
Economic Study of Puerto Rico

Volume II

United States Department of Commerce

Economic Study of Puerto Rico

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Preface

The Economic Study of Puerto Rico originated in a meeting on March 2, 1977, between President Jimmy Carter and Governor Carlos Romero-Barcelo of the Commonwealth of Puerto Rico. In considering the economic situation of Puerto Rico, President Carter suggested in the meeting, and Governor Romero agreed, that a group of executive branch officials from appropriate departments be formed to carry out a Federal study of the economic problems facing Puerto Rico.

President Carter subsequently asked Secretary of Commerce Juanita M. Kreps to oversee the Federal Study Group and coordinate its work. While retaining the responsibility for overall guidance of the Study, the Secretary assigned policy management to Jerry J. Jasinowski, the Assistant Secretary of Commerce for Policy. Mr. Jasinowski convened Assistant Secretary-level representatives of the departments to be involved on March 24, 1977, to take up the beginning work of the project, and the representatives formed the Interagency Study Group (ISG). A Federal Study Director was named to prepare the design of the Study, set out a schedule of work, and manage the operations of an interagency working group. The ISG met on several occasions in the spring of 1977 to decide on the focus and bounds of the Study, its approach and topic coverage, and the responsibilities of individual agencies.

From the outset, the ISG felt that it was most important for the Study to avoid political questions. In accordance with this decision, the Study does not examine the economic implications of a change in Puerto Rico's political status. Nor does it reach any issues or contain any analysis which concerns a change in Puerto Rico's political status directly.

The ISG agreed that the effort should be confined to economic problems, with an emphasis on the impact of Federal programs on these problems. Furthermore, the primary view of the ISG was that the Study should be thoroughly comprehensive in its review and analysis of the Puerto Rican economy. These decisions were taken in the spirit that the prevailing analysis should recognize fully the broad spectrum of interests of residents of Puerto Rico. The ISG also felt that the setting of priorities and policies for continued economic progress is the prerogative of Puerto Rican residents. This view logically precluded the development from the problems analysis of a set of recommendations or priorities which would constitute, in some sense, an economic plan or projection for the future of the island. The purpose intended for the Study by the ISG is that it serve as a basic source of information and perspective for policy development by Puerto Rico over the next several years.

In place of recommendations, the ISG considered it appropriate that the Study propose a series of economic policy options and approaches which Puerto Rican policymakers could draw upon in line with priorities established for the economy. The options introduced throughout the Study involve broad choices with respect to basic policy thrust, as well as detailed programmatic changes. Federal Government options are also included, but these are necessarily confined to possibilities permitted under prevailing Federal legislation. With respect, however, to some programs of the Department of Health, Education, and Welfare, there are mentioned legislative proposals which have been under consideration in the executive or legislative branches in recent years.

To maintain effective coverage and manageability, the ISG preferred to organize the Study principally on a sectoral basis. In this way participating executive branch agencies could bring to bear their expertise on areas that generally corresponded to their formal responsibilities and at the same time cover major problem areas delineated for the Study.

After setting this course of action, the ISG arranged a meeting with Puerto Rican Government officials to go over the general lines of the approach to be used in the Study and the Study's limits and content. The meeting was held in Washington on May 17, 1977. The Puerto Rican Government group was headed by Mr. Miguel Rivera-Rios, President of the Puerto Rico Planning Board. The group agreed to the ISG general plans and offered to prepare background materials to help get the Study underway. Under the coordination of Mr. Rivera-Rios, a Puerto Rican counterpart committee to the ISG soon thereafter completed a detailed agenda of Puerto Rico's problems. The agenda provided a valuable basis of departure for the Federal agencies involved in the Study. On June 24, 1977, following agreement within the ISG as to the final design and content of the Study, work was begun. In the remainder of 1977 extensive field work and research were undertaken by the ISG agencies.

After the initial phases of the project were underway, Deputy Assistant Secretary of Commerce S. Stanley Katz and the Study Director met with Cabinet-level officials of the Puerto Rican Government in San Juan on November 18, 1977. A review of the Study's approach, limits, content, and organization was made for the Puerto Rican officials and a progress report on work to date was presented. Detailed outlines of all parts of the Study were tabled and requests were made to the Puerto Rican Government for special data that were needed for the planned analysis.

Preliminary drafts of the sections of the Study were finished by the ISG agencies in early 1978. The Department of Commerce reviewed them and made appropriate suggestions for changes to produce a complete and well coordinated final product. In order to facilitate the process of coordination, a series of ISG meetings was held in the spring of 1978. The ISG examined Study results, including the findings of the overall economic assessment produced by the Office of the Chief Economist for the Department of Commerce. The ISG agreed on the major problems and issues revealed in the analysis of the aggregate economy and on the options set out in the Study. Following this series of meetings, steps were taken among ISG agencies to assure the final interagency coordination of all aspects of the Study.

Drafts of the assigned Study sections were completed by the agencies in the fall of 1978 and a draft of the complete Study was provided to the Puerto Rican Government for review on October 30, 1978. The Puerto Rican Government conducted an examination of the Study and made the final results of its review available on March 20, 1979. The review produced suggestions, clarifications, and data refinements which the ISG felt contributed materially to the accuracy, soundness, and clarity of the Study.

Deputy Assistant Secretary of Commerce Frederick T. Knickerbocker and the Study Director led a delegation of ISG representatives to San Juan and held meetings in the Puerto Rico Planning Board during the first week of May 1979, with Mr. Rivera-Rios and other Puerto Rican policy officials to discuss the review findings and lay the ground for the final revisions of the Study. In accordance with the mutual understandings reached in the meetings, the ISG agencies undertook the last alterations and additions necessary to ready the Study for publication. While the Study was carefully coordinated with the Puerto Rican Government throughout its preparation, all views in the Study are ultimately those of the ISG.

During preparation of the Study the Puerto Rico Planning Board and other agencies of the Puerto Rican Government extended invaluable assistance to representatives of the Federal Government. ISG teams visited Puerto Rico for their fieldwork and all their efforts were supported by provision of access to key

Puerto Rican Government officials and to the extensive data resources of the Government. Puerto Rican technical level personnel were very helpful in furnishing statistical material and numbers of essential data compilations were specially produced by them for the Study.

Much of the analysis was also facilitated by the views and interpretations offered by Puerto Rican observers throughout the private sector. Many businessmen, consultants, university teachers, and former Puerto Rican Government officials freely gave their time.

The Puerto Rican economy has been subject to a great deal of examination and analysis over the years, and the large, valuable body of literature available has been widely consulted by ISG agencies. Previous inquiries, however, were generally concerned with particular aspects of the economy and none appear to have been produced with the dimensions of this Study. The extensive Federal resources employed and the approach taken in this effort have made possible a study of the most comprehensive scope yet undertaken.

William B. Pounds
Study Director

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Introduction

The Economic Study of Puerto Rico is made up of three parts.

Part One of the study is the General Economic Assessment. It provides a macroeconomic overview of Puerto Rico containing a description and analysis of production, income, employment, external trade, inflation, investment, and the role of government. The assessment draws on information in the various sector reports of the Study and brings together separate material in an overall context. The assessment sets out the major issues confronting the Puerto Rican economy; these subsume all the other issues that are treated in the body of the Study. In addition, Part One provides a conceptual framework for the development of major alternatives for Puerto Rico in planning its future economic direction.

Federal Programs and Policies, Part Two, is designed to bring together in one place an analysis of the characteristics and effects of Federal programs and policies in Puerto Rico. It includes, within a systematic and summary treatment, those programs dealt with separately in the Part Three sector reports plus all additional programs that are significant in Puerto Rico. Aspects covered include the relationship of Federal assistance to Puerto Rican needs, the results of expenditures on identified problems, and the differing program treatment that Puerto Rico receives under its relationship to the United States. Part Two contains approximately 85 program profiles in a final section covering over 100 Federal programs accounting for over 90 percent of the total Federal assistance going to Puerto Rico. The profiles provide on a comparable basis a statement of program purpose, Puerto Rican eligibility and treatment, actual outlays, administrative requirements for funding, and identification of problems which prevent optimal participation by Puerto Rico.

Nine sector studies, constituting the bulk of the Study, make up Part Three. The Study is essentially sectoral in its approach and the sector analyses collectively account for the main body of the Puerto Rican economy. The sector studies cover:

- Industry
- Agriculture, Food, and Rural Living
- Tourism
- Housing and Construction
- Transportation
- Energy
- Commercial Banking
- Employment, Wage Structure, and Migration
- Social Conditions and Human Services

No provision is made for a separate sectoral treatment of services, but the Banking and Tourism Sectors together are important components of private services activity in Puerto Rico, and most public enterprises services are covered in the Energy and Transportation Sectors. Particular attention is given to the goods sectors and, within this framework, Industry receives an emphasis consistent with its major contribution to output. Construction is accorded special sectoral treatment since it also is an important economic activity in Puerto Rico. A separate sector study is included on employment, unemployment, and wages because these labor aspects are of vital concern, and likewise, a separate report is provided for social conditions and human services in consideration of the linkage to economic

progress. Each sector study provides a view of the structure and operation of the sector, an examination of relevant Federal programs and policies, an analysis of the significant problems, and a presentation of policy and program options.

An Executive Summary is provided in the forepart of the Study.

Part Three: Sector Studies

Industry

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Under a grant from the U.S. Department of Commerce, the Institute of International Law and Economic Development, of Washington, D.C., carried out the basic data collection and analysis for the Industrial Sector Study. Work under the grant was supervised by L. Randolph Mye of the Puerto Rico Study Staff of the U.S. Department of Commerce. Revisions and additions in succeeding drafts were written by Mr. Mye, aided by suggestions from George D. Hanrahan, of the Office of the Chief Economist of the Department of Commerce, and Study Director William B. Pounds. David McMeans of the Study Staff contributed the appendix that analyzes Puerto Rican shipments of manufactures to the United States.

Many individuals in the Puerto Rico Planning Board notably Suriel Sanchez, Rosendo Miranda, and Olga Martinez, extended invaluable assistance in collecting data and in offering interpretations and advice. Bertram Finn, William Martinez, and Allan Udall of the Puerto Rico Economic Development Administration were also most helpful in contributing information and suggestions. In addition, members of the Puerto Rican business community, consultants, university teachers, and other private individuals provided many helpful views.

Industry

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Chapter I.—Summary and Findings

THE STUDY

Strategy for Development

Industrial development has been the prime factor fostering economic growth in Puerto Rico since the late 1940's. Initially the Puerto Ricans through the Industrial Development Company, a government entity, attempted to create government enterprises in the cement, glass container, paperboard, structural clay product, and shoe industries. However, by 1948, the Puerto Ricans realized the limitations of public control and ownership.

The inherent limitations of the policy of direct government development of manufacturing enterprises (among them, limited financial resources and lack of marketing and distribution systems, skills, management, etc.) led to the structuring in the late 1940's of a new strategy to promote Puerto Rico's economic transformation. This strategy was based on attracting external investors to establish manufacturing plants that would export most of their production from Puerto Rico to the U.S. market, or third markets if possible.

In implementing this policy strategy, Puerto Rico offered a variety of advantages:

(1) The position within the U.S. customs union of manufacturing plants located in Puerto Rico;

(2) A comprehensive Puerto Rican tax exemption program, coordinated with an advantageous special status granted by U.S. tax legislation to U.S. subsidiaries operating in designated areas, including Puerto Rico—"possessions corporations";

(3) A significant wage-cost differential between Puerto Rico and the United States, which was related to the special treatment granted to Puerto Rico in the application of Federal minimum wage legislation;

(4) Subsidized rents, wages, training, etc., also used as incentives to attract new firms;

(5) The creation, in 1950, of a new agency, the Economic Development Administration (EDA), in order to coordinate and promote the industrialization program.

The above factors have undoubtedly been ex-

tremely effective in attracting manufacturing plants, as indicated by the increase in the manufacturing sector's net domestic income from \$89 million in 1950 to \$2,845 million in 1977.

This policy has operated since its inception with no basic change in objectives, but in its implementation there was a shift away from emphasis on less competitive labor-intensive, low wage industries toward industries capable of paying higher wage rates, which turned out to be industries with regulated monopoly or capital-intensive characteristics. These characteristics usually involved an increase in the embodied capital-labor ratio. The new administration which took office in 1977 announced one significant change in future policy. While the manufacturing sector is to continue to receive major emphasis and to be considered as a "stanchion" of the economy, it is not to be given exclusive attention. Increased attention is to be given to other sectors, particularly agriculture and certain components of the services sector.

Results

The Puerto Rican export-led development strategy has resulted in very large increases in output, in significant changes in economic structure, and in greatly increased consumption levels.

Overall Growth—The economy as a whole has grown significantly.

a. Gross domestic product increased from \$572 million in 1947 to \$9,717 million in 1977. In real terms (1954 dollars) it increased by 565 percent over the period.¹

b. Gross product (equivalent to GNP in U.S. national account terms) grew from \$612 million in 1947 to \$7,914 million in 1977. In real terms, it increased by 410 percent from 1947 to 1977.

c. GNP per capita rose from \$154 in 1940 to \$2,391 in 1977. It increased in real terms by 197 percent from 1950 to 1973, after which it declined slightly, falling from \$1,186 to \$1,086 in 1977. This increase is all the more remarkable when it is con-

¹ The base year used in the Puerto Rican statistical series in converting current values to real terms is 1954.

sidered that population rose from 2,200,000 in 1950 to 2,912,000 in 1973, and to 3,267,000 in 1977.

d. Employment increased by 239,000, from 536,000 to 775,000 from 1947 to 1974, but fell in 1975 with slow recovery strength.

Contribution by Sectors.—There has been considerable variation in the performance of the sectors in their direct contributions to this growth.

a. Manufacturing; commerce (wholesale and retail trade); government; and finance, insurance and real estate have in descending order been the largest contributors to the increase in GDP.

b. Government, commerce, manufacturing, and services, in that order, have made the largest contributions to absolute increases in employment.

c. The position of agriculture in the economy has declined dramatically. Agricultural output, which was 20.6 percent of GDP in 1947, was only 3.5 percent in 1977. Output in real terms fell absolutely over that period (from \$154 million in 1954 dollars, to \$127 million). Employment dropped by 188,000 in the period 1947 to 1977, from 229,000 to 41,000, and from 42.7 percent to 5.5 percent of total employment.

d. The government sector increased employment at an average annual rate of 7.2 percent between 1940 and 1977, while the economy expanded employment opportunities by 1 percent and the manufacturing sector by 2.6 percent. By 1977 government contributed 23 percent and manufacturing 19.5 percent of total employment for the economy.

Contribution by the Manufacturing Sector.—*Overview.*—The manufacturing sector has played a major role in the growth which has occurred. Manufacturing has substantially increased its share of nominal net domestic income from 15 percent in 1950 to 34 percent in 1977. During the period, the annual growth rate of total income was 10.4 percent, while for the manufacturing sector it was 13.7 percent. In the decade 1950–60, manufacturing income advanced at an annual rate of 12.5 percent, compared to 8.1 percent for other sectors. The share of manufacturing in total production rose from 15 percent to 21 percent. In the decade 1960–70, the difference between the annual growth rate for manufacturing (12.7 percent) and that of other sectors (11.4 percent) diminished, with the result that the ratio of manufacturing to net domestic income rose by only 3 percent, to 24 percent. For the period 1970–74, manufacturing net income continued to advance at a high rate of 17 percent, reaching 28.6 percent of net domestic income by 1974 and 34 percent in 1977. The growth of sectoral income at the height of the recession in FY 1975 was 7.3 percent as compared to the annual average rate of 14.6 percent in the period 1970–77.

Manufacturing Employment.—The manufacturing sector has been an important contributor to employment creation. Manufacturing employment increased from 56,000 in 1940 to 147,000 in 1974, but was 144,000 in 1977.

The U.S. recession in 1975 impacted heavily on the manufacturing sector, causing a decline in employment of about 13,300 jobs, or about 15 percent of total sector employment. The decline in employment during the recession was generally concentrated in chemicals and in electric machinery, which are essentially export-oriented, and in construction materials, which reflected the slowdown in the construction industry. However, employment over the long term in the chemical industry (of which drugs are a part) has increased strongly. It rose by 256 percent between 1970 and 1976, while total manufacturing employment increased by only 6 percent in the same period. It appears that the bulk of the increase of employment in chemicals was registered by the drug industry as it expanded operations.

Profits.—Profit expectations play the key role in the Puerto Rican tax exemption policy for industrialization. Manufacturing sector profits rose at an average annual rate of about 13.8 percent for the period 1947–77. In 1975, the growth of net profits was 3.1 percent compared to the annual average of 26.7 percent for the period 1970–77. In the most recent years, 1973–77, the annual rate was 16.3 percent. The drug industry accounted for about 47 percent of the sector's total profits in 1977, with electric machinery in second place with about 16 percent of profits. Between 1970 and 1977, the drug industry's profits grew 958 percent, while total sector profits grew 512 percent.

The ratio of profits to GDP for the whole manufacturing sector was 22 percent in 1977 compared to 25 percent in 1967, while for drugs alone the ratio increased from 2 percent to 10 percent in the same period. Net profits per employee increased from \$32,159 to \$40,649 in the drug industry and from \$9,740 to \$12,947 in the electric machinery industry during FY 1975, notwithstanding the recession in Puerto Rican economic activity. For the sector as a whole, net profits per employee increased from \$6,239 to \$12,028 (a 25.5 percent annual rate) over the recession and partial recovery period 1974–77.

The gap between GDP and GNP was about 23 percent by 1977, clearly indicating the transfer of profits off the island. The funds generated on the island have financed to some extent new investment, reducing the necessity of bringing new funds to the island, as well as investment in Puerto Rican Government securities. Although the balance of payments treatment of capital flows could involve some double

counting, there is little doubt that investment in off-shore securities was substantial prior to the revision of section 931 in 1976.

Wage Contribution.—For the manufacturing sector, wages and supplements have sharply declined relative to the manufacturing sector's contribution to GDP formation. The ratio of wages and supplements to sectoral GDP declined from 52.5 percent to 34.7 percent between 1969 and 1977. Moreover, the ratio of wages and supplements to sectoral profits moved from 189 percent in 1969 to 67 percent in 1977. Excluding the pharmaceutical industry from the calculation, the ratio of wages to profit for 1977 is about 100 percent as opposed to the 67 percent sectorwide figure. The faster growth of profits relative to wages demonstrates in part the slow growth in overall sectoral employment. These factors imply a shift toward capital-intensive industries. This shift is consistent with the expressed desire in Puerto Rico to attract industries that have higher technology and greater capacity to pay higher wages, and demonstrate long-term competitiveness which will not be easily duplicated in LDC's.

Recovery from Recession.—Manufacturing output increased by 16 percent in 1977 and was led by a substantial increase in exports of 38 percent (in nominal terms). Sectoral net income rose 19 percent in 1977 over 1976, while employment increased in absolute terms by 11,000 jobs with chemicals, instruments, and electric machinery industries providing 90 percent of the new employment. Through the first 9 months of FY 1978 an additional 3,000 jobs were apparently created in the sector. Moreover, output appears to be growing at an annual rate of about 9 percent in real terms. Thus, the recovery appears to be taking place nicely, despite the slowdown in investment during calendar 1977, which may have been attributable to investor uncertainty over revisions in the Puerto Rican incentives law.

Changing Characteristics of the Sector.—The extraordinary growth of the manufacturing sector in Puerto Rico has been accompanied by a process of structural change. The rapid increases in the wage rates and fringe benefits have been the underlying forces behind changes in the composition of manufacturing output and employment. The changes have basically consisted of the disappearance or decline of labor-intensive industries, which has to a great degree been offset by the creation and rapid development of industries with a higher capital/labor ratio. This process has operated since inception of the industrial development program. For example, the home needlework industry, which employed 51,000 persons in 1950 and represented 48 percent of the manufacturing work force, declined to 10,000 persons by 1960 and virtually disappeared in the decade

1960–70. This reduction of sector employment was largely compensated by an expansion of textile and apparel industries, which, despite their basically labor-intensive character, operated with more capital per worker. However, some segments of the apparel industry could not cop with increased wage costs. The output of the handkerchief and glove industries fell from \$25 million in 1950 to \$5 million by 1971.

The process of change from labor-intensive to capital-intensive industries has proceeded uninterrupted with impressive gains in manufacturing exports, net income, and employment except in the 1975–76 recession period. The effectiveness of the industrial development program in attracting new industries has generally been sufficient to offset plant closings due partly to rising labor costs. A significant portion of these new industries were able to afford rising labor costs. For example, net income generated in the chemicals and allied products industry expanded from \$9.9 million in 1960 to \$110.4 million in 1970. In 1970, this industry was paying an average wage rate of \$2.26 or about 19 percent above the sector's average and about 33 percent higher than the apparel industry. By 1976, the chemical industry paid an even higher wage rate (\$3.90), which was 36 percent higher than the sector's average of \$2.86, and about 67 percent higher than the apparel industry. Professional and scientific instruments plants which EDA had attracted could likewise pay higher wage rates than the apparel industry by 1976.

In 1970, the traditional, labor-intensive industries still constituted the most important element of the manufacturing sector, generating about 49 percent of total sector employment and 33 percent of total sector net income. By 1976, these industries had increased their relative share of employment (about 55 percent), but suffered a decline in their relative share of net sectoral income (about 31 percent).

In 1977, the nontraditional industries registered a sharp gain in net income of 34 percent, surpassing the rest of the sector. Moreover, employment in these industries recovered strongly, increasing some 13 percent and representing 95 percent of the employment increase for the whole sector. The expansion in net income of nontraditional industries was mainly related to advances in the chemicals and electrical machinery sectors, which compensated for the continued decline in the petroleum and cement industries. The latter were affected by high-cost raw materials and the crisis in the construction industry.

Competitive Position of Puerto Rican Industry

Competitive Factors in Relation to Non-U.S. Producers.—An analysis of costs and benefits of a

manufacturing plant location in Puerto Rico compared to foreign countries is very complex. No conclusive results have been discovered in this study, and further study should be undertaken.

The decision to invest in Puerto Rico as opposed to other areas is generally dependent on profit expectations and the evaluation of risks related to the decision. First, for many labor-intensive industries, a Puerto Rico location suffers from a significant wage cost disadvantage in relation to most third world countries (assuming productivity is similar for these industries). For example, in the apparel industry, a comparison of hourly wage rates with certain Latin American and Asian countries shows Puerto Rican wage rates 2 to 14 times higher.

While Puerto Rico is at an apparent disadvantage in terms of labor costs, this is balanced to some extent by the competitive advantage enjoyed by Puerto Rico due to the absence of tariff barriers on Puerto Rican goods exported to the U.S. market. Puerto Rico probably has transport cost advantages (to the United States) in relation to some few countries such as the Dominican Republic,² but for most other third world countries transport costs may act as a disadvantage to a Puerto Rican plant location.

Other factors which seem to favor Puerto Rico relative to third world countries are:

(1) Puerto Rico has a long tradition of political stability and democracy;

(2) Investment in Puerto Rico is not subject to the risks of currency devaluation, import and exchange controls, or confiscation of property without adequate compensation;

(3) Manufacturing plants in Puerto Rico are not subject to the risk of U.S. tariff increases or imposition of nontariff barriers;

(4) Puerto Rico has a relatively well trained and stable work force.

Competitive Factors in Relation to U.S. Producers.

—During the early years of the industrialization program, Puerto Rico offered potential manufacturing investors the advantage of low wage rates, which were associated with the special treatment given to Puerto Rico in the Federal minimum wage law. The hourly wage rate in promoted industries was 29.9 percent of the U.S. average and 44.3 percent of the wage rate in Mississippi in 1949. Moreover, in the apparel and related products industry, the Puerto Rican wage rate was \$.30 in 1949, equal to about 35 percent of the Mississippi rate and 24 percent of the U.S. average. As a result of the labor cost advantage, the rate of return on equity before taxes was substantially higher in promoted industries operating in Puerto Rico compared to those operating in the United States. In 1956, the rate of return on

equity investment before taxes was about 37 percent in Puerto Rico and about 22 percent in the United States. After taxes, the Puerto Rico based operation had a return about three times higher than the U.S. operation.

The accelerated pace of wage increases in Puerto Rico has significantly eroded the wage differential in favor of Puerto Rico. The average manufacturing wage rate in Puerto Rico increased from 44 percent of the Mississippi wage rate in 1949 to 72 percent in 1970 because the Puerto Rico manufacturing wages were advancing at a much faster annual rate (6.9 percent) than in Mississippi (4.5 percent). In the apparel industry, the relative labor cost advantage experienced an ever greater erosion in the period 1949–70. The Puerto Rican wage rate in this sector increased from 35 percent to 93 percent of the Mississippi wage rate during 1949–70. Since 1970, the Puerto Rican wage rate in the apparel industry has increased about 3 percent annually in nominal terms. Overall, the average wage rate in Puerto Rican manufacturing increased 8.2 percent in the period 1971 to 1976, while in the United States manufacturing average wages increased 9.5 percent in nominal terms. The widening absolute gap in wage levels between Puerto Rico and the United States is the result of a lower base on the island against which the percentage change is calculated. Thus, it appears that Puerto Rico has not improved its position relative to the United States in recent years.

Other costs, such as energy and transport, tend to impact on Puerto Rico more heavily than mainland industrial locations. The energy cost differential between Puerto Rico and the Sunbelt States seems to vary in the range of 60 percent (Hawaii) to 190 percent (Louisiana).

Industrial Incentives Act and U.S. Tax Exemption

The Industrial Incentives Act (IIA) of 1948 constituted the principal policy instrument used by the Puerto Ricans to attract U.S. firms to the island. The act, among other things, offered time-limited exemptions from Puerto Rican profit taxes, which, conjoined with section 931 of the Federal IRS Tax Code, essentially permitted tax-free operations on the island. The 1948 IIA provided for a 10-year exemption period from Puerto Rican corporate income taxes, property taxes, and excise taxes on enterprises engaged in the production of new manufactured products. The 931 corporations were allowed to exclude from gross income all foreign income, including Puerto Rican source income, if they met the following requirements: (1) 80 percent or more of gross income was derived from sources within Puerto

² Source: Puerto Rican Maritime Authority Study, 1976.

Rico and/or a possession of the United States; and (2) at least 50 percent of gross income came from the active conduct of a trade or business therein.

A U.S. company desiring to establish a plant in Puerto Rico could operate through a section 931 subsidiary corporation, thus avoiding the payment of Federal income tax on Puerto Rican net income until distributed by the subsidiary to the parent company. This special treatment under Federal tax legislation allowed the section 931 subsidiary to avoid the payment of Federal corporate taxes during the whole Puerto Rican-granted exemption period, provided earnings were not repatriated to the parent on a current basis. Furthermore, if the section 931 subsidiary were liquidated at the end of the exemption period, the accumulated earnings of the subsidiary would be transferred to the parent without the imposition of any Federal income tax, under the Internal Revenue Code, section 332. Liquidation was also tax free under Puerto Rican law.

The effect of the Puerto Rican tax exemption was in practice approximately to double the after-tax rate of the return on investment by U.S. corporations through a section 931 subsidiary in Puerto Rico. Therefore, as long as manufacturing enterprises could operate with an acceptable rate of profit (including the illegal possibility of shifting profit through transfer pricing) in Puerto Rico, then the tax exemption under the IIA was a powerful inducement to locate in Puerto Rico.

Even in the recession of 1975, tax exemption represented a benefit of \$414.8 million for the section 931 subsidiaries operating with profit. The accumulated value of the tax exemption (under the IIA) for the period 1948-77 amounted to about \$3,300 million.

The tax exemption incentive has been enhanced over the years by the Puerto Rican Legislature and recently by the U.S. Congress. In 1961 the Puerto Rican Government reviewed the IIA, extending to 13 years (from 10 years) the period of exemption for manufacturing plants located outside the San Juan metropolitan area. In 1963 the new Industrial Incentives Act established 10-year, 12-year, and 17-year geographic zones for exemption periods.

The recent change in the Federal tax code embodied in section 936 of the 1976 tax reform law was a positive U.S. action which encouraged section 931 corporations to place funds in Puerto Rican assets, at the same time allowing them to repatriate dividends free of U.S. income tax on a current basis. The revisions in the law should benefit Puerto Rico by permitting it to capture through taxation (toll-gate taxes) some portion of repatriated earnings. The proposed revisions by the Romero Administration of the Puerto Rican Incentive Act, enacted into law in June 1978, moved in the direction of increasing

the tax liability of corporations operating on the island. The eventual need of graduating corporations from tax exemption to a taxable status is an important step which recognizes the structural changes taking place in the last 15 years in this sector.

Nontax Factors in Puerto Rican Support of Industrialization

In addition to the tax exemption, Puerto Rico offers a variety of incentives designed to attract manufacturing firms including: Worker training and other technical assistance; construction and subsidized rental of industrial buildings; capital grants or "special incentives" related to the location of plants and number of workers employed by new plants; direct loans from the Government Development Bank and to a much lesser extent the Puerto Rican Industrial Development Company (PRIDCO); and payroll subsidies.

In the construction and rental of industrial buildings for the period 1942-77, nearly 1,307 industrial buildings were constructed by PRIDCO, with a total area of 22.4 million square feet at a cost of about \$200 million in current prices. Rents charged on standard industrial buildings constructed by PRIDCO are about 40 percent below rents on privately owned buildings. Land and building rental in PRIDCO industrial parks appears to be priced below most comparable factory locations in the States.

Under capital grants, the maximum grant for the first 30 workers is about \$10,000, while in the underdeveloped areas the grant is about \$30,000. PRIDCO has disbursed a total of about \$38 million between 1951 and June 1977 to assist industrialists in defraying costs of machinery, transportation, special installations, employee training programs, rentals, electricity costs, and other items.

Direct loan programs have been more modest in Puerto Rico than in some of the States of the Union. At the end of fiscal year 1977, the industrial loan portfolio of the Government Development Bank and PRIDCO amounted to about \$130 million, which represented a small portion of the total industrial investment of about \$12 billion. Industrial revenue bonds have not been used in Puerto Rico to finance industrial development.

Sources of Investment

Investment in the manufacturing sector has been financed essentially from external sources—approximately 90 percent has come from mainland U.S. firms. Most Puerto Rican units of U.S. companies are import/export production facilities operated under parent company management decisions taken

within the context of a total worldwide market and production orientation. This entrepot function has, essentially, limited Puerto Rican production to meeting needs within the continental market, making the sector dependent on the market situation in the United States.

It appears that future Puerto Rican development will continue to depend on long-term external capital inflows to maintain a strong growth trend. This inflow rests heavily on continued facilitation by Federal tax actions and policies. To the extent that the Commonwealth can stimulate employment growth and expand its tax base to finance further economic and social infrastructure, the complementary Federal Government efforts can assist Puerto Rico in increasing the well-being of the island's people.

Problems and Shortfalls

In the Overall Economy.—The lack of natural resources, the shortage of local capital, and the relatively small size of the local market have made Puerto Rico's economic development highly dependent upon an inflow of external resources and upon production for the export market. The extent of this dependence has increased as economic growth has proceeded. For example, net inflow of capital in 1975 was \$2.2 billion, 85 percent of aggregate investment financing available as compared with 35 percent in 1950. About 70 percent of Puerto Rico's national income is spent on imports. Merchandise exports were 46.9 percent of GDP in 1977 as compared with 33.6 percent in 1950. Net Federal Government transfers to Puerto Rico were about \$2.4 billion in 1977, about 25 percent of GDP. The extent of the manufacturing sector's dependence on external investment is shown by the fact that in 1973 external stockholders' equity in nine industries was 98.3 percent of total equity (e.g., 99.988 percent for pharmaceuticals, 99.98 percent for petrochemicals, and 98.9 percent for electrical machinery). These nine industries produced over 57 percent of manufacturing output in 1977.

This dependence is probably characteristic of a small economy with limited resources, and, like any other subnational jurisdiction, Puerto Rico does not have available to it the usual national tools of monetary, trade, and exchange policies. This gives rise to high "leakages" with consequent low "multiplier" effects from increased production and income. It also makes the economy highly vulnerable to the risk of changes in external economic conditions, changes in Federal programs and policies, and Puerto Rico's position in the U.S. Federal system.

Linkages among the sectors, and especially between the manufacturing and other sectors, have been growing slowly. This implies some reduction

in leakages from the economy or a slight increase of the income multiplier.

The heavy dependence on external investment, coupled with apparent insufficient linkages, has resulted in a situation in which the very large increases in output produced on the island do not result in corresponding increases in income accruing to Puerto Rico. There is a widening disparity between increased output and Puerto Rican income generation, with Puerto Rican income per unit of output falling. GDP exceeded GNP by \$2 billion in 1977. GNP as a percentage of GDP has fallen continuously throughout the period 1947 to 1977, dropping from 107 percent in 1947 to 81 percent in 1977.

High unemployment is a persistent characteristic of the economy. The rate of net job creation, therefore, appears insufficient to meet existing labor supply which apparently is enlarged by recent return migration. This could imply a greater need for expansion in employment opportunities preferably in the productive and service sectors. Transfer payments relative to personal income have tended to increase reducing the social ill effects of unemployment, but not solving the long-term problem of employment creation. Out-migration to the mainland may arise in the future to alleviate the problem at the risk of losing talented people whose contribution to the island's economy would be sorely needed.

There are wide variations in productivity among the sectors as shown by the fact, that, despite the large reduction in employment in agriculture increased by 345 percent from 1948 to 1976 as compared with an increase of 326 percent in manufacturing. Output per employee in agriculture was 30 percent of that in manufacturing in 1948. By 1976, it had increased to only 31 percent.

The economy is characterized by high consumption and low savings. The propensity to consume is shown as being greater than one in some years. Personal consumption expenditures in recent years have exceeded GNP. Net domestic savings appear to be virtually zero since the mid-1960's.

In the Manufacturing Sector.—The manufacturing sector has made major contributions to the economic growth which has occurred. However, it exhibits certain weaknesses and there appear to be limitations on the contribution it can make in relation to the magnitude of the problems faced by Puerto Rico.

The large volume of external investment flowing into the sector and the accompanying large increases in output are falling short of generating desired employment.

Manufacturing employment increased by 79 percent from 1949 to 1963; by 55 percent from 1963 to 1973, and fell 5.6 percent from 1973 to 1977;

the latter decline is reflective of the incomplete recovery from the recession. The decline in employment may be in part due to the effects of recession in labor-intensive industries. However, the growth in manufacturing output was retarded by the recession in 1975 and has since begun to recover quite rapidly with 1978 real growth expected to be about 9 percent.

The total number of jobs created by manufacturing has been small in relation to the unemployment problems of the economy. From 1950 to the peak in 1974, the manufacturing sector produced 92,000 net additional jobs, an average increase of 3,833 jobs a year. An average of 5,000 new jobs a year was created in each of the periods 1960-65 and 1965-70. During the highest period, 1964-69, net additions to employment amounted to 8,200 a year. An increase of 5,000 jobs a year represents only $\frac{1}{37}$ th of reported unemployment in 1977 and 8,200 a year amounts to only about $\frac{1}{23}$ d. The total force increased by almost 11,000 a year from 1960-65, about 17,000 a year from 1965-70, and about 22,800 a year from 1970-77. These data take no account of what appears to be a low labor force participation rate (about 41 percent compared with a U.S. mainland rate of about 62 percent). Thus, it would appear that the manufacturing sector cannot be counted on to solve in a major way the overall employment problem. Indirect effects of direct investment are limited by a low multiplier (a low level of backward or forward linkages) and induced investment resulting from the direct investment appears low to meet total employment requirements of the economy. Yet it would be desirable to establish explicit direct and indirect employment targets for the sector to guide promotion activities. Presently, Fomento uses informal employment guidelines as one criteria in its promotion activities.

Since the present direction of development is highly dependent upon external investment and Federal, as well as local, tax exemption; vulnerability to changes in the corporate and investment policy of external investors and to changes in governmental tax policy is exacerbated. Some parts of the sector are sensitive to the changes in U.S. trade policies which reduce restrictions on imports from low-wage economies. Corporate investment and production decisions, materials supply, and product distribution systems are almost entirely related to policies, practices, and financial, and tax considerations of mainland parent corporations with little influence from Puerto Rican economic forces.

Linkages within the sector and with other sectors are limited. Earlier studies show that prior to 1963 industries in Puerto Rico were engaged primarily in processing semifinished materials into export items in a form still short of final product. Analysis of

more recent periods shows that forward linkages, as measured by the ratio of interindustry sales to total shipments, improved somewhat from 1963 to 1972. The analysis also shows that Puerto Rico became less dependent on imported materials during that period, implying that backward linkages increased slightly. Limited development of backward linkage could arise out of a combination of circumstances, including a shortage of natural resources, low capital accumulation in Puerto Rico, its relationship to the U.S. market, and the predominance in the sector of mainland parent-Puerto Rican subsidiary relationships in production, distribution, and financial relationships.

Production for the local market is relatively small with imports supplying a large portion of local demand both for products for final consumption locally and products entering into production for export. The scarcity of resources and the limited size of the local market dictate that greater expansion of the manufacturing sector must depend heavily upon intermediate goods imports and production for the export market. Analysis made in this study indicates that there are three types of industry situations which are deserving of exploration for possible efforts to expand production for the local market. First, there are those industries for which the size of local demand for final consumption, the volume of imports, and economies of scale suggest that increased local production for the local market is likely to be feasible. Examples are certain food products (milk products, bakery products, fruit and vegetable canning, beer), packaging and containers, and rubber products. Second, there are industries which the evidence suggests (but available data and the scope of this study are inadequate to permit firm conclusions) may offer potential for production of intermediate products. Certain textile mill products are examples. Finally, there are some industries which *a priori* seem to be suitable candidates for efforts to expand local production, but for which evidence available is insufficient to permit any immediate conclusion. These include furniture, packaging and containers, and glass products.

In the Incentives System.—Exemption from the Federal corporate income tax in combination with a plentiful supply of relatively low-wage-rate labor has been the major factor in bringing about the very large volume of external investment in manufacturing industries in Puerto Rico. The Puerto Rican incentives program, especially exemption from Commonwealth taxes, has also been a significant factor. If present cost and profit differentials between the island and mainland narrow, exemption from Federal income taxes and tax concessions from Puerto Rico may become even more important. The nature of

industries now locating in Puerto Rico suggests that such exemptions may have come to be the primary factor in leading industries to locate there. Nonetheless, the past system has a number of problems inherent in it:

a. It provides only limited means for influencing priorities in the direction of investment, the nature of industries to be established, or the fashion in which the factors are combined.

b. It tends to reinforce the natural tendencies for mainland parent companies to arrange intercorporate decisions, transactions, production and distribution systems, and fund flows in a way which will maximize overall company objectives.

c. It tends to impair the ability of the manufacturing sector to perform the normal functions of serving as a source of governmental revenues and of accumulation of capital for investment in the economy in which it operates.

d. It introduces an element of uncertainty into consideration of investment decisions since status after the exemption period is unknown. This may deter some investment and tend to develop a sector of more or less transitory industries, that is, firms which come in, operate for the exemption period, and then move out. To the extent that there is such a tendency, it, in turn, intensifies the tendency toward a nonintegrated sector.

The recently enacted Puerto Rican legislation moves in the direction of the removal of these deficiencies.

Significant Differences Among Industries

The comparative analysis made of industry groups is based on fragmentary and to some extent noncomparable data. It utilizes proxies which may bias results. It is also incomplete and leaves out many factors which must be taken into account in formulating governmental policy toward, and programs affecting, the manufacturing sector. The analysis is, in many cases, too aggregated and needs to be carried to 3- and, perhaps in some cases, 4-digit SIC codes for some industries. As a result, it cannot serve as a basis for final policy and program formulation. It may, however, have significance for government policy in a number of ways. First, it points to specific questions concerning current and prospective policy which should be examined. Second, it indicates that there are certain options as to sector policy, and taxation and incentive programs which should be further explored. Third, it is suggestive of the kind of analysis which should be made, using more adequate data and methodology, to provide one basis for policy and program formulation.

The analysis demonstrates that (a) there are wide variations in the benefits provided Puerto Rico by

various industries; (b) provision of such benefits is conditioned and constrained by a number of factors; and (c) there are variations in the degree of risk or vulnerability to Puerto Rico involved in different directions or emphases in the development of the internal composition or structure of the manufacturing sector. Variations arise from such factors as the characteristics of individual industries, profit levels, comparative rates of profits as between the island and the mainland, market and demand conditions, and the nature of investment incentives utilized.

Subject to the limitations and qualifications stated in the first paragraph above, the following findings also emerge from that analysis:

1. In general the highest output per unit of investment is produced by the more capital-intensive industries. (These industries embody the most modern available technology and organizational systems in the capital investment made on the island.) However, it may be inadequate in meeting employment or other policy goals.

2. Capital-intensive industries or industries with regulated monopolies, in contributing to increased Puerto Rican factor incomes, usually have to:

- a. Have substantial export market;
- b. obtain relatively skilled labor; and/or
- c. have enough profits to pay taxes.

Industries falling into this category include:

Pharmaceuticals
Petrochemicals
Petroleum and refinery products
Professional and scientific instruments
Electrical machinery
Nonelectrical machinery.

Profit rates for these industries tend to be high. Except for petroleum refining and products and possibly petrochemicals, whose location in Puerto Rico has been entirely dependent upon special favorable price arrangements for foreign oil which have now disappeared, growth prospects for industries in this group appear to be good.

3. Profit rates for industries in Puerto Rico tend to be higher than aftertax rates for the same industries on the mainland. This differential has been for many industries a primary reason for location in Puerto Rico.

4. The analysis indicates that imposition of a 20-percent corporate income tax would be likely to leave aftertax profit rates in Puerto Rico higher for most industries than such rates for those industries on the mainland. Exceptions might be some food products industries and furniture and possibly stone-clay-glass

and primary metals. It may also be true of chemicals, machinery, tobacco, fabricated metals, and paper products if the low Puerto Rican profit rates for those industries in 1975 were to continue.

It appears, however, that a corporate income tax with an effective rate of 40 percent on profits earned in Puerto Rico would significantly change the relationship between Puerto Rican and mainland profit rates (see chapter IV). The study uses these figures only illustratively to analyze the impact of different tax-rate levels.

5. Imposition of moderate corporate income taxes would be an effective way to increase Puerto Rican income generated by some industries. Industries which offer the greatest potential in this regard are pharmaceuticals, by a large margin, and then electrical machinery to a significant but much lesser extent. Also, instruments, machinery, and possibly apparel and beverages may offer some potential.

6. The volume of employment rather than wage rates seems to be one determinant of an industry's contribution to Puerto Rican income. The very large spread between the more numerous lower wage, high-labor utilizing industries and the small number of high-wage, capital-intensive industries and the growing size of the latter may, however, be bringing about some structural shifts in the distribution of worker income.

7. Wage rates in Puerto Rico were increasing faster than rates on the mainland through 1970. In recent years the absolute spread between the two has, however, widened somewhat because of the higher base for mainland rates. Wage rates in Puerto Rico have increased considerably faster than in other foreign areas with which it competes.

Minimum wage requirements have been a factor in the past in increasing wages in Puerto Rico. Present legislation which will bring the Puerto Rican minimum to mainland minimum by 1981 may be quite important in that regard. Information available indicates that in 1976, 38 percent of the work force had wages lower than the minimum established for January 1978. Only petroleum, chemicals, printing and publishing, and machinery had average wage rates higher than the minimum rate to become effective in 1981. Even if differentials between Puerto Rican and mainland wage rates remain unchanged, the effect on the rate of profit in Puerto Rico could be substantial. Industries likely to be affected are, of course, those with a high proportion of labor costs in total costs such as apparel, rubber and plastics, wood and furniture, and leather products.

8. A combination of greatly increased wage levels and imposition of corporate income taxes would be likely to substantially reduce Puerto Rican profit rates.

9. At present Federal loan and grant-in-aid programs impact only marginally on Puerto Rican industry.

10. Federal program and Puerto Rican program priorities are not closely related. Puerto Rico in general must react rather than relate to Federal policy in advance.

Summary

The analysis in the following chapters (III-V, VII, VIII, IX) is geared toward evaluating industries on the basis of six major criteria: (1) local income, whether for labor or capital; (2) potential government revenue generation; (3) employment creation; (4) linkage potential; (5) import substitution potential; and (6) long-term trade competitiveness. Other factors in a qualitative sense are not ignored, but require more sophisticated tools than presently available. For example, local entrepreneurial development, worker training and skill upgrading, wage absorption capacity, market diversification, etc., are factors that should be more thoroughly evaluated by Puerto Rican authorities. Survey benchmarking of these elements would provide a useful start in the development of a more quantitative evaluation approach. In any event, the analysis does take account of the major factors impacting on Puerto Rico's economy.

Furthermore, the study suggests that the problems which policy needs to address are:

How to achieve a continuation and acceleration of the upward trend in growth of Puerto Rican income, output, and employment.

How to maintain the flow of external investment.

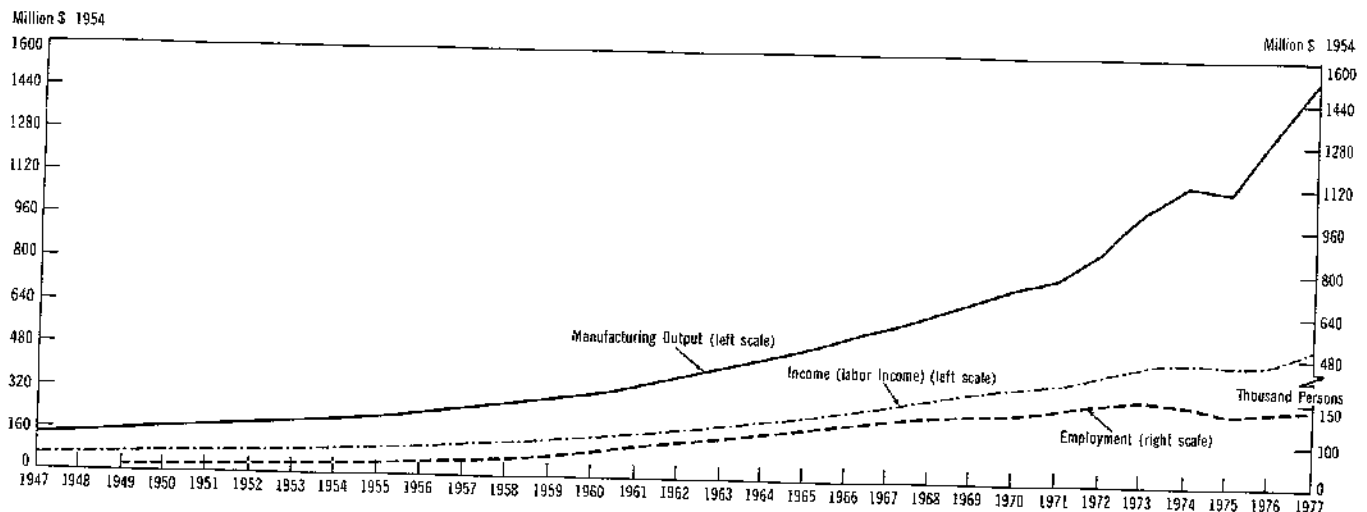
How to increase the income generation effect of investment in the sector which is a function of: (a) the nature of the industry in which the investment is made; (b) the potential for payment of Puerto Rican taxes; and (c) increased linkage and multiplier effects.

How to reduce risk of vulnerability to changes in external circumstances and in relationships within the Federal system.

How to improve and maintain the competitive position of Puerto Rican industry.

Chart 1 summarizes the historical development and the present situation in the sector and illustrates the nature of the problems faced. Probably the most striking feature of the chart is the dramatic rise in the output curve after 1971 and the failure of the labor income and employment curves to follow that rise. It may represent a period of "takeoff" for a number of industries in the rate of increase in employment and income.

CHART 1—MANUFACTURING SECTOR OUTPUT
INCOME AND EMPLOYMENT



PUERTO RICAN DEVELOPMENT STRATEGIES

Strategies for dealing with the problems identified are of two kinds. First, there are choices of the basic policy or strategy to be followed for assisting the development of the manufacturing sector. Second, there are various programmatic options relating to the means to be used in carrying out the basic policy option chosen. The implications of the study for each type are summarized separately below.

Objectives and Assumptions Affecting Choice

There are a number of objectives to which the development of the sector might be expected to contribute. The relative weighting given them will condition the choice among basic policy options. From that perspective, they might be considered as criteria for choice. Analyses contained in the study suggest that under Puerto Rican conditions, a set of reasonable objectives or criteria are:

1. A sustained rate of growth in real GNP at close to the historical levels of the last 30 years.
2. A reduction of unemployment in order to reduce the human, social, political, and economic costs of unemployment.
3. A sustained movement toward a pattern of income distribution which avoids a large concentration of income in a small segment of the population.
4. Reduction in an efficient manner of vulnerability to changes in conditions not subject to Puerto Rican control, including: (a) corporate policy and financial considerations unrelated to Puerto Rican economic conditions, and (b) changes in conditions and the nature of relationships within the U.S. Federal system.

Finally, the study results suggest acceptance of the following assumptions as conditioning the possible strategies that could be considered.

1. Policy toward the manufacturing sector is to be a part of an overall development policy which emphasizes development of other sectors in addition to manufacturing. Such a policy seems to have been adopted by the present government and is supported by the analysis in the study.

2. Certain fundamental elements of past policy toward manufacturing are sound and will be continued, including: (a) enhancement of Puerto Rico's Federal relationship and its position as a part of the U.S. economy; and (b) primary reliance upon imported materials and production for the export market rather than following an exclusive "import substitution" policy (but not precluding the possibility of stimulation of economic production for the local market and increasing "linkages" where feasible) and similar reliance on external capital (but not to the exclusion of attempts to stimulate local savings and investment).

Given the above assumptions, the study suggests a range of policy options is feasible for continued development of the manufacturing sector.

In selecting the strategy the policymaker is confronted with a series of criteria bounded by the investor's selection of technology and the appropriate factor proportions. This latter element is most appropriately measured by the capital/labor ratio (K/L). The amount of capital per employee is assumed to embody the technology package associated with the investment. Industries with a relatively high K/L ratio have in recent years been attracted to Puerto Rico. These industries have absorbed substantial labor, but given the size of the capital re-

quirements increased labor absorption may be problematical. On the other hand, increased technical skills, higher wage and fringe benefits, and increased investment are important contributions these industries bring to the island. The long-term competitiveness of these industries is another factor which Puerto Rican policymakers consider in attracting the industries to the island.

In sum emphasis on attracting these industries offers the following principal advantages:

1. It is known and understood in Puerto Rico and in the mainland and has succeeded in attracting industries to Puerto Rico.

2. It is now attracting high-profit industries whose costs are relatively insensitive to wage rates and which provide high output per worker.

3. The approach provides a means for upgrading skills and increasing productivity as measured by output per worker. The higher skills tend to be transferable.

4. In the past 11 years, the capital-intensive industries have provided the increase in employment generated in the manufacturing sector.

5. The opportunities for downstreaming and increased linkage effects could be enhanced by the capital-intensive industries. In recent years Puerto Rico has not clearly benefitted from linkage development, but these industries are expected to establish greater local ties over the medium term.

6. The high-profit, capital-intensive industries provide a strong base for Puerto Rico to expand its revenues through the potential of corporate taxes, thereby increasing the island's capacity to maintain infrastructure and undertake needed social investments without increasing reliance on outlays of Federal funds.

However, there may be some disadvantages for the island's economy. Among these may be:

1. The ability of the approach to generate large increases in Puerto Rican employment in the near term is limited because of the capital-intensive character of new investment.

2. Direct Puerto Rican income is largely confined to that derived from the labor component of output, and the return to property would essentially still flow off the island because of continued external ownership.

3. It may involve a tendency in the long run toward concentrating direct income to Puerto Rico in the hands of a relatively small and skilled labor group.

4. The approach is very dependent on the use of the tax exemption to attract needed heavy flows of foreign savings for investment and is, accordingly, vulnerable to risks of change in the nature of Puerto Rico's position within the Federal system.

Attracting these industries embodies in the policy-maker's decision an implicit ranking of the objectives associated with the sector in an order in which the prime emphasis is on growth of sector product. The investment increase which the objective is designed to obtain would, through direct and multiplier effects, raise GNP along with GDP, and expand domestic income. However, the approach may lead to a large external ownership component and a further widening of the GDP-GNP gap. While employment increases result from this approach, the criterion of direct employment creation is subordinated to the overall growth and income objectives.

Another strategy is one under which policy and program emphasis would be placed on those industries whose establishment makes the greatest immediate contribution to employment creation and labor income. In general, these industries have a low relative K/L ratio. Because the flow of investment to such industries is now slower than to the higher K/L industries, selective program support in the nature of favorable financing and subsidization of labor expenditures would be relied on to supplement the normally available tax-exemption inducements.

There are a number of advantages associated with this approach. Among them are:

1. If successful, it would in the short run stimulate more employment and labor income than would a policy strictly emphasizing growth in output, and so would be more directly responsive to the problem of Puerto Rico's current high unemployment.

2. It would tend to build a sector structure consistent with Puerto Rico's supply of abundant and relatively inexpensive labor (relative to the mainland).

3. The resulting structure would be somewhat less vulnerable to changed Puerto Rican/Federal relationships.

4. Because of the generally lesser amounts of capital required for investment in labor-intensive enterprises, there would be greater scope for Puerto Rican investors to acquire ownership of capital, and for Puerto Rico to share more fully in direct manufacturing income going to property.

However, there are a number of disadvantages associated with the approach. Among them are:

1. Industries to be emphasized are generally not those with the highest prospects for market growth, particularly for export. The demand for labor-intensive products might limit the ability of these industries to grow sufficiently to absorb available labor supply. Special market promotion efforts might have to be undertaken to strengthen demand.

2. It probably would need extra supporting actions, in the form of subsidies and possibly with

respect to seeking changes in minimum wage legislation. These actions may be costly or difficult to effect.

3. It might be difficult to obtain business acceptance of the differential program treatment required, and the potential investment of some capital-intensive firms might be discouraged.

4. The low-grade technology does not offer a good opportunity for upgrading skills and increasing worker productivity, nor does the slower productivity growth associated with these industries permit the real wage rate to rise as fast as in the capital-intensive sectors.

5. The prospects for linkage development among most labor-intensive industries are relatively limited.

The implications of fulfilling these policy goals reflect a concern to increase the domestic income of the island relative to the growth of gross domestic income. A lower K/L ratio, given the island's reliance on external investment and its relative abundance of labor, would probably lead to increases in labor's share of income, at least in the short term. With capital income as a smaller share of total manufacturing income, given the present ownership structure of the sector, the difference between the GDP and the GNP of Puerto Rico would tend to narrow. In the implicit ranking of sector objectives under this approach, growth of manufacturing output is given a tertiary position. Employment is the prime objective, followed by the objective of narrowing the GDP-GNP gap.

Programmatic or Supporting Options

A number of programmatic options are available for consideration by the Puerto Rican Government. Because they are in the nature of policy instruments they can be considered for use without regard to which overall strategic approach they may apply. They may support one or the other strategic approach. However, the programmatic options covered by the study are not necessarily complementary, and choice must be involved in considering them in any combination as support measures for carrying out a strategic approach.

The programmatic options include:

1. *Adoption of a minimum current profits tax for manufacturing corporations.*—This option, developed in appendix A, applies particularly to the concern about keeping promoted firms in operation on the island after the period of their tax exemption. Appendix A can be considered from the standpoint of effectiveness in retaining firms and at the same time expanding and retaining a corporate tax base that could yield significant revenue.

2. *Adoption of a differentiated incentives system.*—This option would recognize that there are wide variations among industries in terms of their benefits to Puerto Rico and within the conditions that make possible or constrain their ability to produce such benefits. As an alternative to the present largely undifferentiated system, there can be considered a system which differentiates incentives treatment by classes of industry. The system could operate through direct subsidies, such as, grants to companies to support employment or wage goals or through other grant programs normally associated with PRIDCO. The outlines of such a system and the additional data needed for full development of it are presented in chapter IV.

3. *Adoption of a limited import substitution program.*—Even with continued emphasis on export-based industries, a policy which emphasizes the local production of selected commodities which can be efficiently and economically produced for local consumption or for incorporation into exports is an option. Chapter VIII identifies industry possibilities in this respect and discusses the government action which would be required for their promotion.

Decisions with respect to all of the options are hampered by a substantial lack of data. In the conduct of this study it has been noted that it would be useful particularly to have additional data with respect to the section as a whole, as well as for separate industries: investment flows, capital stock, current hourly wages, final sales, unit-cost estimates, capital utilization measures, and intraindustry purchases and import components of final sales, which would in part result from an updating of the input-output data. This lack of data exists at both the macro and micro level and requires consideration of instituting an expanded and continuing program of data collection, research, and analysis. The data should allow for better program and policy formulation and a base for evaluation of policies in the sector.

FEDERAL GOVERNMENT OPTIONS

Federal Government options are in the nature of decisions about program content and size, rather than choices among alternative programs. The Possessions Corporation System of Taxation under section 936 is of central importance to continued Puerto Rican industrial development. Aside from section 936, however, existing Federal Government programs have only a marginal impact on industrial development. There are few programs of a direct support character devoted to industrial development. Since, except for section 936, Federal programs have broad applicability among States and

territories, decisions with respect to content and size are independent of basic policy options chosen by Puerto Rico. Actions which the Federal Government might take are in general more related to other parts of the Puerto Rican economy than to the manufacturing sector. There are, however, some general actions which might be taken which would be helpful effects on the development of the sector:

1. Coordinating more closely Federal programs to Puerto Rican priorities.
2. Full recognition of the impacts on Puerto

Rico in consideration of U.S. trade policy and granting of trade concessions.

3. To the extent possible under statutory limits, taking account of differences between the island and the mainland in applying regulatory requirements.

4. Efforts to include Puerto Rico in regular U.S. statistical series where Puerto Rico is not now fully included. Provision of assistance to Puerto Rico (both long-term and short-term as well as temporary duty assignments of mainland advisers) in reviewing its economic data gathering, research, analysis, and reporting systems.



Chapter II.—Economic Conditions, Development Strategy, and Policy

FACTORS AFFECTING SECTOR

Sector Role

A function of the manufacturing sector in an economy is to provide a diversified and balanced economic structure and thereby reduce the economy's vulnerability to wide fluctuations of a single product economy as Puerto Rico's was through the early 1950's. An increase in the economic well-being of the population is thereby effected through employment opportunities,¹ as well as a more equitable distribution of the income from economic growth.

The extent to which and the way in which a sector serves such purposes will be affected by the conditions which exist in the economy and by policies and actions of the government and financial institutions.

Elements Impacting on the Role and Functions of the Sector

A number of factors inherent in Puerto Rico's situation condition the role which manufacturing can play in the economy and the extent to which it performs these functions.

Size and Location.—Puerto Rico is small with a land area of about 3,400 square miles, about 2.2 million acres. Much of this area is mountainous. The U.S. Soil Conservation Service has estimated that not more than 40 percent of the total area contains soils which are suitable for cultivation and that much of this would have to be subjected to intensive conservation methods if erosion were to be presented. This limited land area means that agricultural potential may be constrained, good industrial sites may be scarce, and the island is susceptible to problems inherent in high population density and the dangers of pollution and environmental degradation involved in concentration of industry in small areas. The fact that it is an island in the Caribbean, on the other

hand, may mean that the winds and the ocean may make pollution less of a factor.

Puerto Rico's location, 1,000 miles from Miami, and the fact that it is an island adds to its transportation costs in relation to mainland U.S. markets and producers and means that transportation between it and major markets and sources of supply must be by sea or air.

Resource Base.—The island is deficient in most natural resources. The principal mineral resources are clays, salt, sand and gravel, and stone. The only metabolic minerals available are very small quantities of iron ore and some copper and nickel which are not yet being exploited. A 1965 report of exploration suggested that an annual production of 70 tons of copper for possibly more than 30 years might be feasible. Some consideration is now being given to exploration of this deposit. No petroleum or natural gas deposits have been located, resulting in the need to import energy at relatively high costs and the lack of locally available raw materials on which to base the petrochemicals industry. There is now some suggestion of offshore deposits, but whether, even if there are such deposits, they would be a Puerto Rican rather than a Federal resource is open to serious question. The overall supply of water appears to be adequate but there are problems of location and utilization of supplies so that conservation measures are needed.

In summarizing the limited natural resource base, the Puerto Rican Economic Development Administration has stated that "... Puerto Rico is almost totally lacking in natural resources around which industrial complexes of any magnitude or depth could be developed."²

The Federal Relationship.—While of a different character from such factors as its size, location, and resource endowment, Puerto Rico's relationship with the United States is also a factor which has condi-

¹ Under conditions of unemployed resources, the provision of employment to those resources may be considered one of the objectives of the industrial sector.

² *The Overall Economic Development Plan for the Commonwealth of Puerto Rico*, June 1966, p. 129. Commonwealth of Puerto Rico Economic Development Administration.

tioned, and still conditions, its entire economy in general and its industrial sector in particular in a very fundamental way. From the beginning of its political relationship with the United States, it has had completely free access to the enormous mainland U.S. market and to the U.S. financial markets. There are no restrictions on labor or capital flows. Persons, goods, and funds are able to move between Puerto Rico and the mainland without legal restrictions. Conversely, it is subject to unrestricted competition from producers located on the mainland. Its products are afforded the same tariff and other trade protection as are products produced on the mainland and they are subject to import competition resulting from reduced tariffs and other trade concessions in the same way as products produced on the mainland.⁸ With the dollar as its currency, it is not subject to balance of payments and exchange rate problems in the international sense. On the other hand, it does not have available to it the tools of monetary, exchange, and trade policy possessed by independent countries. In general, it is covered by the Federal legal system. From all these perspectives, its economy must operate in the same way as that of a State.

In addition, as a part of the U.S. Federal system, Puerto Rico participates in Federal assistance programs and is subject to certain Federal legal and regulatory requirements which affect its economy. That participation and the application of Federal regulatory requirements are not automatic as in the case of a State. Instead, the provisions of particular statutes are determining. Its position is thus in some cases similar to a State and in some cases it differs in terms of the extent of participation and coverage. Historically the extent of participation has been high and the movement seems to be in the direction of achieving State-like treatment. A further significant factor in this connection is the fact that Puerto Rican citizens and corporations under certain conditions are not subject to the Federal income taxes. U.S. Customs duties on items imported to Puerto Rico and U.S. excise taxes on Puerto Rican rum and tobacco sold on the mainland are returned to Puerto Rico. Insofar as legal and regulatory requirements are concerned, those of greatest significance for the economy have been the Fair Labor Standards Act (particularly minimum wage standards), requirements for use of the U.S.-flag carriers (the Jones Act), and U.S. trade and tariff policy. Environmental protection requirements and energy regulations are coming to be of increasing importance. (For a discussion of these points see part two, volume 1, of this Study.)

⁸ There are limited exceptions to the text. The United States has imposed sugar quotas on Puerto Rico and Puerto Rico is able to impose a tariff on coffee imports as a result of special legislation authorizing such action. Leibowitz, A. H., *The Applicability of Federal Law to Puerto Rico*, 56 Geo. L. J., 219 (1967).

DEVELOPMENT POLICY, STRATEGY, AND PROGRAMS

Conditions When Industrialization Strategy Was Adopted

In the early 1940's when the first organized attempts to bring about the economic development of Puerto Rico began, the economy was primarily agricultural. Sugar, coffee, and tobacco production were the main activities. Industrial production was a small part of total output. It was dominated by textiles and tobacco and sugar processing. Population was high in relation to land area and resources. Income and wage rates were low and unemployment was high. Federal Government assistance was a significant factor. Tables 1 and 2 summarize the more significant of those conditions.

Table 1.—Economic Indicators, 1940

A. Population, labor force, and employment		
1. Population:		
Total		1,869,255
Density (No. per sq. mile)		544
2. Labor force:		
Total		602,000
Percentage labor force participation		52.1
3. Employment:		
Total		536,000
Percentage of total population		28.8
4. Unemployment:		
Total		66,000
Percentage of labor force		11.1
B. Product, investment, income, and consumption		
	Constant 1954 prices	Current prices
1. GNP:		
Total	\$499,601,000	\$287,000,000
Per capita	269	154
2. Gross fixed domestic investment:		
Total	39,000,000	
Percentage total of GNP	7.8	
3. National income:		
Total	407,000,000	225,000,000
Per capita	218	121
4. Personal income		219,200,000
5. Personal consumption expenditure		236,000,000
6. Personal savings		17,200,000

Source: *Socio-Economic Statistics of Puerto Rico*, Puerto Rico Economic Planning Board, and *Socio-Economic Study of Puerto Rico*, May 1971, Commonwealth of Puerto Rico, Office of the Governor.

Particularly significant facts as shown by these tables and to which attention is called are: the already high population density; the high level of unemployment (without the emergency public works program it would have been in the order of 15 percent); the low level of GDP and national income on both a total and a per capita basis; a high relative level of personal consumption with personal consumption expenditure exceeding both personal income and national income; the dominance of agriculture in both income and employment and the far-back second place of manufacturing (25 percent of manu-

Table 2.—Income and Employment by Sector, 1940

Sector	National income		Employment	
	Amount (Millions of dollars)	Percentage	Amount (Thou- sands)	Percentage
All sectors	225	100.0	536	100.0
Agriculture	70	31.1	229	42.7
Manufacturing	27	12.0	56	10.4
Home needlework			45	8.4
Construction	3	1.3	16	3.0
Transportation and other public services	18	8.1	20	3.7
Commerce	26	11.7	54	10.1
Finance, insurance, and real estate	25	10.9	2	0.4
Services	21	9.3	73	13.6
Government	19	8.5	13	2.4
Rest of world (net)	16	7.1		
Emergency public works			24	4.5

Source: *Socio-Economic Study of Puerto Rico*.

facturing employment was in agricultural products processing industries); and the low levels of wages.

The unique fiscal and trade relationship arising from Puerto Rico's participation in the U.S. Federal system was a major factor in the economy at the time of the adoption of a development strategy in the early 1940's. Federal disbursements were being made in Puerto Rico for regular Federal Government programs (education, agriculture, highways, social security, veterans benefits) and special programs (hurricane relief, unemployment and work programs, food relief, agricultural adjustment and relation programs, public health). Large disbursements were also being made for military projects and activities. In addition, remittances were being made to Puerto Rico of excise taxes collected in the States on rum and tobacco imported from Puerto Rico. Finally, loans were being made in Puerto Rico by agencies of the Federal Government. Federal disbursement amounted to \$147 million in 1943. Excise tax remittances amounted to \$157 million in the period 1942-46. Military expenditures totaled \$167 million in the period 1941-43. Total Federal grants and expenditures in Puerto Rico were \$118.2 million in 1942 and \$143.7 million in 1943.⁴ A "windfall" of \$160 million in increased remittance of U.S. excise tax on rum was

⁴ See *The Economy of Puerto Rico*, report of the United States Tariff Commission, March 1946, pp. 4, 5, and 11.

received from 1941 to 1946 as a result of increased consumption of rum caused by the wartime shortage of whisky in the United States.

The most important factor in the Federal relationship was, however, the free-trade relationship. The evidence seems clear that in the 1940's, Puerto Rico was, on balance, benefiting substantially from the relationship. The U.S. Tariff Commission examined the situation in some detail and concluded that, "Notwithstanding the impossibility of accurately estimating the magnitude of the net gain which Puerto Rico has derived from its free-trade relations with the United States, all evidence indicates that it has been large."⁵

Table 3 shows the size of Puerto Rico's trade and the extent of Federal expenditures in 1942 and 1943. From this it is to be noted that there was a trade deficit each year and that, while the value of exports was high, it was exceeded by both imports and Federal grants and expenditures.

A number of special factors had adversely affected employment and income. Application of the U.S. Fair Labor Standards Act to Puerto Rico in 1938 significantly increased costs in some industries, e.g., home needlework. Amendment of that Act in 1940 provided for a flexible system under which minimum wages would be established industry by industry in accordance with ability to pay. It still operated, however, to put an upward pressure on wage costs. By 1940 the Puerto Rican sugar industry was faced with competition from mechanized production on the mainland and in duty-free areas such as Hawaii and the Philippines and from low-cost production in Cuba. Cigar production was suffering from a shift in smoking habits from cigars to cigarettes.

DEVELOPMENT POLICY AND PROGRAM

The First Organized Development Effort

It was under these economic circumstances that the Popular Democratic Party led by Munoz won control of the legislature in 1940 after a campaign

⁵ *Ibid.*, p. 9.

Table 3.—Balance of External Payments of Puerto Rico, FY 1942 and 1943¹

[In thousands of dollars]

ITEM	1942			1943		
	Receipts	Payments	Net credit (+) debit (—)	Receipts	Payments	Net credit (+) debit (—)
Merchandise trade (adj.)	103,205	154,660	—51,455	88,289	116,698	—28,409
Other items	13,380	43,483	—30,103	12,109	30,957	—18,848
Federal grants and expenditure	121,634	3,474	+118,160	147,435	3,753	+143,682
Total	238,219	201,617	+36,602	247,833	151,408	+96,425

¹ Constructed from appendix VI—"Balance of external payments of Puerto Rico, FY 1928, 1942, and 1943." *Ibid.*, p. 66.

promising "*Pan, Tierra y Libertad*" and Tugwell was appointed Governor in 1941. This represented a major change in the political atmosphere and a shift in emphasis from an almost exclusive concern for future political status to a concern for improvement in the well-being of the people.

This concern for the welfare of the people led to certain specific actions designed to improve economic conditions. A Planning Board was established and made responsible for preparing the government's capital budget. Investment was considered to be the prime mover in development. The guiding principle was to invest to create "work spaces." The decision was made to use the \$160 million (5 times the budget) of extraordinary receipts from the excise tax on rum as the source of investment funds for financing income generating, self-supporting enterprise. The following public corporation, modeled on the TVA, were set up to carry out the program:

The Land Authority	1942
The Transportation Authority	1943
The Communications Authority	1943
The Puerto Rico Industrial Development Co. (PRIDCO)	1943
The Development Bank	1943
The Housing Authority	1944
The Agriculture Company	1946
The Water Resources Authority	1946
The Aquaduct and Sewer Authority	1946

Several of these corporations were authorized to borrow in the open market to augment their subscribed capital.

Initially, the focus of policy was on agriculture and the rural areas. An attempt was made to settle landless farmers on their own plots in newly established rural communities. Some sugar plantations were bought by the Government and an attempt made to operate them on a profit-sharing basis with workers. The Agriculture Company undertook local food distribution. A rural self-help housing program was undertaken. Except for the housing program, these activities were unsuccessful for a number of reasons, among them—too many farmers and too little land, high costs, insufficient water, etc. These activities have played little role in subsequent development programs.

While the main emphasis was on agriculture, the importance of industry in Puerto Rico's development was recognized. The Puerto Rican Industrial Development Company was formed with an initial capital of \$500,000 which had been increased to \$19 million by 1946. It also received a cement plant valued at \$2 million and plans for a number of projects which had been under consideration by the Puerto Rican Reconstruction Administration, a Federal, depression-spawned, institution then in liquidation.

The Industrial Development Company began op-

erations by investing in government-owned and operated enterprises. It concentrated on products for sale in the local market which could be produced from local raw materials such as bagasse, sand, clay, limestone, and waste paper. Lack of shipping, arising from the war, and the nature of the raw materials provided a protection for the local market and wartime shortages enhanced local demand. Four plants in addition to the inherited cement plants were established, one each for paperboard, shoes, structural clay products and sanitary ware, and glass containers (based on the high demand for rum). It invested in the Caribe Hilton Hotel. Construction of a textile mill was begun. It also operated labor training and technical research projects and handicraft projects in textiles, ceramics, and furniture.

Stimulation of private investment played some part in the early approaches to development of the industrial sector. PRIDCO was prepared to provide buildings for lease to private firms. In 1944 an office was opened in New York to promote private investment in Puerto Rico. A bill providing tax exemption for private industrial investment was passed by the legislature in 1944 but was not signed by Governor Tugwell.

The operation of the other authorities added a dimension to the program for industrial development. Through them the infrastructure necessary for such development was improved. The Development Bank provided a means by which capital could be provided before PRIDCO had built up its credit standing.

The Second Phase of Industrial Development

Many factors led to a change in the basic approach to the development of the economy in general and the manufacturing section in particular. As previously indicated, difficulties with the agriculture program arose and by the mid-1940's it was becoming apparent that agriculture could not be the foremost sector for sustaining the economy and achieving full employment. Problems were being encountered in the early approach to industrial development. Most of the government-owned plants were inefficient and operating at a loss. The number of jobs created was disappointingly small (about 2,000 by 1947). The extraordinary excise tax receipts had been fully utilized and collections had fallen back to more normal levels. It had become clear that the investment necessary to accomplish a reasonable level of employment would far exceed amounts which could be provided by the Government.

Under these circumstances a new approach evolved under which (1) emphasis was placed upon industry rather than agriculture as the lead development sector, (2) reliance on private investment and

ownership replaced reliance on government ownership and financing, and (3) production for export rather than production for the local market was stressed. In essence it was decided to exploit the advantages of being an integral part of the U.S. market, freedom from the Federal income tax, and an abundant supply of low-wage labor.

Perhaps the most significant action in implementing such a policy was the passage in 1947 and an amendment in 1948 of a law providing: exemptions for specified periods from the Puerto Rican business income tax of earnings from investment in new industry and exemption of new business from property taxes. This and the exemption from U.S. Federal income taxes together were expected to provide a powerful incentive for investment in Puerto Rico by mainland corporations. Various other incentives were also provided (see chapter VIII). Steps were taken to sell PRIDCO-owned plants to private industry and disposition was completed by 1951. An active program for promotion of private investment in Puerto Rico was instituted. The Economic Development Administration was established and given functions of research, investment promotion, and technical assistance to industry. The Planning Board began to undertake a substantive planning role. PRIDCO had powers to build, lease, and sell industrial buildings and to invest in or lend to private enterprises. It also, in 1953, began a program designed to induce location of industry outside San Juan involving the use of special incentives, including cash grants. A program for promotion of local industries began in 1954. A Division of Puerto Rican Industry was established in Fomento which provided assistance in the conduct of feasibility studies, technical and management advice, and marketing assistance. Local plants were made eligible for startup subsidies not available to others and participated in the PRIDCO loan and grant program. The Development Bank also made some loans to local enterprise.

Third Phase of Development

Certain major elements of the approach to development adopted in the late 1940's and mid-1950's have continued to the present time: Emphasis on production for export; dependence on the private sector; concentration on industry as the lead sector in the economy; and use of incentives, especially exemption from corporate income taxes, for stimulating investment in industry.

Developments during the 1950's, however, led to reappraisal of some aspects of the approach. While considerable success had been attained in attracting industry to Puerto Rico, it was proving to be particularly vulnerable to cyclical variations in business conditions in mainland United States and to in-

creased labor costs resulting from rising wage rates. In this latter connection, labor intensive industries in Puerto Rico were subject to both uncertainty and potentially rising labor costs.

In addition it appeared that, while a number of industries were investing and expanding in Puerto Rico, they had no relation to each other or to other industries on the island.

No specific new policy or approach was articulated at first but as a result of such circumstances an approach began to evolve under which promotional efforts rather than being neutral as to type of industry, became more focused on types of industry thought to be less subject to cyclical changes, less vulnerable to increasing wage costs, and capable of providing linkages which would result in a more integrated sector structure. Efforts came to be directed toward larger, well-known mainland companies. Larger and more technical projects were pushed and there was a move toward more capital-intensive industries. Efforts to stimulate local industries were increased with the period of taxation-exemption for such industry being extended to 17 years.

The policy of stimulating more competitive, higher wage, greater technological industries in Puerto Rico which started in the early 1960's was formalized in the Overall Economic Development Plan⁶ of June 1966:

... The essential task of economic development is to shift the preponderance of employment from such low productive, low paying activities [agriculture, home needlework, tobacco stemming] to those which can pay the worker higher wages because productivity is greater (p. 94).

... Unlike other countries, which are primarily involved in producing for their own economies and which possess tools such as tariffs and foreign exchange controls to protect their industries, Puerto Rico must add to and retain its market through constant improvement of its productivity vis-a-vis the highly efficient U.S. manufacturers without the aid of artificial barriers that independent countries may use. Since most of the industries coming to Puerto Rico tend to be relatively labor intensive, as compared with the United States, constantly improving productivity per labor dollar becomes vital to continued growth. Because nonmarket pressures are forcing wages up very rapidly as compared to the mainland, it is necessary to improve labor productivity in Puerto Rico at a rate which will be faster than on the mainland. This can be done by increasing the capital investment per worker, which unfortunately tends to be associated with reduced job opportunities. . . . (pp. 97-99).

⁶ *The Overall Economic Development Plan For the Commonwealth of Puerto Rico*, Economic Development Administration, June 1966.

... Because of the lack of land and the potential population growth and the need to raise incomes, it was necessary to restructure the Puerto Rican economy by developing a manufacturing sector which could compete with mainland factories in their own markets. In order to be competitive, it was necessary to utilize technology which was sufficiently labor-saving, in order that the Puerto Rican manufacturers could compete in the United States market, even though, from the standpoint of the total economy, it might be desirable to adopt a less advanced technology in order to increase employment (pp. 130-131).

Similar statements are contained in later documents issued by the Planning Board. For example, it was stated that:

... The promotional policy of the EDA was modified to apply increasing effort to attract heavy industries, such as petroleum refining and derivative chemicals. These are bigger users of male labor, relative to female, and pay higher wage rates because of their greater use of capital per employee. However, in relation to the amount of capital invested and to promotional time and effort expended, their total direct impact upon employment is less. At the same time, these heavy industries do not use uneducated and unskilled labor. But this is precisely the kind of labor that constitutes the hard core unemployed. And when persons of this type do secure employment, they are heads or members of the families whose incomes are below the poverty line. Nevertheless, in order to provide more employment for males, accelerate overall income growth, broaden as well as deepen the technological and industrial foundations of the island's economy, and provide greater stability, increasing emphasis on the promotion of heavy industry is unavoidable.⁷

Again it stated

... The persistently high rate of unemployment and the less-than-desirable rate of uninduced formation of industrial enterprises mean that the EDA will have to accelerate its great efforts in promoting both mainland-owned and domestically-owned enterprises. The need for these expanded efforts will be made all the more urgent as the agricultural development programs to raise productivity in that sector result in unavoidable additional releases of manpower of low productivity. And, yet, for reasons pointed out in a preceding section, promotional emphasis will have to be on heavy, capital-intensive, high-productivity industries, rather than on labor-intensive ones, as in the past (pp. 75-76).

In discussing the goals and overall strategy of

⁷ *The Four Year Economic and Social Development Plan of Puerto Rico, 1969-72*, Office of the Governor—Puerto Rico Planning Board, December 1968, p. 71.

economic development in Puerto Rico, the Planning Board stated:

... Labor intensive industries would continue to provide a significant proportion of new manufacturing employment. Because 75 percent of unemployment in Puerto Rico stems from male workers, the capital-intensive heavy industries such as chemicals, petrochemicals, metals, shipping, aircraft, etc., would be given increasing promotional emphasis. Other industries being investigated are plywood and wood products, educational films, and the processing and canning of fish. Projects for the production of paper from bagasse are under study. The capital-intensive industries, as stated in OEDP, will integrate Puerto Rico's industrial base by attracting labor-intensive satellite manufacturing operations. The base industries will provide raw materials and semiprocessed products to be used as inputs for the outputs of satellites manufacturing operation.⁸

By 1965 programs were being carried out in accordance with a development plan in which priorities, goals, and programs were laid out, first in general and then in quite specific terms. A Planning Board Paper of December 1967, *Goals, Priorities and Programs for the Commonwealth of Puerto Rico and the Southwest Region*, discusses priorities in general terms and indicates that (1) "as a matter of priority" the Government will continue to support the industrial sector, (2) agriculture is "an important sector from the point of view of income and employment," (3) expansion of exports and making the economy more self-sufficient "should be tried" in order to improve the balance of trade, and (4) a "special emphasis" will be given to the expansion of vocational, secondary, and university education and "The Commonwealth Government intends to assign a very high priority to the areas of vocational education."

Tourism is mentioned and it is stated that other sectors "should expand somewhat in line with the expansion of the sectors of manufacturing, agriculture and tourism." The Four Year Economic and Social Development Plan for 1969-72 says that first priority is to be given to expansion of vocational, technical, university, professional, and secondary education; second priority to the industrialization program "which already has become a backbone of our development progress"; third, to the expansion of the highway program; and fourth, to the expansion of water supply to meet the needs of the San Juan area, the expansion of the petrochemical industry, its needs of agriculture, and the population expansion. All other programs are assigned a fifth priority.

⁸ *Overall Program and Project Priorities for the Development of Puerto Rico and the Southwest Region*, Puerto Rico Planning Board, August 1970, p. I-5.

Governor Luis Munoz Marin in his 1964 message to the legislature and Governor Roberto Sanchez Vilella in his 1969 message articulated specific goals to be accomplished which were incorporated into the overall development plan. They were:

1. Full education in quality and depth.
2. Maximum health, with substantial equality for all as regards the quality of the science applied for its formation.
3. A home for every Puerto Rican family.
4. An increased share for Puerto Ricans in the growing Puerto Rican economy and in decision-making in the private sector.
5. Abolition of extreme poverty. (A more specific goal of a minimum annual income of \$2,000 per family is indicated elsewhere in the document.)⁹

Projections were made of the number of jobs required to "bring employment to acceptable levels" (apparently a 4-percent unemployment rate) and of the amount of employment to be provided by the individual sectors. Table 4 shows such projections.

The document, *Goals, Priorities and Programs For The Commonwealth of Puerto Rico and the Southwest Region*, shows total employment as increasing from 690,000 in 1965 to 960,000 in 1975.

It was estimated that a total of 170,200 additional jobs would be required in the 1965-70 period of which 52,800 would be provided in 1965 and 117,200 in the period 1966-70.¹⁰ An increase of 108,000 new jobs was projected for the period 1969-1972.¹¹

It was anticipated that accomplishment of these objectives would have certain specific results and in the later years projections were made of various changes expected to occur. A target of an 8.8 percent annual rate of increase in GDP for the period 1965-

⁹ See, *The Overall Economic Development Plan For the Commonwealth of Puerto Rico*, op. cit., p. 144.

¹⁰ *Overall Program and Project Priorities*, table 42, p. 86.

¹¹ *Four Year Economic Development Plan, 1969-72, Summary*, p. 9.

Table 4.—Projected Labor Force, Employment, and Unemployment, 1970 and 1973

[In thousands]

	1965-70 ¹		1965-73 ²		
	1965	1970	1965	1969	1973
Labor force	772	898	—	—	—
Total employment	688	813	657	772	806
Agriculture	122	104	119	84	70
Manufacturing	128	163	121	145	170
Mining	—	—	2	1	2
Construction	66	83	62	73	84
Transportation	30	34	28	30	34
Public service (utilities)	16	19	16	19	26
Trade	124	157	119	132	143
Services	112	140	97	116	132
Finance and real estate	—	—	10	13	17
Government	87	113	83	109	128
Unemployment	84	85	—	—	—

¹ See *Overall Economic Development Plan*, table 75.

² See *Overall Program and Project Priorities*.

76 and the interim period of 1969-72 was established.¹² Table 5 shows projections of increases in GDP by sector, expected for the time periods 1964-65, 1969-70, and 1969-73.

Output per worker was estimated as increasing from \$6,000 in 1969 to \$8,142 in 1973. Output per worker in manufacturing was projected to increase by 50 percent from \$7,400 to \$11,154 during the same period.¹³

Policies of the New Administration

The new administration in Puerto Rico which came into office January of 1977 has not yet fully articulated its economic policies and programs. However, it appears that there will be some changes from those followed by previous administrations.

First it seems that greater emphasis will be given to assisting the development of other sectors, especially agriculture and services than has been the case in the past. Recognition was given to such a

¹² *Four Year Economic Development Plan 1969-72*, table 3, p. 24.

¹³ See *Goals, Priorities and Programs*, pp. 1-4.

Table 5.—Projected Increase in GDP, by Sector

[In millions of dollars]

	1960-72 ¹				1964-65	1969-70 ²	1969	1973 ³
	1960	1966	1969	1972	1964-65	1969-70	1969	1973
Sector total	1,697	3,147	4,314	5,383	2,914	4,420	4,326	6,563
Agriculture	164	172	235	270	182	252	160	281
Manufacturing	366	761	1,130	1,630	623	1,066	1,099	1,874
Construction and mining	101	240	350	480	211	371	319	534
Commerce and commercial services	337	671	832	1,065	583	826	841	1,172
Utilization and transportation	152	283	362	483	249	338	398	543
Finance and real estate	172	290	460	670	318	507	509	763
Other services	161	396	465	600	341	473	509	688
Government and miscellaneous exports	187	361	480	640	507	587	503	729
Errors and omissions	57	27	—	—	—	—	-10	—

¹ See *Goals, Priorities and Programs, For the Commonwealth of Puerto Rico and the Southwest Region*, Dec., 1967, p. 10, and *Four-Year Economic Development Plan 1965-72*, p. 13.

² *Overall Economic Development Plan*, p. 172.

³ *Overall Program and Project Priorities*, p. 172.

policy by Governor Carlos Romero Barcelo in his February 1978 State of the Commonwealth Message in which he stated:

. . . It is evident that our economic development cannot depend on any one isolated or particular sector to achieve the growth that Puerto Rico needs in order to solve its most pressing problems. For this reason we feel that it is important that no one sector be neglected nor left behind through want of effort or imagination.

In that message he set forth a detailed program for agricultural development which has been started. He also indicated that a study of the services sector is being made and mentions a few specific projects which are being explored. The examples given involve new services related primarily to Puerto Rico's location in relation to the United States, Europe, and Latin America.

A proposal for modification of the tax incentives program has been passed by the legislature. In his message the Governor said:

. . . The fundamental objective of our Government is to have our growth move from a generation based on tax incentives to a stage of self-generation and greater economic stability and soundness, and to a stage where it (the manufacturing sector begins to contribute in measurable form to the maintenance of our economic infrastructure and governmental services.

Salient features of the legislation are: (1) while significant tax exemption is to be provided and is to

remain a major feature of development policy, complete exemption will not be made available for new investment; (2) for the first time some exemption will be extended outside the manufacturing sector to certain areas of the services sector; and (3) some provision is made for modest credits for expanded payrolls.

While emphasis is to be given to other sectors as indicated, it appears that the basic policy toward manufacturing is to be continued. The Governor stated in his message that:

. . . The development of the manufacturing sector is and will continue to be the stanchion of our growth, although it will not continue to be the only sector getting Government priority.

Apparently the policy of emphasizing high wage, capital-intensive industry will be continued as indicated by the Governor's message which says:

. . . We intend to turn Puerto Rico into a center of attraction for the pharmaceutical industry, and for the electronics and the scientific and hospital instruments and equipment industries. These industrial sectors, which have industries with great growth potential in the United States and in the entire world, will also, in the next decade, be important stanchions in Puerto Rico's industrial growth by nature of the fact that they are high-salary industries that require highly developed skills; that require a fair amount of labor; and that have great potential for exporting to Caribbean and Latin American markets.

Chapter III.—Growth and Change in the Manufacturing Sector

This chapter examines in some detail the growth and change which have occurred in the manufacturing sector in Puerto Rico. The contribution of the sector to output, income, and employment is appraised. A comparative analysis is made of the contributions of various industry groups. Changes in costs and other factors affecting the performance of the sector are identified. The effects of changes in the nature and structure of the sector in terms of their implications for the role of the sector and of particular industry groups in contributing to easing of Puerto Rico's economic problems and for Puerto Rican policy toward the sector are appraised. The analysis is based on overall data relative to output, income, employment, and the like and on detailed examination of particular industry groups which is contained in the "Industry Profiles" in Part Three.

OVERALL SECTOR GROWTH

Output

We have used contribution to GDP as the best available measure of output.

By 1977 manufacturing had become first among the sectors in its contribution to GDP. Its rate of increase in contribution was, however, exceeded by that of the construction, services, government, and finance-insurance, and real estate sectors.

Table 1 shows the manufacturing sector contribution to GDP, the size of its contribution in relation to the total, and the rate of increase in its contribution.

As may be seen from this table, the sector's contribution to GDP increased from \$105.7 million in

Table 1.—Manufacturing Sector Contribution to GDP and Labor Income

Item	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
GDP:																
Amount																
(millions of current dollars) ..	128.0	100.8	105.7	119.7	143.1	158.2	183.9	203.5	220.9	255.4	277.5	284.0	326.9	366.3	424.4	488.5
Percentage of total	22.4	16.4	15.1	16.5	18.6	18.0	19.9	20.2	20.8	22.3	22.5	21.2	21.9	21.7	23.0	23.3
Amount																
(millions of 1954 dollars)	147.5	113.4	120.4	139.3	162.2	166.0	189.6	203.5	220.2	252.6	268.1	260.8	294.5	321.6	361.8	401.7
Percentage increase	—	-23.1	6.2	15.7	16.4	2.3	14.2	7.3	8.2	14.7	6.1	-2.7	12.9	9.2	12.5	11.0
Labor income:																
Amount																
(millions of current dollars) ..	56.7	55.9	57.9	61.6	67.4	74.7	86.3	100.3	107.5	124.2	137.0	146.3	159.1	180.4	206.3	241.9
Percentage GNP	9.3	8.6	8.1	8.2	8.3	7.7	8.2	9.1	9.4	10.4	10.6	10.7	10.5	9.6	11.3	11.8
Amount																
(millions of constant dollars) ..	63.4	60.6	65.1	72.0	75.9	78.5	91.7	100.3	107.6	122.8	132.5	135.1	147.2	162.8	182.4	210.9
Percentage increase	—	-4.4	7.4	10.6	5.4	3.4	16.8	9.4	7.3	14.1	7.9	2.0	9.0	10.6	12.0	11.6
Item	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	
GDP:																
Amount																
(millions of current dollars) ..	558.6	611.5	668.6	746.3	828.0	938.4	1,064.2	1,190.0	1,334.6	1,598.1	1,879.2	2,199.2	2,309.8	2,882.1	3,347.3	
Percentage of total	22.7	23.8	26.0	23.7	23.3	23.8	24.0	23.6	23.5	25.2	27.1	28.3	28.1	32.5	34.4	
Amount																
(millions of 1954 dollars)	448.0	471.1	503.8	549.6	582.3	629.8	687.9	736.4	781.4	897.3	1,034.2	1,130.1	1,108.3	1,341.1	1,520.1	
Percentage increase	11.5	5.2	6.9	9.1	5.9	8.2	9.2	7.1	6.1	14.8	15.3	9.3	-1.9	11.8	13.3	
Labor income:																
Amount																
(millions of current dollars) ..	277.4	303.4	337.6	371.1	417.0	477.7	553.8	607.9	658.6	751.3	841.8	925.8	964.8	1,028.1	1,162.2	
Percentage GNP	12.2	12.2	12.2	12.3	12.5	13.0	13.4	13.0	12.5	13.1	13.4	13.6	13.5	13.8	14.7	
Amount																
(millions of constant dollars) ..	239.8	258.2	283.0	305.2	326.3	365.9	408.1	429.9	447.6	494.2	534.8	528.4	482.9	478.9	523.3	
Percentage increase	13.7	7.7	9.6	7.8	6.9	12.1	11.5	5.3	4.1	10.4	8.2	-1.2	-8.6	-8	9.3	

Source: Puerto Rico Planning Board, unpublished Income and Production Information.

1949 to \$3,347.3 million in 1977. In real terms it was \$1,520.1 million in 1977 as compared with \$120.4 million in 1949, an increase of 1,163 percent. Its share of GDP rose from 15 percent in 1949 to over 34 percent in 1977. Its output in 1977 was almost twice that of the trade sector which made the next largest contribution to GDP. Except for the period 1964-71 during which it was relatively stable, the rate of increase in output has, however, fluctuated widely and frequently. No upward trend in the rate of increase is discernible. In contrast, manufacturing output as a percentage of total output rose gradually from 15.4 percent in 1949 to 22.5 percent in 1957, was 23.5 percent in 1971, and then began to rise very rapidly thereafter, reaching 34.4 percent in 1977.

On a comparative basis, the sector's output falls into about five periods, or phases, as shown by table 1. From 1949 through 1956, it increased more rapidly than did the output of the rest of the economy. The period 1958-63 was one in which manufacturing output increased at about the same rate as that of the rest of the economy. After increasing at a faster rate in 1964 and 1965, it again increased at almost the same rate as that of the rest of the economy from 1966 through 1971. From 1972 through 1974 it increased much more rapidly than that of the rest of the economy, reflecting the large increase in the pharmaceuticals and some of the machinery industries, and the fall in output of other sectors, particularly construction. Then, in 1976 and 1977, it increased at a rate greatly in excess of the rate for the rest of the economy, reflecting a rapid recovery in sector output and the continued depression of the construction sector.

The combination of these kinds of changes in the economic conditions and the changes which have been occurring in the nature of Puerto Rican industry, make it very difficult to reach conclusions based on recent performance as to the future course of total sector output. The best informed guess, however, would seem to be that, given a relatively high level of mainland economic activity, the course of Puerto Rican manufacturing will be upward.

Labor Income

The data in table 1 show that the amount of the sector's contribution to income is large and has increased greatly, amounting to \$72 million in 1954 dollars in 1950 and over \$523 million in 1977, an increase of 627 percent.

As was the case with its contribution to output, the rate of increase in the sector's contribution to income has varied widely from year to year. It appears, however, that the annual rates of increase have tended to be somewhat lower after 1963 than

they were earlier. Its contribution to income relative to the contribution of the rest of the economy, as measured by manufacturing labor income as a percentage of GNP has been remarkably stable. This is an apparent gradual upward trend which slowed slightly after 1963, with the percentage increasing from 7.4 in 1949 to 11.5 in 1963, to 13.5 in 1975, and then rising more rapidly to 14.7 in 1977.

Labor income has increased more rapidly than has GNP produced by the rest of the economy, but manufacturing sector income as a percentage of GNP, while increasing steadily, has increased very slowly. In 1977, it was 14.7 percent of GNP as compared with 8.1 percent in 1949. This amounts to an average increase of only .23 percentage points a year.

Finally, the sector's contribution to income has been considerably less than proportionate to output growth. Manufacturing sector contribution to labor income increased by 704 percent from 1949 to 1977, while its contribution to GDP increased by 1,163 percent. The very large excess of GDP over gross product (GNP) discussed in chapter I, coupled with the fact that in 1977 manufacturing sector's contribution was over 34 percent of GDP while its contribution to labor income was less than 15 percent of GNP, suggests that the sector's contribution to Puerto Rican income is less than that suggested by GDP and net income figures for the sector. The failure of the sector's contribution to Puerto Rican income to keep pace with sector output has been particularly marked from 1969 to the present. The rate of increase in labor income produced by the manufacturing sector was higher than the rate of increases in GDP produced by the sector in 14 of the 21 years from 1949 through 1969. That rate was, however, lower than the rate of increase in manufacturing output in every year from 1970 through 1977. This is a reflection of the increasing capital intensity of Puerto Rican industry.

From all this, it may be concluded that the manufacturing sector is not producing as much income for Puerto Rico as might be expected of it in light of its performance in terms of output. This is, of course, to a considerable degree, a result of the fact that Puerto Rico is heavily dependent on outside sources of capital, given the extremely low rate of domestic savings.

The tax exemption program has also been an important factor in the inability of the sector to produce as much income for Puerto Rico as might be expected in view of the volume of investment and output which had been forthcoming. While some exemption has probably been a necessary element in inducing external investment in Puerto Rico, and may have become increasingly significant in recent years, the fact that the high volume of returns to property flows largely to nonresidents and produces little or no tax

Table 2.—Manufacturing Sector Employment, Except Home Needlework and Percentage Change in Employment (Fiscal Years)

Item	1949	1950	1958	1960	1962	1963	1964	1965	1966	1967
Amount (thousands)	49	55	70	81	92	91	54	106	115	121
Percentage of total (percentage)	—	9.6	—	14.9	15.7	15.0	16.1	17.5	18.1	18.8
Absolute change (percentage)	—	6.0	15	11	11	-1.0	3.0	12.0	9.0	6.0
Rate of change (percentage)	—	10.0	27.4	15.7	13.6	-1.1	3.3	12.8	8.5	5.2

Item	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Amount (thousands)	127	135	132	132	141	142	147	137	133	144
Percentage of total (percentage)	19.4	20.0	19.2	18.9	19.1	18.8	19.0	18.6	18.5	19.5
Absolute change (percentage)	6.0	8.0	-3.0	—	9.0	1.0	5.0	-10.0	-4.0	11.0
Rate of change (percentage)	5.0	6.3	-2.2	—	6.8	0.7	3.5	-6.8	-2.9	8.3

Source: Puerto Rico Planning Board, 1977 *Economic Report to the Governor*; Puerto Rican Department of Labor, Census of Manufacturing.

revenues for Puerto Rico means that the sector does not produce the Puerto Rican revenue in the volume that would be expected otherwise.

In spite of these facts, it is true that the manufacturing sector's contribution to income in Puerto Rico has been and now is substantial, amounting to about 15 percent of GNP in 1977.

Employment

The manufacturing sector has made a significant direct contribution to increased employment. The extent of that contribution is shown by table 2. As may be seen, manufacturing employment increased by about 92,000 or 167 percent, from 1950 to its peak in 1974. Although sector employment declined slightly from 1974 to 1977, it was still 19.5 percent of total employment and 25.2 percent of total non-governmental employment in 1977. The manufacturing employment level in 1977 was 1,000 less than that of the trade sector and 24,000 less than that of the government sector. It exceeded the services sector by 17,000. Employment in manufacturing grew somewhat more rapidly until 1969, with the most rapid growth occurring in the period from 1965

through 1969. After 1969 the employment growth rate declined sharply and was negative or zero in 4 of the 8 years from 1970 through 1977. There was, however, substantial recovery in 1977. After 1969, the sector's rate of employment growth closely followed the rate of growth in total employment. (See chart 1.)

While the increase in manufacturing employment has been large, it has fallen considerably short of expectations. A comparison of actual with various projections of total sector employment is contained in table 3.

This table shows that employment in 1977 was at about the level projected for 1969, and that employment in the sector at its peak in 1974 was only very slightly above projected 1969 levels. Employment in 1977 was 25,000 less than a projected 1972 level and in 1970 was 31,000 less than a projection for that year. As pointed out earlier, in 1977 employment in manufacturing was exceeded by that in government and in commerce.

It was estimated that 40,000 new jobs in manufacturing; 9,000 in 1966-78, 9,000 in 1967-68, 10,000 in 1968-69, and 12,000 in 1969-70; would be created by PRIDCO investment in the period

CHART 1—MANUFACTURING EMPLOYMENT

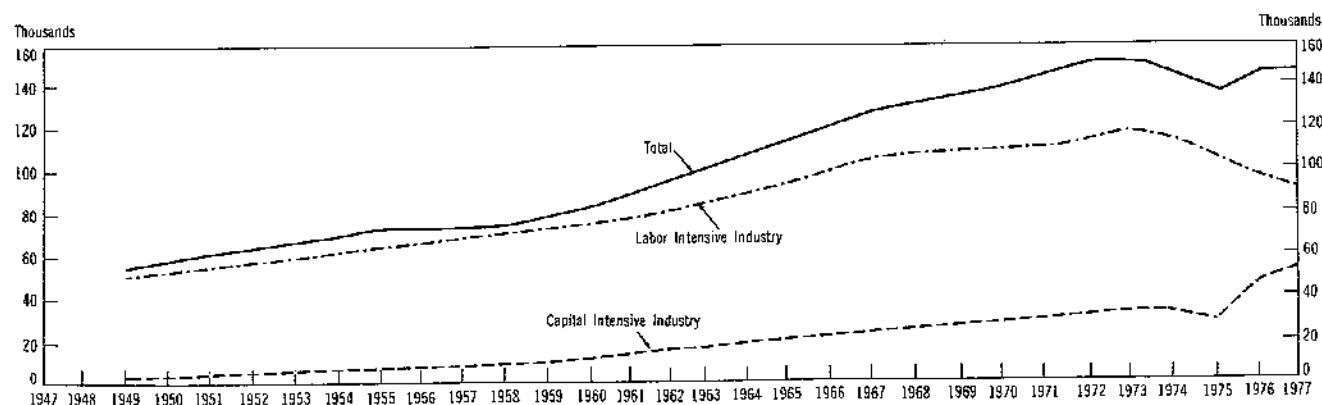


Table 3.—Actual and Projected Employment in Manufacturing

[In thousands]

Item	1960	1965	1967	1968	1969	1970	1972	1973	1974	1976	1977
Actual	81	106	127	127	135	132	141	142	147	133	144
Projected—Four-Year Economic Development Plan (table 21)	81	—	125	131	139	—	169	—	—	—	—
Projected—Overall Economic Development Plan (table 75)	—	128	—	—	—	163	—	—	—	—	—
Projected—Overall Program and Project Priorities	—	121	—	—	145	—	—	170	—	—	—

1966–70. In fact, the increase was only 17,000 for the period, that is, 12,000 for 1966–67, none from 1967–68, 8,000 from 1968–69, and a decrease of 3,000 from 1969–70.

A 1975 Puerto Rican report made in connection with U.S. trade negotiations stated that Puerto Rico had an objective of adding 345,000 jobs to the 1974 level by 1985.¹ An objective of increasing manufacturing employment to 232,000 was also stated. This would mean an increase of 89,000 over the period, an average annual increase of 8,000 jobs in manufacturing. These rates exceed by a considerable margin any rates of increase which have been achieved in the past on a sustained basis.

Perhaps more significant is the fact that the growth in manufacturing employment has been small in relation to absolute increases in population and the labor force and to the volume of unemployment. Population increased by 921,000 and the labor force, even accepting the sharply declining participation rates used in its calculation, increased by 241,000 from 1950 to 1977.

As seen in table 2, employment in manufacturing increased at a rate of 5,000 per year for the periods

¹ Commonwealth of Puerto Rico Presentation Before the International Trade Commission and Special Trade Representative, May 1975, pp. 269, 275.

1960–65 and 1965–70. The rate was 3,750 a year for the period 1970–74 when (1974) total employment in the sector reached its peak; and 1,714 for the period 1970–77. An annual increase of 5,000 represents only 1/8th of reported unemployment (186,000) in 1977. Even with a sharply declining rate of participation of population in the labor force (a 21-percent decline from 1950 to 1977), the total labor force increased by almost 19,000 a year from 1960 to 1965; 17,000 a year from 1965 to 1970; and about 22,800 a year from 1970 to 1977.

INTERNAL SECTOR CHANGES

At the same time that the manufacturing sector was growing as indicated above and as changes were occurring in intersectoral relationships as discussed in chapter I, changes were also taking place within the sector. There were changes in composition, structure, factor costs, relative importance of industry groups, and other circumstances. In this section we will identify the most significant changes and examine them in order to provide a basis for appraisal of their relation to Puerto Rican development problems and of their significance for governmental policy toward the sector.

Table 4.—Number of Industrial Establishments by Industry Groups for Selected Years 1966–76

Industry group	1966	1970	1973	1976	Percent- age changes 1966–76	Em- ployees per unit 1966	Em- ployees per unit 1976	Sample applica- tions for tax ex- emptions 1977–78
Apparel	412	454	465	400	–3	81	93	10
Food	475	447	422	364	–23	42	66	6
Fabricated metals	212	304	361	289	36	17	16	4
Chemicals	91	111	145	176	93	34	71	22
Furniture	217	222	161	157	–28	18	18	2
Stone-clay-glass	236	237	251	149	–16	25	27	0
Wood	80	81	190	131	64	6	8	0
Electrical machinery	89	113	122	131	47	90	102	18
Printing	119	122	124	119	0	19	24	0
Miscellaneous manufacturing	102	132	112	89	–13	37	34	4
Instruments	26	36	57	79	204	107	134	7
Machinery except electrical	53	60	56	67	26	37	68	7
Rubber and plastics	36	58	57	67	86	75	52	3
Textiles	62	80	81	53	–15	100	81	1
Leather	74	75	55	40	–46	128	125	1
Paper	30	26	37	40	33	39	37	3
Tobacco	73	49	47	35	–52	108	130	0
Primary metal	20	17	21	23	15	43	43	0
Petroleum	10	16	18	20	100	186	147	0
Transportation	21	21	20	14	–33	31	24	2
All industries	2,417	2,641	2,782	2,497	3	62	65	90

Source: Puerto Rico, Department of Labor, *Census of Manufacturing Industries* (various years).

Relative Importance of Industry Groups

Number of Establishments.—A very rough indication of the relative size of industry groups and a basic introduction to the structure of manufacturing in Puerto Rico may be obtained by a comparison of the number of establishments in the various industry groups. Table 4 lists the number of establishments and change in number of establishments for selected years from 1966 to 1976. The industry groups are ranked according to number of firms in 1976.

It is clear that in terms of number of establishments, the sector is dominated by the apparel, food products, and fabricated metals industries.

Trends in growth in number and changes in size of establishments may also be significant. Nine industry groups had a loss in number of establishments from 1966 to 1976. Of these, five also reduced their average number of employees: Transportation, leather, textiles, furniture, and miscellaneous industries. The remainder of the industry groups which lost absolute number of establishments gained in average number of employees, indicating that industrial concentration is occurring in these industries.

During the 1973-76 recession period, only seven industry groups increased in number of establishments. Positive change occurred in the following industries as indicated: Instruments (+39 percent); machinery except electrical (+20 percent); chemicals (+21 percent); rubber and plastics (+18 percent); petroleum (+11 percent); primary metals (+10 percent); and electrical machinery (+7 percent).

A sample of 90 applications for industrial tax exemptions was taken from some Fomento listings for December 1977 through March 1978 in order to get a feel for the character of current industrial growth (by firm). According to the sample, the chemical, electrical machinery, and apparel industries account for 56 percent of the establishment requests for new tax exemptions.

Output.—Relative changes in output by industry groups, as measured by changes in contribution to GDP, will give an indication of changes in the composition of structure of the sector. Such changes are shown in table 5.

It is apparent that in terms of output, the sector in 1947 was dominated by the food, alcoholic beverages, apparel, and to a much lesser extent, tobacco industries, which together accounted for 85.6 percent of sector contribution to GDP. The sugar, apparel, and alcoholic beverages (primarily rum) industries made up 68.9 percent of the total output of the sector.

A number of changes in the composition of the

sector are shown by relative changes in output that occurred during the period 1947 through 1965. Sugar declined sharply both in absolute amount and as a percentage of sector output. By 1965, it contributed only 5.7 percent of sector output as compared with 30.5 percent in 1947. The apparel industry on the other hand grew at the same rate as the whole sector until about 1960, and in 1965 produced 13.4 percent of sector output as compared with 15 percent in 1947. Other industries also began to assume increasing importance during the period, with industries other than sugar, alcoholic beverages, apparel, and tobacco making up 63.3 percent of sector output in 1965. Among those were food products; textiles; stone, clay, and glass; beer; leather products; paper and paper products; and printing and publishing.

The period from 1965 to 1970, especially that from 1965-67, saw the beginning of major changes in the composition of the manufacturing sector. It was during this period that the pharmaceuticals, petrochemicals, metals and machinery, and petroleum refinery and products industries began to achieve importance in terms of contribution to sector output. By 1967, combined they produced 28.8 percent of the sector's contribution to GDP. By 1970 the largest industries in terms of percentage of sector output were apparel (14.8 percent), food products (11.9 percent), alcoholic beverages (10.7 percent), electrical machinery (8.4 percent), and pharmaceuticals (8.0 percent).

After 1970 the chemicals and machinery industries grew rapidly in terms of output. The output of the pharmaceuticals industry increased in real terms by 77 percent in one year from 1971 to 1972 and continued to increase rapidly. There were also rapid increases in the output of the petrochemicals and electrical machinery industries. Apparel output also increased in real terms until 1975, but not as rapidly as the fastest growing components. By 1977, the largest contributors to sector GDP were pharmaceuticals (26.5 percent), electrical machinery (12.9 percent), apparel (8.3 percent), and petrochemicals (7.4 percent).

Employment.—Employment is probably one of the most important direct indicators of an industry's significance to Puerto Rico. It is significant of course because of its social and political implications. However, given the very heavy dependence of Puerto Rico on external investment, its importance in income generation gives it a more than usual economic significance.

The relative importance of industry groups over the past 30 years as indicated by their provision of employment is shown in table 6.

As may be seen from table 6, industry group

Table 5.—Industry Group Output (Contribution to GDP) Output of Sector GDP

[In millions of current dollars]

	1947		1955		1960		1965	
	Amount	Percent- age of total	Amount	Percent- age of total	Amount	Percent- age of total	Amount	Percent- age of total
Food (except alcoholic beverages)	\$52.5	41.0	\$61.5	27.8	\$82.6	22.5	\$135.7	20.3
Sugar	(39.1)	(30.5)	(33.5)	(15.2)	(34.6)	(9.4)	(38.3)	(5.7)
Soft drinks	(1.4)	(1.1)	(2.4)	(1.1)	(4.5)	(1.2)	(8.2)	(1.2)
Beer	(3.2)	(2.5)	(13.4)	(6.1)	(20.0)	(5.5)	(30.2)	(4.5)
Other food products	(8.8)	(6.9)	(12.2)	(5.5)	(23.2)	(6.3)	(59.0)	(8.8)
Apparel	19.2	15.0	33.1	13.0	51.6	14.1	89.7	13.4
Tobacco	8.0	6.2	12.0	5.4	12.0	3.3	39.0	5.8
Stone, clay, glass	3.8	3.0	13.0	5.9	23.3	6.4	36.4	5.4
Printing and publishing ¹	3.0	2.3	4.6	2.1	11.2	3.1	14.4	2.2
Wood and furniture	3.5	2.7	8.0	3.6	9.3	2.5	16.3	2.4
Textiles	.8	.6	7.4	3.3	14.7	4.0	22.8	3.4
Paper	—	—	—	—	5.2	1.4	7.0	1.0
Leather	—	—	—	—	7.4	2.0	25.9	3.9
Alcoholic beverages	30.0	23.4	33.1	15.0	43.8	12.0	78.9	11.8
Subtotal	120.8	94.4	172.7	78.1	261.1	71.3	466.1	69.8
Other information	7.2	5.6	48.2	21.8	105.2	28.7	220.5	32.1
Total	218.0		220.9		366.3		686.6	

	1967		1970		1971		1972		1973	
	Amount	Percent- age of total	Amount	Percent- age of total	Amount	Percent- age of total	Amount	Percent- age of total	Amount	Percent- age of total
Food	133.9	16.2	141.9	11.9	145.1	10.8	158.8	9.9	182.3	9.7
Sugar	(35.3)	(4.3)	(17.8)	(1.5)	(19.0)	(1.4)	(7.4)	(0.5)	(13.0)	(0.7)
Beer	(29.0)	(3.5)	(33.2)	(2.8)	(25.9)	(1.9)	(35.1)	(2.2)	(34.0)	(1.8)
Other food products	(69.6)	(8.4)	(90.9)	(7.6)	(100.2)	(7.5)	(115.3)	(7.2)	(135.3)	(7.2)
Apparel	115.6	14.0	175.7	14.8	168.0	12.6	187.9	11.8	202.4	10.8
Tobacco	45.0	5.4	97.2	6.5	93.4	7.0	92.3	5.6	96.3	5.1
Stone, clay, glass	46.2	5.6	58.8	4.9	69.9	5.2	8.8	5.1	84.2	4.5
Wood and furniture	18.6	2.2	27.2	2.3	39.4	3.0	39.4	2.5	31.0	1.6
Textiles	26.7	3.2	41.9	3.5	54.2	4.1	44.3	2.8	55.2	2.9
Printing and publishing	14.2	1.7	22.6	1.9	25.2	1.9	25.5	1.6	29.7	1.6
Paper	9.1	1.1	12.6	1.1	13.2	1.0	11.8	0.7	11.7	0.6
Leather	31.3	3.8	38.0	3.2	36.7	2.7	30.1	1.9	32.4	1.7
Subtotal	400.2	48.3	545.3	45.8	595.2	44.6	627.1	39.2	681.1	36.2
Rubber and plastics	12.3	1.5	30.1	2.5	34.8	2.6	26.0	1.6	25.6	1.4
Primary metals	11.3	1.4	11.8	1.0	11.5	0.9	13.5	0.8	17.3	0.9
Fabricated metals	21.4	2.6	36.4	3.1	45.8	3.4	56.1	3.5	58.3	3.1
Transportation equipment	2.4	0.3	2.6	0.2	2.7	0.2	3.7	0.2	4.8	0.3
Other chemicals	4.7	0.6	7.4	0.6	7.8	0.6	9.3	0.6	13.0	0.7
Instruments	17.4	2.1	38.0	3.2	48.3	3.6	61.1	3.8	74.8	4.0
Total	510.1	61.8	722.2	60.7	796.0	58.9	838.7	52.5	919.0	48.9
Alcoholic beverages	93.7	11.3	127.4	10.7	141.6	10.6	159.5	10.0	164.2	8.7
Soft drinks	14.5	1.8	25.9	2.3	29.4	2.2	36.0	2.3	37.4	2.0
Pharmaceuticals	49.9	6.0	94.9	8.0	126.7	9.5	225.4	14.1	315.5	16.8
Petrochemicals	23.0	2.8	18.7	1.6	21.2	1.6	59.0	3.7	64.5	3.4
Petrorefining	23.9	2.9	45.7	3.8	56.6	4.2	40.1	2.5	83.8	4.5
Other petroproducts	18.3	2.2	23.9	2.0	28.2	2.1	34.6	2.2	42.3	2.3
Machinery	11.2	1.4	13.9	1.2	15.5	1.2	27.6	1.7	38.3	2.0
Electrical machinery	58.4	7.1	100.4	8.4	107.8	8.1	154.9	9.7	188.9	10.1
Subtotal	292.9	35.4	451.8	38.0	527.0	39.5	737.1	46.1	934.9	49.7
Discrepancy	803.0	97.2	1,174.0	98.7	1,323.0	99.1	1,575.8	98.6	1,853.9	98.7
	25.0	3.0	16.0	1.4	11.0	.8	22.3	1.4	25.3	1.3
Grand total	828.0		1,190.0		1,334.6		1,598.1		1,879.2	

Table 5.—Industry Group Output (Contribution to GDP) Output of Sector GDP—Con.

[In millions of current dollars]

	1974		1975		1976		1977	
	Amount	Percent- age of total	Amount	Percent- age of total	Amount	Percent- age of total	Amount	Percent- age of total
Food	105.9	9.4	230.7	10.0	258.2	9.0	246.9	7.4
Sugar	(23.8)	(1.1)	(35.8)	(1.5)	(27.3)	(0.9)	(5.6)	(0.2)
Beer	(23.7)	(1.1)	(32.8)	(1.4)	(36.3)	(1.3)	(29.0)	(0.9)
Other food products	(158.4)	(7.2)	(162.1)	(7.5)	(194.6)	(6.8)	(212.3)	(6.3)
Apparel	233.3	10.6	270.0	11.7	255.9	8.9	276.6	8.3
Tobacco	116.0	5.3	115.9	5.0	123.6	4.3	127.0	3.8
Stone, clay, glass	89.9	4.1	91.0	3.9	79.3	2.6	86.7	2.6
Wood and furniture	30.1	1.4	25.6	1.1	29.8	1.0	29.2	0.9
Textiles	59.4	2.7	53.2	2.3	42.3	1.5	45.4	1.4
Printing and publishing	35.7	1.6	37.5	1.6	40.3	1.4	37.0	1.1
Subtotal	770.3	35.0	823.9	35.6	829.4	28.8	848.8	25.4
Paper	16.5	0.7	16.2	0.7	16.4	0.6	20.8	0.6
Leather	35.6	1.6	34.1	1.5	34.3	1.2	34.9	1.0
Rubber and plastics	32.8	1.5	33.7	1.4	44.3	1.5	45.2	1.4
Primary metals	24.0	1.1	22.5	1.0	16.2	0.6	13.4	0.4
Fabricated metals	70.7	3.2	73.3	3.2	73.9	2.6	74.6	2.2
Transportation equipment	5.2	0.2	5.1	0.2	5.9	0.2	5.8	0.2
Other chemicals	8.7	0.4	9.5	0.4	16.2	0.6	29.9	0.9
Instruments	82.9	3.8	97.6	4.2	—	—	—	—
Total	1,046.7	47.6	1,115.8	48.3	1,036.6	36.0	1,073.4	32.1
Alcoholic beverages	156.7	7.1	172.6	7.5	205.8	7.1	204.1	6.1
Soft drinks	35.2	1.6	40.5	1.8	43.8	1.6	58.2	1.7
Pharmaceuticals	378.4	17.2	506.6	21.9	666.0	23.1	886.2	26.5
Petrochemicals	109.4	5.0	103.8	4.5	251.1	8.7	247.4	7.4
Petroleum refining	102.7	4.7	69.5	3.0	72.5	2.5	62.2	1.9
Other petroproducts	77.6	3.5	22.2	1.0	33.4	1.2	43.3	1.3
Machinery	50.0	2.3	59.2	2.6	83.0	2.9	131.5	3.9
Electrical machinery	231.5	10.5	242.0	10.5	297.4	10.3	430.2	12.9
Instruments	—	—	—	—	142.4	4.9	165.3	4.9
Total	1,141.5	51.9	1,216.4	52.7	1,797.4	62.4	2,228.4	66.6
Subtotal	2,188.2	99.5	2,332.2	101.0	2,834.0	98.3	3,301.8	98.7
Discrepancy	11.0	0.5	(^a)	—	48.1	1.7	45.5	1.4
Grand total	2,199.2		2,309.8		2,882.1		3,347.3	

^a Net income rather than GDP.

^a Industry group totals do not add to sector total.

Note: Figures in parentheses add to total.

Source: Puerto Rican Planning Board. Unpublished worksheet for income and product accounts.

contribution to employment has exhibited two contrasting tendencies—change and continuity of relative importance. Change is exemplified, first by an increase in the number of industries with a significant number of employees. In 1949, almost 60 percent of manufacturing employment was provided by the sugar mill, apparel, and food industries. A fourth was provided by sugar mills alone. These three industries, plus tobacco; stone, clay, and glass; and wood and furniture provided over 80 percent of manufacturing employment. Only 10 industries employed as many as 1,000 people. By 1967, 80 percent of sector employment was spread over 10 industries and 19 industry groups had more than 1,000 employees. In 1977, 10 industry groups still provided 80 percent of manufacturing employment

but 20 or more employed more than 1,000 persons.

The second major element of change was the dramatic decline in importance of the sugar industry and the rise in importance provided by the electrical machinery, professional and scientific instruments, and pharmaceuticals industry. Sugar mills, which employed over 14,000 people in 1949 (25.8 percent of sector employment), employed only 3,400 in 1976 (2.4 percent of the sector total). In contrast, employment in the electrical machinery industry rose from 1,450 in 1954 to 13,600 in 1977; instruments from 1,050 to 12,000; and pharmaceuticals from 437 to some 9,360. These three industries, whose employment was too small to be separately reported in 1949, provided 6.4 percent of sector employment in 1958; 10.6 percent in 1967; 12.8 percent in 1970;

Table 6.—Manufacturing Employment by Industry Group, Selected Years 1949–77

1949			1958			1967		
Industry	Amount	Percent- age of total	Industry	Amount	Percent- age of total	Industry	Amount	Percent- age of total
Sugar	14,241	25.8	Apparel	19,998	25.3	Apparel	35,755	28.5
Apparel	10,805	19.6	Sugar	7,676	10.1	Food	10,468	8.4
Tobacco	7,116	12.9	Food	6,144	8.6	Leather	10,406	8.5
Food	5,808	10.5	Tobacco	4,509	6.3	Electrical machinery	8,549	6.9
Stone, clay, glass	2,562	4.6	Textiles	4,444	6.2	Tobacco	7,070	5.6
Wood and furniture	2,215	4.0	Stone, clay, glass	4,131	5.8	Textiles	6,809	5.4
Alcoholic beverages	1,512	2.7	Wood and furniture	3,327	4.7	Stone, clay, glass	6,418	5.1
Printing and publishing	1,459	2.6	Electrical machinery	3,049	4.3	Wood and furniture	4,512	3.6
Textiles	1,450	2.6	Leather products	2,620	3.7	Sugar	3,954	3.2
Other chemicals	1,268	2.3	Fabricated metals	2,007	2.8	Fabricated metals	3,678	2.9
Leather products	911	1.7	Printing and publishing	1,516	2.1	Instruments	3,284	2.6
Soft drinks	883	1.6	Alcoholic beverages	1,196	1.7	Rubber and plastics	3,233	2.6
Beer	799	1.4	Instruments	1,148	1.6	Printing and publishing	2,398	1.9
Machinery	617	1.1	Beer	1,119	1.6	Petroleum	2,027	1.6
Fabricated metals	310	0.6	Other chemicals	1,119	1.6	Soft drinks	1,803	1.4
Paper and products	294	0.5	Rubber and plastics	1,022	1.4	Beer	1,774	1.4
			Soft drinks	947	1.3	Alcoholic beverages	1,393	1.1
			Machinery	703	1.0	Pharmaceuticals	1,384	1.1
			Paper and products	635	0.9	Paper and products	1,245	1.0
			Primary metals	426	0.6	Machinery	1,155	0.9
			Pharmaceuticals	364	0.5	Petroleum chemicals	1,155	0.9
						Primary metals	866	0.7
						Other chemicals	790	0.6
						Transportation equipment	670	0.5
Miscellaneous	2,389	4.3	Miscellaneous	4,587	6.4	Miscellaneous	3,651	2.9
Total	55,137		Total	71,188		Total	125,287	

1970			1972			1973		
Industry	Amount	Percent- age of total	Industry	Amount	Percent- age of total	Industry	Amount	Percent- age of total
Apparel	36,819	25.9	Apparel	39,200	26.6	Apparel	40,721	26.6
Food	11,717	8.6	Food	16,608	12.3	Food	14,954	9.8
Electrical machinery	10,701	7.8	Electrical machinery	12,290	8.3	Electrical machinery	14,817	9.7
Textiles	8,904	6.5	Instruments	7,726	5.2	Instruments	9,069	5.9
Leather	8,309	6.1	Textiles	7,693	5.2	Textiles	7,594	5.0
Stone, clay, glass	6,839	5.0	Stone, clay, glass	7,459	5.1	Stone, clay, glass	7,239	4.7
Tobacco	6,120	4.5	Leather	6,100	4.1	Leather	6,655	4.4
Instruments	5,246	3.8	Fabricated metals	5,835	4.0	Tobacco	5,569	3.6
Wood and furniture	5,089	3.7	Tobacco	5,557	3.8	Fabricated metals	5,470	3.6
Fabricated metals	4,952	3.4	Wood and furniture	5,049	3.4	Pharmaceuticals	4,965	3.2
Rubber and plastics	4,057	3.0	Rubber and plastics	3,813	2.6	Wood and furniture	4,895	3.2
Sugar	3,699	2.5	Pharmaceuticals	3,535	2.4	Petrochemicals	4,856	3.2
Petroleum	2,907	2.1	Petroleum	3,174	2.2	Sugar	3,751	2.5
Printing and publishing	2,559	1.9	Petrochemicals	2,939	2.0	Rubber and plastics	3,744	2.4
Beer	1,985	1.5	Other chemicals	2,910	2.0	Printing and publishing	2,097	1.9
Petrochemicals	1,745	1.3	Printing and publishing	2,559	1.9	Petroleum	2,764	1.8
Pharmaceuticals	1,686	1.2	Sugar	2,051	1.4	Soft drinks	1,714	1.1
Soft drinks	1,681	1.2	Soft drinks	1,736	1.2	Paper and products	1,362	0.9
Alcoholic beverages	1,498	1.1	Alcoholic beverages	1,660	1.2	Machinery	1,291	0.8
Other chemicals	1,459	1.1	Beer	1,475	1.1	Other chemicals	1,221	0.8
Paper and products	1,392	1.0	Machinery	1,438	1.0	Primary metals	1,204	0.8
Machinery	1,392	1.0	Paper and products	1,199	0.8	Alcoholic beverages	1,147	0.8
Primary metals	1,114	0.8	Primary metals	1,089	0.7	Beer	1,146	0.8
Transportation equipment	545	0.4	Transportation equipment	433	0.3	Transportation equipment	592	0.4
Miscellaneous	4,309	9.2	Miscellaneous	3,425	2.3	Miscellaneous	3,230	2.1
Total	136,737		Total	147,247		Total	152,867	

Table 6.—Manufacturing Employment by Industry Group, Selected Years 1949-77—Con.

1975			1976			1977		
Industry	Amount	Percent- age of total	Industry	Amount	Percent- age of total	Industry	Amount	Percent- age of total
Apparel	36,075	26.4	Apparel	37,054	25.6	Apparel	36,200	25.1
Food	15,198	11.1	Food	16,281	11.2	Electrical machinery	13,600	9.4
Instruments	10,829	7.9	Electrical machinery	13,337	9.2	Food	¹ 13,250	9.2
Electrical machinery	9,919	7.3	Instruments	10,611	7.3	Instruments	12,000	8.3
Stone, clay, glass	6,169	4.5	Pharmaceuticals	7,315	5.1	Pharmaceuticals	19,360	6.5
Pharmaceuticals	5,964	4.4	Stone, clay, glass	5,333	3.7	Leather	5,500	3.8
Leather	5,161	3.8	Leather	4,990	3.4	Stone, clay, glass	5,200	3.6
Tobacco	4,980	3.6	Fabricated metals	4,724	3.3	Machinery	14,840	3.4
Textiles	4,898	3.6	Tobacco	4,531	3.1	Textiles	4,600	3.2
Fabricated metals	4,610	3.4	Machinery	4,325	3.0	Petrochemicals	14,368	3.0
Wood and furniture	3,891	2.8	Textiles	4,277	3.0	Fabricated metals	¹ 3,800	2.6
Sugar	3,459	2.5	Wood and furniture	3,737	2.6	Petroleum	¹ 3,720	2.6
Petrochemicals	3,134	2.3	Rubber and plastics	3,499	2.4	Wood and furniture	3,700	2.6
Machinery	3,055	2.2	Sugar	3,416	2.4	Tobacco	3,000	2.1
Rubber and plastics	2,744	2.0	Petrochemicals	3,290	2.3	Sugar	2,737	1.9
Petroleum	2,620	1.9	Petroleum	2,938	2.0	Printing and publishing	¹ 2,640	1.8
Printing and publishing	2,570	1.9	Printing and publishing	2,885	2.0	Soft drinks	2,282	1.6
Soft drinks	1,626	1.2	Other chemicals	1,915	1.3	Rubber and plastics	¹ 2,280	1.6
Other chemicals	1,517	1.1	Soft drinks	1,727	1.2	Alcoholic beverages	¹ 1,999	1.4
Alcoholic beverages	1,467	1.1	Alcoholic beverages	1,510	1.0	Other chemicals	¹ 1,872	1.3
Paper and products	1,242	0.9	Paper and products	1,479	1.0	Paper and products	¹ 1,760	1.2
Beer	1,200	0.9	Beer	1,237	0.9	Beer	¹ 1,632	1.1
Primary metals	987	0.7	Primary metals	994	0.7	Primary metals	¹ 1,200	0.8
Transportation equipment	414	0.3	Transportation equipment	335	0.2	Transportation equipment	¹ 160	0.1
Miscellaneous	2,888	2.1	Miscellaneous	3,049	2.1	Miscellaneous	2,600	1.8
Total	136,617		Total	144,789		Total	144,300	

¹ Estimated by apportioning larger group by labor income contribution.

1949-58 figures are fiscal year averages.

1967-77 figures are October employment which tends to be higher than the fiscal year figures.

Source: Puerto Rico Department of Labor, Census of Manufacturing.

18.8 percent in 1973; and 24.2 percent in 1977. The rate of growth in employment in pharmaceuticals was especially high after 1970.

In contrast to these changes in the relative volume of employment provided by the various industry groups, there has been a remarkable consistency and continuity in industry groups which have been the major contributors to employment since the beginning of the Puerto Rican economic development program.

First, apparel has consistently been the most important industry in terms of employment. In 1949, it provided 19.6 percent of manufacturing employment, second only to sugar. By 1958, it had surpassed sugar and provided 25.3 percent of employment in the sector. It provided 28.5 percent of sector employment in 1967 and employed 40,700 in 1973. In 1977, it employed 36,200, still 25 percent of manufacturing employment as compared with 19,670 in 1949, even though many groups were becoming more significant as indicated above. The employment provided in 1977 was 2.7 times that of electrical machinery, 3 times that of instruments, and almost 4 times that of pharmaceuticals notwithstanding the rapid growth in employment in those industries after 1967.

Food products, other than sugar, which had provided some 13 percent of sector employment in 1949, still provided some 12 percent in 1977. In that year, food products and apparel provided almost 40 percent of total manufacturing employment.

In 1949, the five largest industry employers were sugar mills; apparel; food products; tobacco; and stone, clay, and glass. In 1958, the list was the same except that textiles had replaced stone, clay, and glass. The 1967 list included again apparel, food products, and tobacco, but with leather products and electrical machinery replacing sugar and textiles. In 1970, textiles replaced tobacco. In 1976 and 1977, the list included apparel, food products, electrical machinery, instruments, and pharmaceuticals. If the seven largest industries are chosen, the list remains the same from 1963 through 1977, except that instruments replace tobacco in 1970 and pharmaceuticals replace textiles in 1975. Three that were on the 1949 list of seven are on the 1977 list and make up about 40 percent of sector employment.

Table 7 ranks the industry groups according to employment growth (percentage change) 1967-77.

As table 7 indicates, the top three industries, chemicals, machinery except electrical, and instruments, dominate the sector in terms of percentage

Table 7.—Net Employment Growth 1967–76

SIC industry group	Employment base 1967	Net change 1967–70	Net change 1967–73	Net change 1967–76	Percent change 1967–76
Chemicals	3,329	1,561	7,713	9,191	276.1
Machinery except electrical	1,155	237	136	3,170	274.5
Instruments	3,284	1,962	5,785	7,327	223.1
Wood products	784	—	814	577	73.5
Electrical machinery	8,549	2,167	6,268	4,788	56.0
Petroleum products	2,027	880	737	911	44.9
Fabricated metals	3,678	1,274	1,792	1,046	28.4
Food	19,992	588	2,720	4,179	20.9
Printing	2,397	161	500	488	20.4
Paper	1,245	147	117	234	18.8
Primary metals	866	248	338	128	14.8
Rubber and plastics	3,233	824	511	265	8.2
Apparel	35,755	1,064	4,966	1,299	3.6
Miscellaneous manufacturing	3,651	658	—421	—602	—16.5
Stone, clay, glass	6,418	420	821	—1,085	—16.9
Tobacco	7,070	—950	—1,501	—2,539	—35.9
Furniture	3,728	573	—431	—1,352	—36.3
Textiles	6,809	2,095	785	—2,532	—37.2
Transport	670	—125	—78	—335	—50.0
Leather	10,646	—2,337	—3,991	—5,656	—53.1
All industries	125,287	11,450	27,580	19,502	15.6
Women's and infants' undergarments	18,538	1,083	1,415	—2,507	—13.5
Pharmaceuticals	1,384	302	3,581	5,931	428.5

Source: Unpublished data, Puerto Rico Planning Board, December, 1977.

growth. In terms of net employment contribution, however, chemicals, instruments, electrical machinery, and food, lead the sector, each group adding over 4,000 new employees during the 1967–76 period.

Seven industry groups lost employment during the last decade with the leather and leather products industry accruing a net loss of 5,656, over 50 percent of its 1967 work force.

All five lead industries² by total employment gained net employment during the 1967 to 1977 period. However, growth was most rapid in chemicals

² Chemicals, instruments, electric machinery, food, and nonelectrical machinery.

(driven by the pharmaceutical firms with 428.5 percent growth), instruments, electrical machinery, and food. Together these four groups had a net increase in employment of 26,000 workers greater than the net gain for the industrial sector as a whole.

The recession of 1974–75 impacted on the sector employment, but the largest single source of unemployment came from the construction sector. Table 8 reflects the employment impact of the 1974–75 recession period.

The machinery except electrical industries increased net employment about 3,000 between 1973–76, identifying this group as an emerging growth industry requiring more detailed analyses. In general

Table 8.—Net Employment Growth 1973–76

	Employment base 1973	Net change 1973–74	Net change 1973–75	Net change 1973–76	Percent change 1973–76
Machinery except electric	1,291	2,056	1,764	3,034	235.0
Instruments	9,069	465	1,760	1,542	17.0
Chemicals	11,042	152	—427	1,478	13.4
Paper	1,362	—197	—120	117	8.5
Food	22,712	1,009	238	1,459	6.4
Petroleum	2,764	58	—144	174	6.3
Printing	2,897	133	—327	—12	—4
Miscellaneous manufacturing	3,230	—632	—342	—181	—5.6
Rubber and plastic	3,744	—103	—1,000	—245	—6.5
Apparel	40,721	—2,694	—4,646	—3,667	—9.0
Electrical machinery	14,817	—2,269	—4,898	—1,480	—10.0
Fabricated metals	5,470	148	—860	—746	—13.6
Wood products	1,598	—187	—302	—237	—14.8
Primary metals	1,204	—159	—217	—210	—17.4
Tobacco	5,569	—263	—589	—1,038	—18.6
Leather	6,655	—507	—1,494	—1,665	—25.0
Stone-clay-glass	7,239	53	—1,070	—1,906	—26.3
Furniture	3,297	—525	—792	—921	—27.9
Transportation	592	—139	—178	—257	—43.4
Textiles	7,594	—429	—2,696	—3,317	—43.7
All industries	152,867	—3,310	—16,250	—8,078	—5.3
Pharmaceuticals	4,965	484	999	2,350	47.3
Women's and infants' undergarments	19,953	—3,060	—3,041	—3,922	—19.7

Source: Unpublished data, Puerto Rico Planning Board, December, 1977.

sector growth is pushed by an increase of 2,931 in one subgroup, "general industrial machinery and equipment; service industry machines." The number of firms in this group almost doubled from 11 to 21 during the 1973-76 period. While both the absolute and relative changes in this group appear striking, the statistics should be considered in light of the fact that this group represented only 3 percent of total industrial employment in 1976.

Instruments, chemicals, and food also had relatively large net increases, while the paper industry increased only modestly. It is interesting to note the influence on the chemical industry of pharmaceuticals. The chemical industry had a net increase of 872 workers less than the net increase in pharmaceuticals, indicating a net loss of other products within the chemical group.

The tobacco, leather, stone-clay-glass, furniture, transportation, and textile industries all sustained losses during the 1973-76 period. These industries may incur a long-term negative impact resulting from 1973-74 economic recessionary period. The other industries, despite losses, appeared to begin to recover in 1975-76.

Puerto Rican Income.—Contributions to Puerto Rican income is probably the best measure of an industry's contribution to Puerto Rico. As previously indicated, we have used labor income produced as the best available measure of that contribution. It would have been possible to also include taxes paid. However, given the tax exemptions which exist in Puerto Rico, income from taxes is significant only in the cases of alcoholic beverages, tobacco, and, for 1975-77, petrochemicals.

It is apparent from table 9 that, insofar as generation of income to Puerto Rico is concerned, only a very few manufacturing industries were important in 1947. In that year, two industries, sugar mills and apparel, generated half the income produced by the sector. Four produced over 70 percent of the total and sugar mills, apparel, tobacco, food products, alcoholic beverages, and printing and publishing over 80 percent. Some diversification had occurred by 1960. However, even then, apparel, sugar mills, and food products still produced 40 percent of the total. Over 50 percent was produced by those three industries plus stone-clay-glass and textiles. Considerable diversification occurred from 1960-67. During this period, the various chemical, metals, and petroleum industries began to take on more significance. Half the sector income, however, was produced by five industries; i.e., apparel, food products, stone-clay-glass, electrical machinery, and sugar. These trends continued during the 1967-70 period. After 1970, income produced by pharmaceuticals, electrical machinery, instruments, and petroleum and petrochemicals industries increased rap-

idly. By 1977, some 53 percent of income generated by the sector was produced by six industries; i.e., apparel, electrical machinery, food products, pharmaceuticals, instruments, and stone-clay-glass.

The performance of a few particular industries is especially noteworthy. First, insofar as the volume of income generated is concerned, the apparel industry is clearly in a class by itself. While its percentage of total sector income has fallen, primarily as a result of the beginning of new industries, the volume of income which it has produced has consistently exceeded that produced by any other industry by a wide margin (except for 1947 in which a slightly larger amount was produced by the sugar mill industry). Even in 1977, it still produced $\frac{1}{8}$ th of sector labor income. Its contribution was 147 percent of that of electrical machinery and 191 percent of that of pharmaceuticals. The performance of the food products industry is also noteworthy. Its contribution to Puerto Rican income was a higher percentage of the sector total in 1977 than in 1947, 11 percent as compared with 9.9 percent. It and apparel together contributed 27 percent of the sector total.

The growth in income produced by the electrical machinery and pharmaceutical industries has been striking. Information is not available on the contribution of these industries prior to 1967. However, in that year, labor income produced by the electrical machinery industry was 6.8 percent of the sector total and that of pharmaceuticals was 1.2 percent, only larger than that of other chemicals and transportation equipment. By 1977, electrical machinery's contribution had become second only to that of apparel, and that of pharmaceuticals had come to rank fourth, with the two industries producing 11.1 percent and 8.6 percent, respectively, of the sector's contribution.

Comparison of Contribution to Output, Employment, and Income.—Examination discloses that there have been considerable divergencies within industry groups in their contribution to income, employment, and output. A comparison of such contributions among industries is made in table 10.

Differences are quite marked in some cases. For example, the apparel industry provided one-fourth of manufacturing employment and contributed one-sixth of sector employment while producing one-twelfth of sector output. In contrast, the pharmaceutical industry produced 26.5 percent of sector output and provided 6.5 percent of sector employment and 8.6 percent of sector income. Similarly, the leather products industry produced 1 percent of sector output, 3.8 percent of sector employment, and 2.1 percent of sector income, while petrochemicals produced 7.4 percent of output, 3.0 percent of employment, and 4.1 percent of income.

Table 9.—Labor Income by Industry Group, 1947-77

1947			1960			1967		
Industry	Amount (millions of dollars)	Percent- age of total	Industry	Amount (millions of dollars)	Percent- age of total	Industry	Amount (millions of dollars)	Percent- age of total
Sugar mills	14.9	26.2	Apparel	37.0	20.5	Apparel	87.1	21.1
Apparel	14.3	25.2	Sugar	20.5	11.4	Food products	40.7	9.7
Tobacco	6.0	10.6	Food products	15.5	8.6	Stone-clay-glass	28.6	6.9
Food products	5.6	9.9	Stone-clay-glass	12.7	7.0	Electrical machinery	27.9	6.8
Alcoholic beverages	2.4	4.2	Textiles	10.4	5.8	Sugar	22.8	5.5
Printing and publishing	2.3	4.1	Printing and publishing	6.9	3.8	Leather products	22.7	5.5
Wood and furniture	1.7	3.0	Tobacco	6.7	3.7	Textiles	18.9	4.6
Beer	1.5	2.6	Wood and furniture	6.7	3.7	Tobacco	18.7	4.5
Stone-clay-glass	1.2	2.1	Leather products	4.8	2.7	Petroleum	15.0	3.6
Soft drinks	.9	1.6	Beer	4.2	2.3	Wood and furniture	14.5	3.5
Textiles	.6	1.1	Alcoholic beverages	3.6	2.0	Fabricated metals	13.5	3.3
			Soft drinks	3.2	1.8	Printing and publishing	11.7	2.8
			Paper and products	2.6	1.4	Instruments	11.2	2.7
Subtotal	51.4	90.6		134.8	74.7	Beer	9.8	2.4
						Rubber and plastic	9.7	2.4
Metals and machinery	2.0	3.5	Metals and machinery	25.5	14.1	Alcoholic beverages	7.7	1.9
Chemicals	1.2	2.1	Chemicals	5.0	2.8	Soft drinks	7.2	1.7
Miscellaneous	2.2	3.9	Miscellaneous	16.0	8.9	Machinery	6.8	1.6
						Petrochemicals	6.7	1.6
						Primary metals	6.1	1.5
						Paper and products	5.4	1.3
						Pharmaceuticals	5.1	1.2
						Other chemicals	3.8	0.9
						Transportation equipment	1.7	0.4

1970			1972			1974		
Industry	Amount (millions of dollars)	Percent- age of total	Industry	Amount (millions of dollars)	Percent- age of total	Industry	Amount (millions of dollars)	Percent- age of total
Apparel	133.4	21.9	Apparel	139.2	18.5	Apparel	166.9	18.0
Food products	56.0	9.2	Food products	76.3	10.2	Food products	98.0	10.6
Electrical machinery	45.4	7.5	Electrical machinery	69.6	9.3	Electrical machinery	91.0	9.8
Stone-clay-glass	39.2	6.5	Stone-clay-glass	49.0	6.5	Stone-clay-glass	59.6	6.4
Textiles	30.0	4.9	Instruments	33.6	4.5	Petrochemicals	44.9	4.8
Leather products	29.0	4.8	Petrochemicals	31.4	4.2	Instruments	44.0	4.8
Petroleum	24.5	4.0	Petroleum	30.4	4.0	Pharmaceuticals	43.6	4.7
Fabricated metals	21.9	3.6	Textiles	30.0	4.0	Fabricated metals	363.1	3.9
Instruments	21.3	3.5	Fabricated metal	29.7	4.0	Textiles	34.7	3.7
Tobacco	21.1	3.5	Pharmaceuticals	25.0	3.3	Petroleum	34.3	3.7
Sugar	21.0	3.5	Leather products	24.5	3.3	Printing and publishing	29.8	3.2
Wood and furniture	21.0	3.5	Wood and furniture	23.6	3.1	Leather products	26.3	2.8
Printing and publishing	18.5	3.0	Tobacco	22.5	3.0	Wood and furniture	25.2	2.7
Petrochemicals	15.6	2.6	Printing and publishing	20.6	2.7	Tobacco	25.2	2.7
Rubber and plastics	14.6	2.4	Rubber and plastics	20.6	2.7	Sugar	23.8	2.6
Beer	14.6	2.4	Sugar	20.6	2.7	Rubber and plastics	21.7	2.3
Alcoholic beverages	11.8	1.9	Soft drinks	16.9	2.2	Machinery	21.3	2.3
Soft drinks	11.2	1.8	Alcoholic beverages	15.2	2.0	Soft drinks	20.1	2.1
Pharmaceuticals	10.2	1.7	Machinery	13.8	1.8	Alcoholic beverages	15.9	1.7
Machinery	8.7	1.4	Beer	13.6	1.8	Beer	12.1	1.3
Primary metals	8.6	1.4	Primary metals	10.0	1.3	Primary metals	11.7	1.3
Paper and products	7.7	1.3	Paper and products	8.6	1.1	Paper and products	9.2	1.0
Other chemicals	4.2	0.7	Other chemicals	5.8	0.8	Other chemicals	9.2	1.0
Transportation equipment	1.8	0.3	Transportation equipment	3.5	0.5	Transportation equipment	4.1	0.4

Table 9.—Labor Income by Industry Group, 1947-77—Con.

1975			1976			1977		
Industry	Amount (millions of dollars)	Percent- age of total	Industry	Amount (millions of dollars)	Percent- age of total	Industry	Amount (millions of dollars)	Percent- age of total
Apparel	160.7	16.7	Apparel	181.0	17.6	Apparel	190.2	16.4
Food products	105.7	11.0	Food products	110.9	10.8	Electrical machinery	129.4	11.1
Electrical machinery	90.5	9.4	Electrical machinery	97.6	9.5	Food products	126.6	11.0
Stone-clay-glass	60.3	6.3	Pharmaceuticals	71.9	7.0	Pharmaceuticals	99.4	8.6
Pharmaceuticals	58.0	6.0	Instruments	62.2	6.0	Instruments	72.8	6.3
Instruments	48.5	5.0	Stone-clay-glass	53.1	5.2	Stone-clay-glass	50.0	4.3
Petrochemicals	45.3	4.7	Petroleum	42.0	4.1	Petrochemicals	47.1	4.1
Fabricated metals	38.6	4.0	Petrochemicals	40.1	3.9	Petroleum	45.7	3.9
Petroleum	38.5	4.0	Fabricated metals	38.3	3.7	Machinery	45.1	3.9
Textiles	31.1	3.2	Machinery	30.8	3.0	Fabricated metals	37.0	3.2
Printing and publishing	30.4	3.2	Printing and publishing	30.2	2.9	Printing and publishing	31.8	2.7
Sugar	28.4	2.9	Tobacco	29.1	2.8	Tobacco	28.2	2.4
Tobacco	28.2	2.9	Textiles	27.6	2.7	Rubber and plastics	27.0	2.3
Machinery	25.2	2.6	Sugar	26.7	2.6	Textiles	26.9	2.3
Leather	24.6	2.6	Leather	25.3	2.5	Sugar	26.8	2.3
Wood and furniture	23.0	2.4	Rubber and plastics	24.2	2.4	Leather	24.5	2.1
Rubber and plastics	22.6	2.3	Wood and furniture	22.1	2.1	Soft drinks	23.2	2.0
Soft drinks	20.7	2.1	Soft drinks	21.4	2.1	Wood and furniture	20.9	1.8
Alcoholic beverages	15.5	1.6	Alcoholic beverages	16.7	1.6	Other chemicals	20.0	1.7
Beer	12.7	1.3	Other chemicals	16.0	1.6	Primary metals	11.9	1.0
Other chemicals	12.7	1.3	Beer	13.7	1.3	Beer	15.5	1.3
Primary metals	12.4	1.3	Primary metals	16.0	1.6	Primary metals	11.9	1.0
Paper and products	9.0	0.9	Paper and products	9.5	0.9	Paper and products	11.6	1.0
Transportation equipment	4.1	0.4	Transportation equipment	4.2	0.4	Transportation equipment	4.3	0.4

Source: Puerto Rico Planning Board, unpublished worksheet for income and product accounts.

Table 10.—Comparison by Industry Group Contributions to Income, Employment, and Output in 1977
[Percentage of sector total]

Industry Group	Income (labor income)	Employment	Output (GDP)
Apparel	16.4	25.1	8.3
Electrical machinery	11.1	9.4	12.9
Food products	11.0	9.2	9.1
Pharmaceuticals	8.6	6.5	26.5
Instruments	6.3	8.3	4.9
Stone-clay-glass	4.3	3.6	2.6
Petrochemicals ¹	4.1	3.0	7.4
Machinery	3.9	3.4	3.9
Petroleum	3.9	2.6	3.2
Fabricated metals	3.2	2.6	2.2
Printing and publishing	2.7	1.8	1.1
Tobacco ¹	2.4	2.1	3.8
Textiles	2.3	3.2	1.4
Rubber and plastics	2.3	1.6	1.4
Sugar	2.3	1.9	0.2
Leather products	2.1	3.8	1.0
Soft drinks	2.0	1.6	1.8
Wood and furniture	1.8	2.6	0.9
Alcoholic beverages ¹	1.7	1.4	6.1
Other chemicals	1.7	1.3	0.9
Beer	1.3	1.1	0.9
Paper and paper products	1.0	1.2	0.6
Primary metals	1.0	0.8	0.4
Transportation equipment	0.4	0.1	0.2

¹ The wide difference between contribution to output and income in these three areas is partially due to deficiencies in the methodology employed which results in the large amount of excise taxes collected not being included in income.

Source: Calculated from data in tables 3, 5, and 9.

Note: Listing is in order of rank in contribution to income.

Table 11 contains a comparison of changes in industry group production of Puerto Rican income, employment, and output.

During the period from 1947 to 1967, those industries which were most important in terms of their absolute contribution to income, employment, and output were in general also the industries whose contributions were increasing most appreciably. They included apparel, stone-clay-glass, food products, textiles, and fabricated metals. If rates of increase alone were considered, soft drinks would have to be added to the list and stone-clay-glass dropped. In terms of amounts of increase, apparel far exceeded any other industry in all three categories. For those groups for which data is available, the rate of increase was highest for textiles in all three categories. In addition to these industries, electrical machinery and professional and scientific instruments began to become significant and to grow with some rapidity during the period. Neither group was large enough to be reported separately before 1954 and we had data on income and output produced only for the period 1967-77. Employment in electrical machinery, however, increased from 1,454 in 1954 to 8,549 in 1967 while employment in the instruments industry rose from 1,056 to 3,284.

The period 1967-77 was characterized by the rapid growth of the pharmaceuticals, electrical machinery,

Table 11.—Amount and Rate of Change in Increase in Income, Employment and Output by Industry Group

INDUSTRY	1947-67 INCOME		1949-67 EMPLOYMENT		1947-67 OUTPUT	
	Amount (Millions of dollars)	Percentage	Amount (Millions of dollars)	Percentage	Amount (millions of dollars)	Percentage
Apparel	52.2	326	24,950	231	95.4	472
Stone-clay-glass	21.1	1,623	3,856	150	45.0	711
Food products	16.4	260	4,660	8.02	39.0	557
Textiles	14.1	2,014	5,359	370	21.1	3,517
Wood and furniture	9.4	495	2,297	104	13.5	265
Tobacco	8.0	119	-46	-0.6	NA	NA
Printing and publishing	5.6	254	939	64.4	NA	NA
Beer	6.0	353	975	122	24.3	517
Soft drinks	4.6	460	920	104	12.5	625
Alcoholic beverages	3.3	122	-119	-7.9	49.8	113
Sugar	1.1	6.6	-10,287	-72.2	-3.0	-7.8
Machinery			538	87.2		
Fabricated metals			3,368	1,086		

INDUSTRY	INCOME		EMPLOYMENT		OUTPUT	
	Amount (Millions of dollars)	Percentage	Amount (Millions of dollars)	Percentage	Amount (Millions of dollars)	Percentage
Drugs	40.7	1,017	7,976	576	584.5	1,171
Electrical machinery	36.5	167	5,051	59.1	223.3	582
Instruments	25.2	332	8,716	265	56.9	327
Apparel	17.3	25.4	445	1.2	73.1	63.2
Petrochemicals	16.0	308	3,213	278	87.4	380
Machinery	15.0	283	3,685	319	61.9	553
Food products	10.7	47.1	2,782	26.6	41.0	58.9
Petroleum	8.4	71.8	1,693	83.5	-8.1	-19.2
Leather products	6.8	38.2	-4,906	-47.1	-12.1	-38.7
Fabricated metals	6.1	57.5	122	33.2	15.1	70.6
Other chemicals	6.0	200	1,082	137	12.3	262
Printing and publishing	5.1	55.4	242	10.1	1.6	17.6
Soft drinks	4.8	85.7	479	25.6	13.8	95.2
Rubber and plastics	4.6	60.5	-1,003	-31.0	14.9	121.1
Alcoholic beverages	2.7	48.3	606	435	5.4	5.8
Primary metals	1.4	29.2	334	38.6	-5.2	-46.0
Paper and paper products	1.0	23.8	242	10.1	?	?
Transportation equipment	0.6	46.1	-510	-76.1	0.8	33.3
Stone-clay-glass	0.1	0.45	-1,218	-19.0	-2.6	-5.6
Beer	-0.7	-9.1	-142	-8.0	-14.9	-59.4
Wood and furniture	-1.9	-16.8	-700	-15.5	-5	-2.7
Tobacco	-2.0	-13.6	-4,070	-57.6	27.4	60.9
Textiles	-2.7	-18.2	-2,209	-32.4	0.2	1.2
Sugar	-5.2	-29.2	-1,217	-30.8	-32.3	-91.5

Listed in order of amount of increase in income during period. Increases in income and output in millions of constant dollars. Actual amounts of output deflated by U.S. wholesale price index (1967 base) for industry group. Actual amounts of income deflated by consumer price index.

Note: Employment increases for first period are from 1949 to 1967, while income and output increases are for 1947 to 1967.

Source: Puerto Rico Planning Board, unpublished worksheet for income and product accounts.

and instruments industries. Apparel, petrochemicals, machinery, and food products also grew significantly. In general, those industries which were making the largest contributions to income, employment, and output in 1977 were also the ones whose contributions grew most rapidly during the period 1967-77. The major exception is stone-clay-glass which declined, probably because of the drastic fall in construction during the last 3 years of the period.

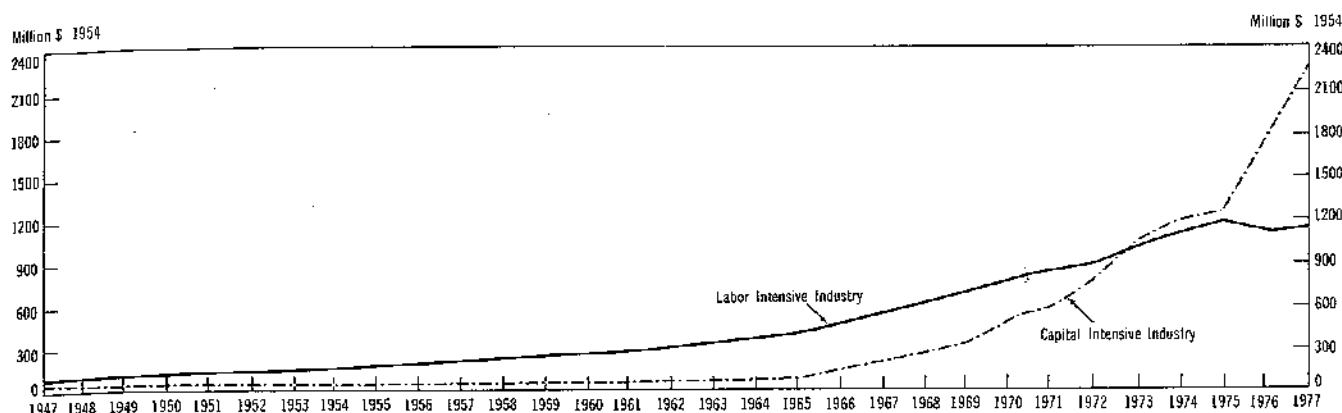
A number of industries, however, declined during the period. These include beer, tobacco, wood and furniture, textiles, and stone-clay-glass. Output and employment also declined in leather products; employment declines were also recorded in rubber and plastics. These declines represent, in part, the effects of economic recession as well as industry conditions. (See charts 2 and 3.)

The decline of the sugar industry was continuous throughout the period.

Changes In Sector Characteristics and Conditions

Dependency on External Trade and Capital.—The scarcity of natural resources in Puerto Rico, indicated in chapter II, led to the evolution of an industrial development strategy based primarily on the processing of imported materials. Nonetheless, in the early years of the development program, the more important industries in the manufacturing sector were those utilizing local source materials. For example, in 1947, over 70 percent of sector output was in the food products (including sugar, beverages, canning and preserving, and other food products), tobacco,

CHART 2—MANUFACTURING OUTPUT (GDP)
LABOR INTENSIVE AND CAPITAL INTENSIVE INDUSTRIES



and stone-clay-glass industries. Even in 1960, 44 percent of sector output was produced by those industry groups. By 1977 these industries produced only 21 percent of sector output. In 1950, capital goods, raw materials, and intermediate goods imported were 24.5 percent of output (GDP). By 1963, this ratio had increased to 29.4 percent. It remained relatively stable for the next 10 years and then increased sharply from 28.4 percent in 1973 to 40.1 percent in 1977.

As has been indicated, production for external markets was a major element in Puerto Rico's development strategy. In 1950, merchandise exports from Puerto Rico were 33.6 percent of GDP. In 1960, the ratio had reached 37.2 percent but in 1970 was only 34.8 percent. After 1970, it increased quite rapidly and reached 46.9 percent in 1977.

A third major element of Puerto Rico's development strategy was the stimulation of external investment in Puerto Rico. Adjusted net inflows of external capital increased from 6 percent of GDP in 1950 to 13.8 percent in 1960, 20.3 percent in 1970, and 24.7 percent in 1977. The extent of external invest-

ment in some industries is shown by equity ownership in 1973 as follows:

Table 12.—External Stockholders Equity as a Percentage of Total Equity

Industry	Percentage
Drugs	99.988
Petrochemicals	99.98
Other chemicals	98.3
Petroleum refining	94.6
Petroleum products	60.0
Primary metals	89.1
Fabricated metals	99.5
Machinery	99.7
Electrical machinery	98.9
Total group	98.3

Source: Puerto Rico Planning Board, unpublished worksheet for income and product accounts.

An examination of changes in the division of sector net income by distributive share may be a more direct indication of changes in capital intensity. Changes in profits and labor income as percentages of net income produced by the sector have been as shown in table 13.

CHART 3—INCOME PRODUCED BY MANUFACTURING
LABOR INTENSIVE AND CAPITAL
INTENSIVE INDUSTRIES

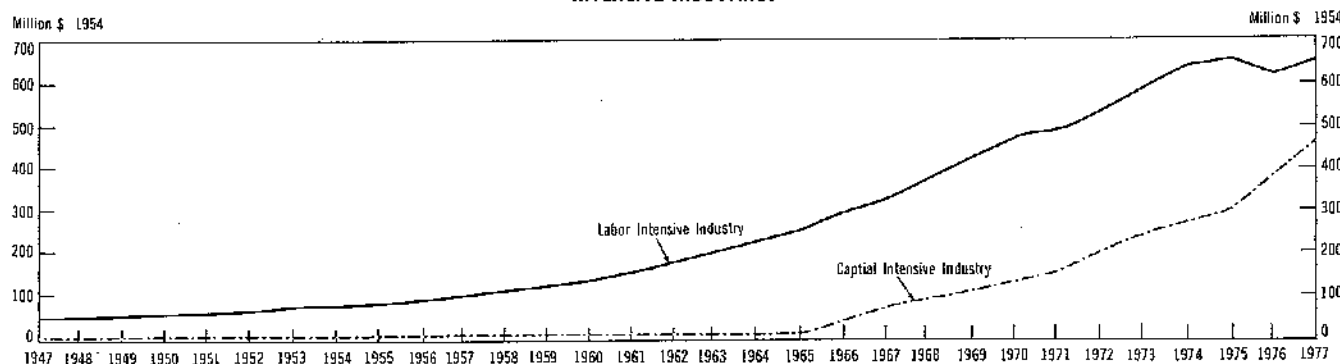


Table 13.—Relation of Profits and Labor Income to Net Domestic Income

[In percentages]

	1950	1955	1960	1965	1970	1972	1974	1976	1977
Puerto Rico:									
Profits	30.6	36.4	37.5	39.9	38.4	41.4	50.5	56.9	59.3
Labor Income	69.4	63.6	62.5	61.1	62.6	58.6	49.5	43.1	40.7
U.S. Mainland:									
Labor Income	73.2	76.8	81.4	77.9	86.3	83.2	87.9	82.1	—

Source: Planning Board, 1977 *Economic Report to the Governor*; unpublished worksheet for income and products accounts.

The shift in relative shares during the 1970's is significant as is the fact that by 1974 the share going to profit was greater than that going to labor and by 1977 was 45.7 percent greater. The difference in the direction of movement between Puerto Rico and the mainland is evident.

We have attempted to make some assessment of the relative importance of labor- and capital-intensive industries by examining the contribution to

output, employment, and Puerto Rican income by those industries which might be considered capital intensive and those which might be considered labor intensive. For this purpose, we have considered that those industries for which the returns to property are more than 50 percent of their contribution to net income to be capital intensive, and those for which labor income is more than half of net income to be labor intensive. On the basis of that criterion, Puerto Rican industries may be classified as follows:

Labor intensive

Apparel
Textiles
Leather
Sugar milling
Beer
Other food products
Wood and furniture
Printing and publishing
Paper and paper products
Stone-clay-glass
Rubber and plastics
Soft drinks (until 1967)
Metals and machinery (as a group until 1967)
Primary metals (after 1967)
Fabricated metals (after 1967)
Transportation equipment (after 1967)
Other chemicals (after 1967)
Instruments (1967-75)

Capital intensive

Prior to 1967

Chemicals (as a group)
Alcoholic beverages

After 1967

Pharmaceuticals
Petrochemicals
Petroleum refining and products
Machinery
Electrical machinery
Alcoholic beverages
Soft drinks
Instruments (1976 and 1977)

Changes in the relative importance of the two groups are summarized in table 14. (See tables 5, 6, 7, and 9 for industry details.)

Productivity Changes.—In discussions of productivity in Puerto Rico reference is usually to labor productivity. It is sometimes measured by value added per employee or value added per dollars of payroll. Profits per worker may also sometimes be

used. Briefly, the attempt is to measure the amount of output associated with an employee, or changes in that output. These measures plus others have empirical as well as theoretical difficulties.

Notwithstanding such difficulties, some attempt to show changes in productivity which have accompanied the changes in industrial structure in Puerto Rico may be useful in providing an understanding of the nature of the existing manufacturing sector.

Table 14.—Relative Importance of Labor and Capital Intensive Industries, (Percentage of Manufacturing Sector Contribution)

Item	Income (Labor)					Employment					Output				
	1947	1967	1970	1974	1977	1947	1967	1970	1974	1977	1947	1967	1970	1974	1977
Labor intensive industries	86.4	79.2	76.3	68.9	56.4	90.9	83.1	79.5	76.5	62.0	70.9	61.6	60.7	47.6	32.1
Capital intensive industries	7.8	18.5	21.0	29.3	41.4	3.9	13.9	15.8	21.7	36.2	23.4	35.4	38.0	51.9	66.6

Source: Tables 5, 6, and 9.

Table 15.—Value Added Per Employee by Major Industry Group 1958–72

[In thousands of current dollars]

	Rank 1954	1954	1958	1963	1967	1972	Percentage change in constant 1954 dollars = 100 ¹	Value added payroll
Chemicals	4	5.2	6.2	19.7	34.4	50.2	441	7.68
Petroleum	—	D	D	D	D	42.0	—	4.44
Machinery except electrical	7-8	3.8	5.9	8.0	12.1	16.9	147	2.93
Primary metals	3	5.3	4.5	8.7	10.8	15.0	60	2.72
Printing	9	3.4	4.5	7.2	8.0	14.1	134	2.50
Metal fabricating	2	5.5	5.1	6.4	11.0	14.9	52	2.83
Instruments	14	2.2	3.4	6.6	8.4	13.9	248	2.91
Food	7-8	3.8	5.6	9.0	12.3	12.4	83	3.11
Stone-clay-glass	13	3.0	4.7	7.1	9.4	11.7	117	2.52
Electrical machinery	10	3.3	7.2	9.1	9.9	11.6	97	2.93
Paper	1	6.8	6.1	6.5	9.5	11.4	—5	2.17
Tobacco	18	1.2	2.2	3.9	5.9	10.3	394	2.84
Transportation equipment	6	4.5	D	D	D	9.6	20	2.18
Miscellaneous manufacturing	11-12	3.1	3.0	3.8	5.2	9.5	71	2.50
Furniture	15	2.0	3.0	4.2	5.6	9.1	151	2.26
Textiles	11-12	3.1	3.4	4.1	6.1	8.6	134	2.40
Rubber and plastics	—	D	3.9	5.4	6.4	7.9	—	1.96
Wood products	5	4.6	2.6	4.1	—8	6.9	—16	1.84
Apparel	17	1.8	2.5	3.4	4.2	5.4	207	2.03
Leather	16	1.9	2.6	3.4	4.5	6.0	63	1.43
Pharmaceuticals	—	—	7.4	30.3	56.3	85.3	—	—
Women's and infants' undergarments	—	—	3.0	3.5	4.2	6.4	—	—

¹ Implicit Price Deflator for Gross Products, 1954 = 100.

Source: U.S. Bureau of Census, Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures (various years).
D—Data unavailable.

Table 15 presents a comparison of industries in terms of value added per employee for certain years from 1954 to 1972 (data was not available for years later than 1972). Industries are listed in order of the amount of value added per employee in 1972.

The chemicals and petroleum industries are readily identified as being far ahead of other industries in labor productivity. The high ranking of the chemicals industry is derived mostly from the high capital and relatively low labor requirements in the pharmaceutical industry.

Other capital-intensive industries follow in the ranking with the more labor-intensive industries making up the bottom portion of the listing. This contrasts somewhat with the 1954 rankings which show a very much narrower range in productivity differences and in which a number of more highly labor-intensive industries rank relatively high.

The greatest percentage increases (rate of growth) in labor productivity occurred in the chemical (441 percent), tobacco (394 percent), instruments (248 percent), and apparel (207 percent) industries.

The increase in productivity in tobacco is in sharp contrast to this industry's loss of firms, table 4, and employment loss, table 6. The discrepancy reflects a structural change within the industry itself. In 1972, the only cigarette manufacturing plant in Puerto Rico continued as a highly productive production unit while the more labor-intensive cigar-making industries (hand rolling) continued to de-

cline in the face of highly competitive Caribbean suppliers.

The dramatic increase in scientific and surgical instrument manufacturing is following on the heels of the pharmaceuticals growth, particularly where product classification, e.g., chemically treated or composed measuring devices, is vague.

Using net earnings (profits) per employee as a measure of productivity permits a comparison for later years. Table 16 presents a comparison of industry groups for selected years from 1967 to 1976.

Table 16.—Net Earnings (Profits) Per Worker in Major Industry Group 1967–76

	1967	1970	1972	1973	1976
Chemicals	\$18.27	\$16.36	\$20.21	\$23.93	\$55.04
Electrical machinery	3.55	4.97	6.67	7.17	14.91
Machinery except electrical	2.19	3.23	9.68	16.20	12.40
Petroleum	9.18	9.78	6.28	24.80	10.80
Instruments	1.91	2.99	3.37	3.80	7.76
Fabricated metals	.47	1.82	3.45	4.04	7.20
Miscellaneous industries	1.66	1.78	2.76	2.66	6.05
Tobacco	2.35	2.61	2.39	2.97	5.67
Food	1.85	2.16	1.91	2.46	4.85
Rubber and plastics	.46	.95	.75	.36	4.37
Transportation equipment	.96	.79	.18	1.49	3.52
Printing	.81	1.20	1.23	1.33	3.22
Paper	1.96	1.66	1.54	1.09	3.21
Textiles	.77	1.09	1.28	2.20	2.75
Stone-clay-glass	1.74	1.04	1.74	1.41	1.88
Apparel	.77	1.11	1.27	1.22	1.81
Leather	.75	.76	.96	1.26	1.64
Primary metal	5.41	1.42	2.24	2.90	1.38
Furniture and wood	.56	.85	.72	1.12	.52
Total industries	2.00	2.48	3.53	4.57	9.48

Source: Puerto Rico Planning Board, unpublished worksheet for income and product accounts.

While there are some changes in the relative position of industry groups, table 17 presents basically the same picture as existed in 1972 for value added per employee. The chemical, electrical machinery, petroleum, machinery, and instruments industries rank highest. The more labor-intensive industries such as printing, paper products, textiles, stone-clay-glass, apparel, leather products, and wood and furniture rank lowest.

A comparison ranking of industries by (a) value added per employee and (b) labor cost as a proportion of value added was undertaken to determine whether differences exist between the two criteria.

Table 17.—Comparative Ranking of Industries by Value Added Per Employee and Labor Cost as a Percentage Cost of Value Added (1972)

Value added/employment	Labor cost/value added
Chemicals	Wood products
Petroleum	Leather
Machinery except electrical	Rubber and plastics
Primary metals	Apparel
Printing	Paper
Metal fabricating	Transportation equipment
Instruments	Furniture
Food	Textiles
Stone-clay-glass	Miscellaneous manufacturing
Electrical machinery	Stone-clay-glass
Paper	Printing
Tobacco	Primary metals
Transportation equipment	Tobacco
Miscellaneous manufacturing	Food
Furniture	Metal fabricating
Textiles	Instruments
Rubber and plastics	Machinery except electrical
Wood products	Electrical machinery
Apparel	Petroleum
Leather	Chemicals

Chapter IV.—Comparative Analysis of Industry Groups and Implications for Sector Policy

This chapter makes a comparison of industry groups in terms of their relative contributions to easing Puerto Rico's economic problems. An attempt is made to classify industries in accordance with their ability to make such contributions. Conclusions are then drawn as to the implications of the analysis for Puerto Rico's policy toward the sector.

There are a number of objectives to which the development of the manufacturing sector might be expected to contribute. What these objectives are, will of course condition the choice among policy options. From that perspective, they may be considered as criteria for choice as well as objectives. The analyses made in the previous chapters indicates that, under Puerto Rican conditions, the most appropriate objectives or criteria for the manufacturing sector are:

1. A sustainable rate of growth in the sector's contribution to the Puerto Rican economy.
2. A reduction of unemployment in order to reduce the human, social, political, and economic costs of unemployment.
3. Achievement of a pattern of income distribution which avoids concentration of a large share of the total in any relatively small population group.
4. Limiting Puerto Rican vulnerability to changes in conditions not subject to its control, including (a) world trade and demand conditions; (b) corporate policy and financial considerations unrelated to Puerto Rican economic conditions; and (c) changes in conditions and the nature of relationships within the U.S. Federal system.

In addition to these objectives or criteria, Puerto Rican policy toward industries must also take into account such considerations as rates of profit and their role in private investment and location decisions and government tax and incentive program decisions; variations in industry practices with respect to corporate structure and plant location,

decentralization, or dispersion; and variations in market and growth prospects.

There may be wide variations in the value to Puerto Rico of investments in the manufacturing sector. For example, there are variations due to types of industry and sources of investment; whether the investment is by residents or nonresidents.

Unfortunately, data is not available which would permit as firm results as are desirable. There does not appear to be any data available on investment by industry groups. Data on profits are drawn from various sources, it may lack comparability from period to period, and is incomplete in coverage. There is no available information on the division between income accruing to residents and nonresidents. Such data as are available tend to be at too high a level of aggregation, and are usually at a 2-digit SIC level, which covers a wide variety of industries with disparate characteristics. Proxies or surrogates must be frequently used. Samples used may not be representative. Despite these difficulties, the study uses the available data as indicators of the direction in which the industrial sector is moving.

An industry's contributions to output, employment, and income are each, to some degree, measures of that industry's contribution to Puerto Rico's development. However, in view of the divergence between output on Puerto Rico and income accruing to Puerto Rico, output is considered as a relatively poor measure of an industry's contribution to employment and local income generation objectives. Increased employment is, of course, an important Puerto Rican objective. Standing alone, however, it also seems to be an inadequate measure. Conceptually, contribution to net income (in the national accounts, *not* the individual firm, sense) *accruing to Puerto Rico* seems to be an appropriate measure of an industry's contribution to Puerto Rican objectives. What makes this a good measure is that it is essentially a composite result of employment, wage rates, employee benefits, and profits. The inclusion

of taxes paid in the gross national income framework seems appropriate since (a) to the extent they are paid by Puerto Ricans, they would usually represent a reallocation from surplus spending units to deficit spending units and not transfers to off-island earning units, (b) under the investment incentive program, taxes paid by nonresidents are insignificant, and (c) the ability to increase Puerto Rican income through the imposition of taxes is one of the policy options to be analyzed.

LABOR INCOME AS A RATIO OF SECTORAL NET INCOME

A comparison of the labor income to net income by industry is shown in table 1. This ratio is used here as a quasi-measure of factor intensity. Inasmuch as Puerto Rican data is not available to measure industrial capital stock either in a sectoral aggregate or by individual industries, the study uses the income ratio to rank industries. The lowest ratio would tend to show relatively high capital intensity, while the highest ratio would tend to show low capital intensity.

The return to capital, which is the obverse of the above ratio assuming other factor inputs as held constant, shows a tendency to higher profits in the sector. Given the industrial ownership structure, where foreign capital has tended to concentrate in high-return industries, the analysis indicates that the relative income going to Puerto Rican factors of production is declining. It is recognized that factor

intensity is not directly measured by the above ratio, but as an indirect measure, along with known industrial profitability, it seems reasonable to infer that Puerto Rico benefits less from these industries under this criterion. Puerto Rican ownership and capital contribution to these industries is particularly nonexistent.

FACTORS CONDITIONING PRODUCTION OF BENEFITS

Relative Profitability

Profitability (return on equity) is not a sufficient guide to an industry's contribution to the Puerto Rican economy. However, it is a very practical consideration which must be taken into account in the development of governmental policy since it is, of course, an extremely important consideration in private investment decisions. It also can be an important consideration in governmental incentives and tax policy decisions. The way profitability may act as a constraint on obtaining the most productive investment in terms of generation of Puerto Rican income is examined below.

The comparison of rates of profit by industry groups presented in this section uses unpublished data provided by Fomento. The ratios were calculated by Fomento based on pro forma tax returns submitted by industrial firms to the Puerto Rican Treasury. The possible weakness of this data should be recognized and, therefore, the implications of the analysis should be used with the greatest caution.

Table 1.—Labor Income as a Percentage of Net Income by Industry

Industry	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Group I—Highest:											
Furniture	83.0	82.1	81.2	80.1	79.0	84.4	80.7	88.5	87.8	88.4	82.0
Printing and publishing	82.7	81.2	74.7	81.9	85.5	83.4	85.3	83.5	81.0	75.0	86.0
Leather products	73.6	77.6	82.4	82.6	82.6	81.8	78.1	75.3	74.1	76.7	74.0
Transportation equipment	71.2	72.6	—	78.0	80.2	—	79.0	81.7	87.4	77.0	78.3
Apparel	76.7	77.4	78.2	77.5	76.9	74.9	77.1	77.2	78.4	73.7	72.6
Stone-clay-glass	69.7	61.4	72.2	79.8	72.9	74.2	79.4	77.6	83.8	84.4	68.7
Group II—High Middle:											
Rubber products	85.0	80.8	—	76.5	70.7	85.6	91.5	70.0	72.3	61.8	62.9
Textiles	78.5	77.8	77.3	73.0	69.4	72.6	65.0	62.4	63.6	70.1	63.7
Paper products	67.1	66.9	67.5	75.1	84.8	81.4	82.2	58.9	61.4	62.6	61.7
Food products	68.0	65.4	66.7	68.4	66.8	72.5	73.8	69.5	66.7	62.5	69.4
Primary metals	55.3	66.8	79.8	79.8	79.8	76.8	70.7	52.9	58.9	—	—
Other chemicals	84.6	67.6	59.4	60.8	68.8	65.5	55.5	—	—	—	—
Group III—Low Middle:											
Tobacco products	53.0	56.7	61.9	57.9	54.2	64.1	63.2	73.9	57.0	53.8	51.1
Fabricated metal products	66.5	85.9	78.1	69.8	59.4	59.0	60.4	53.7	54.9	54.4	51.6
Instruments	65.7	62.9	60.7	58.0	55.5	58.6	56.1	60.3	58.1	44.5	45.0
Group IV—Low:											
Nonelectrical machinery	70.6	70.1	69.8	66.8	65.5	51.8	46.8	43.0	43.2	38.4	35.6
Electrical machinery	50.2	45.7	43.4	46.6	48.3	46.2	45.1	40.5	39.0	33.9	32.1
Petroleum product and refining	39.9	44.7	43.4	41.1	41.6	52.3	29.6	20.5	48.6	46.7	41.1
Petrochemicals	34.4	55.1	—	—	—	—	—	56.7	77.9	30.2	32.7
Group V—Lowest:											
Chemicals (all components)	21.1	23.0	28.0	28.1	29.8	24.4	23.3	21.5	20.7	16.0	16.0
Pharmaceuticals	10.3	9.3	11.1	11.0	12.6	11.5	11.1	11.8	11.7	11.0	11.4
Sector as whole	61.9	62.8	63.4	62.6	32.0	58.6	34.6	49.5	49.7	43.1	40.7

Source: Puerto Rico Planning Board, *Income and Product Accounts*, (unpublished worksheet data).

Table 2.—Profit as a Percentage of Equity by Industry

Industry group	1967	1968	1969		1970	1972	1973		1974	1975		Average
	Puerto Rico	Puerto Rico	Puerto Rico	United States	Puerto Rico	Puerto Rico	Puerto Rico	United States	Puerto Rico	Puerto Rico	United States	Puerto Rico
Printing and publishing	32.4	36.7	34.5	11.3	35.3	45.2	31.6	12.7	29.6	21.4	11.8	29.8
Instruments	17.6	38.1	46.6	14.5	28.6	22.7	23.7	15.2	24.9	23.1	13.7	27.9
Chemicals	24.6	19.1	20.9	11.6	20.2	46.6	34.1	14.2	20.5	17.6	15.2	25.4
Nonelectrical machinery	21.4	17.3	35.0	9.9	35.0	24.6	18.2	12.8	22.0	17.3	13.5	23.8
Electrical machinery	20.1	24.3	26.6	9.2	29.4	16.8	26.7	12.6	22.8	20.6	9.0	23.4
Tobacco products	11.2	6.4	46.3	15.6	13.3	28.1	26.3	14.4	31.9	16.0	15.6	22.4
Apparel	21.3	19.2	20.0	9.6	19.2	28.0	23.7	11.0	21.6	21.0	—	21.7
Fabricated metals	19.3	20.5	17.6	8.6	18.0	24.7	21.9	13.6	22.4	15.4	13.1	20.0
Transportation equipment	13.1	27.2	19.6	6.4	19.6	—	44.3	12.9	30.0	58.8	—	19.1
Wood and lumber	—	—	8.9	6.0	18.6	—	—	20.3	27.8	20.5	—	18.9
Textiles	13.7	17.6	33.2	5.1	33.2	9.0	19.3	8.9	16.4	6.4	4.4	18.6
Rubber and plastics	8.9	9.6	9.5	7.1	11.5	16.4	14.5	11.7	19.0	15.2	8.0	18.3
Furniture	12.1	—	6.7	7.8	5.8	21.1	15.4	13.0	42.9	22.1	—	18.0
Paper and products	19.1	22.8	4.5	7.0	4.2	28.8	23.0	12.5	24.8	11.5	12.6	17.3
Leather products	20.4	17.0	13.2	9.5	11.5	13.9	16.0	9.3	18.9	22.0	—	16.6
Food products	23.0	26.8	15.6	10.9	15.7	13.0	13.5	12.3	7.4	17.2	14.4	16.5
Petroleum refining and products	30.9	10.4	15.5	11.1	11.8	13.8	25.3	11.2	13.5	6.9	12.5	16.0
Primary metals	23.1	14.5	3.0	7.1	3.5	10.9	46.3	9.8	19.9	2.4	8.5	14.1
Stone-clay-glass	6.5	3.0	11.9	6.9	12.7	17.1	23.5	10.8	25.7	2.4	6.8	12.8

Source: Unpublished data provided by Fomento. U.S. rates calculated from the U.S. Federal Trade Commission, *Quarterly Financial Report for Manufacturing, Mining and Trade Corporation*, various years. U.S. rates are for profits after taxes. Puerto Rican rates are for corporations receiving tax exemptions.

Table 2 compares profit rates in the various industry groups in 8 years and with U.S. mainland rates (after taxes) for 3 of those years.

In considering the Puerto Rican rates, it should be borne in mind that the exemption from U.S. corporate income taxes tends to distort the rates in two ways. First, there may be some tendency for firms with operations in both Puerto Rico and the mainland to manage their accounts in such a way as to maximize profits attributable to their Puerto Rican operation. If so, such a practice would tend to introduce an upward bias into Puerto Rican rates. On the other hand, the provisions of section 931 of the Revenue Code, which provided for application of Federal income taxes on the Puerto Rican profits upon repatriation, tended to lead firms to accumulate large cash or other holdings in Puerto Rico, thus tending to increase the equity base on which profit rates are computed. That this is in fact the case seems to be suggested by balance sheet data in the report on the samples used which seem to show unusually large holdings of cash and "other investments" on the asset side which is then reflected in what seems to be an unusually large "accumulated surplus" item as part of stockholders' equity on the liability side. It is probable that this tendency more than offsets the first and that profits rates from operations in Puerto Rico are higher than reflected in accounting figures.

As was the case with other indicators, industries tend to cluster into groups. It appears that there are at least three possible groupings by rate of profit; a high, middle, and low rate group. Finer classification could be made but would serve little purpose here. These data suggest that profit rates tend to be higher in the more capital-intensive industries as

compared with the more labor-intensive industries. Exceptions to this are apparel, and possibly tobacco products, both of which appear in the high profit group. Tobacco, however, might perhaps better appear in the second group, since 2 of the 8 years show relatively large profits without which its range would be much lower.

Rates of profit for industries falling into the first group substantially exceed the aftertax profits of the same industries on the mainland for the 3 years for which comparisons were made.

In 1969, Puerto Rican industry rates ranged from double to triple the corresponding mainland rates. In 1973, they ranged from 140 percent to 250 percent of the mainland rates, and from 103 percent to 289 percent of those rates in 1970. Some tendency toward a narrowing of the spread seems to be present for the period 1969-75.

Industries falling into the second group in most cases have exhibited a consistently and significantly lower rate of profit than those falling into the first group. Like the first group, they tend to have a higher rate of profit than do similar industries on the mainland. The range from highest to lowest is even greater than for industries in the first group. Three, printing and publishing, apparel, and fabricated metals, out of the twelve such industries fall into the high profit class. Two, primary metals and stone-clay-glass, have lower profit rates than any other industries. Five are at the high middle, three at the middle, and two at the low middle levels. Comparison of Puerto Rican profit rates with after-tax rates for the same industries shows that the Puerto Rican rates are in all cases above, or well above, the mainland rates.

Differences between Puerto Rican and mainland

profit rates in 1973 and 1975 are summarized in table 3.

Table 3.—Ranking of Industry Groups by Differential Between Puerto Rican and Mainland Profit Rates, Percentage of Excess of Puerto Rican Rate

1973	Excess	1975	Excess
Primary metals	358	Transportation equipment	270
Transportation equipment	241	Electric machinery	129
Petroleum refining and products	218	Rubber and plastics	50.0
Stone-clay-glass	210	Printing and publishing	81.4
Printing and publishing	145	Instruments	68.6
Chemicals	130	Textiles	45.5
Apparel	119	Machinery	27.4
Textiles	174	Food products	19.4
Electric machinery	104	Fabricated metals	17.6
Paper and paper products	78.2	Chemicals	15.8
Tobacco	77.7	Tobacco	2.6
Leather products	70.2	Paper and paper products	-6.7
Fabricated metals	57.6	Petroleum	-44.8
Instruments	49.1	Stone-clay-glass	-64.7
Machinery	35.8	Primary metals	-71.8
Furniture	15.2	Apparel	NA
Food products	5.5	Leather	NA
Rubber and plastics	-64.0	Furniture	NA

NA—not available.

Source: Calculated from documents of Fomento and FTC Quarterly Financial Report: Manufacturing, Mining, Trade Corporations. Various years.

Illustrative Effects of Introducing Corporate Taxation

Effect on Profits.—The above analysis of rates of profit has been made on the basis of continuation of past freedom from Commonwealth and Federal corporation income taxes. This situation has changed under the alteration introduced by the present Government in the IIA. Specifically, the amended IIA reduces the exemption to 90 percent through the first 5 years and gradually to 50 percent in a 20-25-

year period. This change goes in the right direction to reduce the postexemption tax shock. However, the remaining issue in this section deals with the application of a higher tax rate possibly applying to industries where there exists a greater capacity to pay taxes. In this section, an analysis is made of what would be the effects of imposition of a corporate income tax with illustrative effective rates of 20 percent or 40 percent. In making the analysis, Puerto Rican profit rates are reduced by 20 percent and 40 percent, respectively, and compared with mainland aftertax rates in 2 years, 1973 and 1975.¹

Table 4 shows the changes in the relation between Puerto Rican and mainland aftertax profit rates which would result from imposition of corporate income taxes with either of the illustrative rates.

Based on table 4, industries may be placed in groups in accordance with effects of taxes on comparative Puerto Rican and mainland rates of profit as follows:

Imposition of 20 Percent Effective Tax Rate¹

Group 1.—Puerto Rican aftertax profit rates higher than mainland rates in all instances:

Printing and publishing
Apparel
Leather products
Electrical machinery
Instruments
Chemicals
Textiles

¹ This method understates profit rates for firms making a profit since profits and losses of all firms in the industry are added to arrive at total profits. We do not know whether losses were proportionately higher or lower in Puerto Rico than on the mainland. 1973 and 1975 were chosen since they are the most recent years for which both Puerto Rican and mainland data are available.

Table 4.—Sensitivity of Profit Rates in Puerto Rico to Removal of Tax Exemption—Federal and/or Puerto Rican

[In percentages]

Industry group	Mainland rate		Puerto Rican rate with 20% tax		Puerto Rican rate with 40% tax		Puerto Rican average rate with 20% tax	Puerto Rican average rate with 40% tax
	1973	1975	1973	1975	1973	1975		
Printing and publishing	12.2	11.8	25.3	17.1	19.0	12.8	23.6	17.9
Instruments	15.2	13.7	19.0	18.5	14.2	13.9	22.3	16.7
Chemicals	14.2	15.2	27.3	14.1	20.5	10.6	20.3	15.2
Machinery	12.8	13.5	14.6	13.8	10.9	10.4	19.0	14.3
Electric machinery	12.6	9.0	21.4	16.5	16.0	12.4	18.7	14.0
Tobacco	14.4	15.6	21.0	12.6	15.8	9.6	17.9	13.4
Apparel	11.0	—	19.0	16.8	14.2	12.6	17.4	13.0
Fabricated metals	13.6	13.1	17.5	12.3	12.5	9.2	16.0	12.0
Transportation equipment	12.9	NA	35.4	47.0	26.5	35.3	15.3	11.5
Lumber	20.3	NA	—	16.4	—	12.3	15.1	11.3
Textiles	8.9	4.4	15.4	5.1	11.6	3.8	14.9	11.2
Rubber and plastics	11.7	8.0	11.6	10.6	8.7	7.9	14.6	11.0
Furniture	13.0	NA	12.3	17.7	9.2	13.3	14.4	10.8
Paper and products	12.5	12.6	18.4	9.2	13.8	6.9	13.8	10.4
Leather products	9.3	NA	12.8	17.6	9.6	13.2	13.3	10.0
Food products	12.3	14.4	10.8	13.8	8.1	10.3	13.2	9.9
Petroleum	11.2	12.5	20.2	5.5	15.2	4.1	12.8	9.6
Primary metals	9.8	8.5	37.0	1.9	27.8	1.4	11.3	8.5
Stone-clay-glass	10.8	6.8	18.8	1.9	14.1	1.4	10.2	7.7

Source: Calculated from data provided by Fomento and various FTC Quarterly Financial Reports for Manufacturing, Mining, and Trade Corporations.

Rubber and plastics
Paper and paper products
Transportation equipment

Group 2.—Average Puerto Rican aftertax profit rates higher than mainland rates but annual rates lower in some years:

Machinery (P.R. annual rate lower in 1975)
Tobacco (P.R. annual rate lower in 1975)
Fabricated metals (P.R. annual rate lower in 1975)
Petroleum refining products (P.R. annual rate lower in 1975)
Furniture (P.R. annual rate lower in 1973)

Group 3.—Puerto Rican aftertax profit rate lower than mainland rate in all cases:

Food products (needs disaggregation; rate for some products certain to be higher)

Imposition of 40 Percent Effective Tax Rate¹

Group 1.—Puerto Rican aftertax profit rate higher than mainland rates in all instances:

Printing and publishing
Apparel
Leather products
Electrical machinery (P.R. rate higher by small margin)

Group 2.—Puerto Rican aftertax profit rates higher than mainland rates in some instances and lower in others:

Machinery (P.R. average rate slightly higher than mainland rates but P.R. rate in 1973 and 1975 lower than mainland rates for those years)
Textiles (P.R. average rate higher than mainland rates but 1975 rate lower than mainland rate)
Printing and publishing (P.R. average rate higher than mainland rates, but 1975 rate lower than mainland rate)
Instruments (P.R. average rate slightly higher than mainland rates but 1975 rate slightly lower than the mainland rate)
Chemicals (P.R. average rate slightly higher than 1973

mainland rate and same as 1975 mainland rate. P.R. 1973 rate would be substantially higher than mainland rate and 1975 P.R. rate would be substantially lower)
Tobacco (P.R. average rate lower than mainland rate but 1973 rate higher than mainland rate)

Paper and paper products (P.R. average rate lower than mainland rate but 1973 rate higher than mainland rate)

Group 3.—Puerto Rican aftertax profit rates lower than mainland rates in all instances;

Fabricated metals
Furniture
Food products (probably only for some components)

Rates of profit in the stone-clay-glass and primary metals industries varied widely with aftertax comparisons with mainland rates as follows:

Primary Metals

1973 P.R. profit rates at both 20 percent and 40 percent tax rates *much higher* than mainland profit rates.

1975 P.R. profit rates at both 20 percent and 40 percent tax rates *much lower* than the mainland profit rate.

Average P.R. profit rates at 20 percent tax rate *somewhat higher* than mainland profit rates and at 40 percent tax rate *equal to or lower* than mainland rates.

Stone-Clay-Glass

1973 P.R. profit rate at both 20 percent and 40 percent tax rates *higher* than mainland rates.

1975 P.R. profit rate at both 20 percent and 40 percent tax rates *lower* than 1973 mainland rate but *higher* than 1975 mainland rate.

Average P.R. profit rate at both 20 percent and

¹ Using groupings analyzed in section IIA pages 4.5 to 4.8.

Table 5.—Illustration of Effect of Income Taxes on Puerto Rican Income Generation (Based on Labor Income and Profits in 1977)

Contribution without tax		Contribution with tax 10% effective rate			Contribution with tax 20% effective rate		
Industry group	Amount (millions of dollars)	Industry group	Amount (millions of dollars)	Percentage increase	Industry groups	Amount (millions of dollars)	Percentage increase
Apparel	190.2	Apparel	197.6	3.9	Pharmaceuticals	263.3	164.9
Food products	128.6	Pharmaceuticals	181.3	82.4	Apparel	205.0	7.8
Pharmaceuticals	99.4	Food products	133.2	5.7	Food products	137.8	11.7
Instruments	72.8	Electric machinery	101.3	39.0	Electric machinery	129.7	78.1
Electric machinery	72.8	Instruments	82.0	12.6	Instruments	91.2	25.2
Beverages	57.9	Beverages	64.1	9.0	Beverages	70.4	18.0
Stone-clay-glass	50.0	Petrochemicals	56.3	19.5	Petrochemicals	65.6	39.0
Petrochemicals	47.1	Machinery	53.9	19.5	Machinery	62.7	39.0
Machinery	45.1	Stone-clay-glass	51.4	2.8	Stone-clay-glass	52.8	5.6
Fabricated metals	37.0	Fabricated metals	40.9	10.5	Fabricated metals	44.9	21.0
Petroleum refining	32.3	Petroleum refining	32.3	—	Tobacco	33.8	19.8
Printing and publishing	31.8	Printing and publishing	32.3	1.6	Printing and publishing	32.7	3.2
Tobacco	28.2	Tobacco	31.0	9.9	Petroleum refining	32.3	—
Rubber and plastics	27.0	Rubber and plastics	28.7	6.3	Rubber and plastics	30.1	12.6
Textiles	26.9	Textiles	28.5	5.9	Textiles	30.1	11.8
Leather products	24.5	Leather products	25.4	3.7	Leather products	26.3	6.4
Wood and furniture	20.9	Wood and furniture	21.3	1.9	Wood and furniture	21.6	3.8
Other chemicals	20.0	Other chemicals	20.0	—	Other chemicals	20.0	—
Other petroleum products	12.4	Other petroleum products	14.7	18.5	Other petroleum products	17.0	37.0
Primary metals	11.9	Paper and paper products	12.3	3.4	Paper and paper products	13.0	6.8
Paper and paper products	11.6	Primary metals	11.9	2.6	Primary metals	11.9	5.2
Transportation equipment	4.3	Transportation equipment	4.4	2.3	Transportation equipment	4.5	4.6

Source: Calculated from data in worksheets for income and product accounts provided by Puerto Rico Planning Board. Amounts with tax equal the amount without tax plus the amount obtained by multiplying total industry profits by the tax rate. The amount added is thus only an approximation of the amount of tax which would have been paid.

40 percent tax rate *lower* than 1973 mainland rate but *higher* than 1975 mainland rate.

The above simple analysis suggests that imposition of a 20 percent corporate income tax would leave Puerto Rican profit rates for almost all industries higher than profit rates for the same industries on the mainland. (This assumes that the relatively low 1975 Puerto Rican profit rates for chemicals, machinery, tobacco, fabricated metals, and paper products are not typical.) Profits in some food products and possibly the furniture industry might, however, be lower than mainland rates. Rates in stone-clay-glass and primary metals have been too erratic to suggest conclusions.

Only three industry groups would continue to have aftertax profit rates from Puerto Rican operations which were significantly higher than mainland profit rates. (Profit rates for electrical machinery would be only slightly higher than mainland rates.) If 1975 were to be considered an abnormal year, textiles might be added to that list.

Effect on Income Generation.—The application of an income tax to manufacturing corporations could probably have a significant effect on Puerto Rican income generated from investment by nonresidents. Table 5 (on p. 45) shows the effects that payment of corporate income taxes at effective rates of 10 percent and 20 percent on total profits earned in 1977 would have had on the various industry contributions to income if all industries had been owned by nonresidents.

It appears that the imposition of corporate income taxes would not do much to change the order of importance of industries in terms of contribution to Puerto Rican income. There are considerable differences among industries in the amounts and percentages of increase as shown below.

20-Percent Effective Income Tax Rate

Industries with largest amount of increase (millions of dollars)	
Pharmaceuticals	163.9
Electrical machinery	56.9
Petrochemicals	18.5
Instruments	18.4
Machinery except electrical	17.6
Apparel	14.8
Beverages	12.5
Industries with largest percent increase (percentages)	
Pharmaceuticals	164.9
Electrical machinery	78.1
Petrochemicals	39.0
Machinery except electrical	39.0
Other petroleum products	37.0
Instruments	25.2
Fabricated materials	21.0

These data also make it clear that increases in Puerto Rican tax revenue that might accrue from the application of corporate income taxes vary widely from industry to industry. They also indicate that the largest contributions would be made by capital-intensive industries (provided there was sufficient incentive for them to remain in or come to Puerto Rico).

Finally, it is pointed out that since the calculation involves the implicit assumption that *all* profits in 1977 accrued to nonresidents, the amount of the increase in income which would result from taxation is overstated in the case of some industries. However, it is precisely those industries from that taxation would produce the largest increases in income which are known to be practically completely owned by nonresidents. (See table 12, chapter III.)

Influence of Wage Rates.—Hourly wages are discussed briefly at the end of this section. However, a review of the average annual salary per worker highlights the fact that there are wide disparities in wages among industry groups. (See table 6.)

Table 6.—Average Annual Salary Per Worker 1977

Industry group	Average annual salary per worker
Petroleum	\$14,318
Transportation	12,534
Primary metals	11,872
Printing	10,472
Chemicals	10,229
Stone-clay-glass	9,958
Fabricated metals	8,101
Food	7,837
Electrical machinery	7,317
Machinery except electrical	7,124
Rubber and plastics	7,098
Miscellaneous manufacturing	7,087
Textiles	6,460
Tobacco	6,418
Paper	6,210
Furniture and wood	5,901
Instruments	5,864
Leather	5,072
Apparel	4,885
All industries	7,101

Source: Derived from Puerto Rico Department of Labor, *Census of Manufacturing Industries, 1977*; Puerto Rico, Planning Board, *Income and Product Accounts* (unpublished worksheet data).

Total labor income is, however, a function of both the volume of employment and wage rates. Table 7 contains rankings of industry groups by the employment, wage rates, and income. It provides a basis for some judgment as to whether wage rates or employment levels are more important in determining an industry's contribution to Puerto Rican income.

Examination of this table suggests that the volume of employment rather than the wage rate is the dominant factor in determining the size of an industry's contribution to Puerto Rican income.

Table 7.—Ranking of Industry Groups by Employment, Wage Rates, and Labor Income, 1976

Industry group	Employment rank	Wage rate rank	Labor income rank
Apparel	1	17	2
Food products	2	9	1
Electrical machinery	3	7	4
Chemicals	4	2	3
Instruments	5	13	5
Stone-clay-glass	6	8	6
Leather products	7	18	14
Fabricated metals	8	10	9
Tobacco	9	15	11
Machinery	10	6	7
Textiles	11	14	13
Rubber and plastics	12	11	12
Petroleum	13	1	8
Printing and publishing	14	3	10
Wood and furniture	15	16	15
Paper	16	12	17
Primary metals	17	4	16
Transportation equipment	18	3	18

Source: Tables 6 and 9 of chapter III and table 6 of chapter IV.

While aggregate employment is the chief determinant in total labor income, the shift toward low labor-absorbing but high wage industries may be creating an elite component of the labor force whose interests could promote higher wages at the expense of driving up wage costs to industries with high rates of labor employment, but whose cost competitiveness is determined by low wage-cost third-country producers. Thus the labor absorption rate of the manufacturing sector could be sharply curtailed, even though labor income would continue to rise. The top five contributors to total worker income have increased their share of labor by about 10 percent between 1967-77. Total compensation growth, as shown in table 8, appears to have accelerated at rates faster than employment growth as shown in table 7 of chapter III. The significance in the ap-

parent structural shift in the industrial sector would probably involve greater pressure on the other sectors to increase their labor-absorption rate as a means of reducing aggregate unemployment. The assumption is that Puerto Rico will be able to continue to attract these generally high wage industries in a volume adequate to maintain, at the minimum, total industrial employment relative to total employment in the economy.

The structural shift in worker income distribution by industry is further highlighted in table 9 where the industry groups are ranked by *growth* in their proportional shares of employment and compensation (1967 to 1976). For example, nine industry groups show a positive increase in their proportion of employment, two remain stable, and nine decreased their relative shares of total employment.

It is difficult to clarify cause and effect or to forecast long-term planning difficulties which may arise from structural shifts in industrial worker income. The rapid increase in compensation accruing to a few industries could push Puerto Rico toward future economy where sustaining growth in labor income (a high percentage of total personal income) was dependent on a few, primarily capital intensive, industries. While the analysis is so general at this point that little else can be concluded from this data, already the five high growth industry groups, i.e., chemicals, machinery except electrical, instruments, electrical machinery, and petroleum, capture almost 40 percent of total industrial compensation. Continuation of this trend could make Puerto Rican income and employment more dependent on a few capital-intensive industries whose location in Puerto Rico is in part dependent upon Federal and Puerto Rican tax exemptions.

Table 8.—Total Compensation Growth by Industry Group 1967-77

[In thousands of dollars]

Industry group	Salary base 1967	Net change 1967-70	Net change 1967-73	Net change 1967-77	Percentage change 1967-77
Chemicals	15,576	15,222	64,639	150,951	961.1
Machinery except electrical	6,792	1,933	10,606	38,320	564.2
Instruments	11,205	10,122	27,811	61,593	549.7
Electrical machinery	27,895	17,487	54,636	101,520	363.9
Petroleum	15,010	9,421	18,317	29,735	148.1
Rubber and miscellaneous plastics	9,662	5,044	11,869	17,362	179.7
Fabricated metals	13,521	8,333	19,978	23,497	173.8
Printing	11,739	6,797	13,619	20,099	171.2
Transportation	1,652	146	1,863	2,644	160.0
Miscellaneous manufacturing	10,057	6,456	5,692	15,950	158.6
Food	88,178	22,293	66,070	125,056	141.8
Apparel	87,065	46,363	67,094	103,058	118.4
Paper products	5,381	2,298	2,981	6,209	115.4
Primary metals	6,065	2,554	4,906	5,801	95.6
Stone-clay-glass	28,596	10,621	29,018	21,368	74.7
Tobacco	18,664	2,438	4,894	9,522	51.0
Furniture and wood	14,537	6,476	11,644	6,310	43.4
Textiles	18,931	11,023	14,710	8,016	42.3
Leather products	22,707	6,266	2,116	1,784	7.9
Total industries	413,233	186,180	428,611	748,945	181.2

Source: Puerto Rico Planning Board, *Income and Products Accounts* (unpublished worksheet data).

Table 9.—Employment and Compensation Growth in Proportional Share of Total

Employment		Compensation
1. Machinery except electrical	+	1. Chemicals
2. Chemicals		2. Machinery except electrical
3. Instruments		3. Instruments
4. Wood products ¹		4. Electrical machinery
5. Electrical machinery		5. Petroleum
6. Petroleum products		6. Transportation
7. Fabricated metals		7. Rubber and miscellaneous plastics
8. Printing		8. Fabricated metals
9. Food		9. Printing
10. Paper	—	10. Miscellaneous manufacturing
11. Primary metal		11. Food
12. Rubber and miscellaneous plastics		12. Apparel
13. Apparel		13. Paper products
14. Stone-clay-glass		14. Primary metals
15. Miscellaneous manufacturing		15. Stone-clay-glass
16. Textiles		16. Tobacco
17. Tobacco		17. Furniture and wood ¹
18. Furniture ¹		18. Textiles
19. Leather		19. Leather
20. Transportation		

¹ Wood and furniture comparison in compensations estimates.

The comparability of Puerto Rican and mainland industry group wage rates is examined in chapter V. That examination reveals that wage rates have been increasing faster than mainland rates but that because of the larger base for mainland rates, the spread between rates has increased somewhat.

Table 10 presents a ranked listing of average

hourly wage rates for each industry group in Puerto Rico. One industry, petroleum, received an average hourly wage greater than the U.S. average wage, (\$5.19) for manufacturing industries, 1976. (Specific industry group comparability with U.S. wages is reviewed in the section on competitive industries.) After petroleum, the chemical, printing, and the non-electrical machinery industries pay the highest average industrial wages in Puerto Rico.

Historical increases in average wage rates by industry, in current dollars, indicate appreciable gains (1966 to 1976). Fourteen of the industrial groups more than doubled their average wage rates. However, in constant dollars (1954=100), two industry groups, transportation and leather, had zero growth. Petroleum again exhibited the highest growth rate but only a 33-percent increase for 1970-76.

Minimum wage requirements have been a factor in the increase in Puerto Rican wages (see chapter X). They may be even more important under recently (1977) enacted Federal legislation.

In 1976, six industries paid less than the mandatory minimum wage of \$2.65 which went into effect in January of 1978; lumber at 95.8 percent of the minimum wage, furniture (92.4 percent), tobacco (90.9 percent), textiles (89.1 percent), apparel (88.3 percent), and leather (82.2 percent). Specific proportions of each industry group employment which paid less than \$2.65 are not available. How-

Table 10.—Hourly Wage Industry Groups 1966-77

[In thousands of current dollars]

SIC industry group	1966	1970	1973	1976	1976 percentage of minimum wages 1/1/78 \$2.65	1976 percentage of total employ- ment	1976 percentage of minimum wages 1981 \$3.35	1973 distribu- tion of locally owned industries (EDA tax sample)	Labor income to total costs 1977
Petroleum	2.76	3.20	4.32	6.01	226.8	2.0	179.4	0	1.8
Chemicals	1.64	2.26	2.87	3.90	147.2	8.6	116.4	16	11.8
Printing	1.74	2.18	3.05	3.74	141.1	2.0	117.6	5	33.8
Machinery except electrical	1.68	2.24	2.85	3.48	131.3	3.0	103.9	5	16.5
Fabrication metals	1.59	2.04	2.56	3.21	121.1	3.3	95.8	33	19.1
Primary metals	1.61	2.04	2.50	3.17	119.6	.7	94.6	5	20.9
Stone-clay-glass	1.69	2.12	2.63	3.15	118.9	3.7	94.0	30	21.8
Transportation equipment	1.55	2.22	2.63	3.13	118.1	.2	93.4	2	30.3
Paper	1.62	2.05	2.49	3.07	115.8	1.0	91.6	2	18.9
Instruments	1.45	1.92	2.32	3.05	115.1	7.3	91.0	12	28.4
Electrical machinery	1.47	1.95	2.24	3.05	115.1	9.2	91.0	12	19.0
Food	1.40	1.82	2.23	2.86	107.9	16.7	85.4	34	14.0
Miscellaneous industries	1.17	1.66	2.07	2.78	104.9	2.1	83.0	8	28.4
Rubber and plastics	1.23	1.73	2.09	2.75	103.8	2.4	82.1	17	26.2
Lumber	1.17	1.62	1.91	2.54	95.8	.9	75.8	7	
Furniture	1.24	1.73	2.00	2.45	92.4	1.6	73.1	31	27.4
Tobacco	1.05	1.49	1.81	2.41	90.9	3.1	71.9	1	17.0
Textiles	1.23	1.61	1.94	2.36	89.1	3.0	70.4	7	16.9
Apparel	1.18	1.60	1.83	2.34	88.3	25.6	69.9	64	35.8
Leather	1.08	1.55	1.69	2.18	82.2	3.4	60.1	5	29.0
All industries	1.31	1.78	2.17	2.86	107.9	100.0	—	288	—

Source: Puerto Rico Department of Labor, *Census of Manufacturing Industries* (various years)

ever, the information presented indicates that 38 percent of the total industrial employment was in industries with average rates below the January 1978 minimum.

The impact will be considerably greater by 1981 when the minimum wage level rises to \$3.35 an hour. As may be seen from table 10, only these industry groups: petroleum, chemicals, printing and publishing, and machinery had average wage rates higher than \$3.35. While some increase in wages from 1970 to 1981 would be expected, it is clear that a large proportion of industries and the manufacturing labor force will be affected.

Firms most likely to receive the greatest negative impact from minimum wage increase are those where labor costs are a high proportion of total costs. Table 10 also presents 1977 labor costs as a proportion of total costs.² Four industries with average wage rates below minimum wage (1976)—apparel, rubber and plastics, wood and furniture, and leather—have a high proportion of total costs associated with labor income. Printing and publishing is the only industry with a high proportion of labor cost which, in 1976, had an average wage rate higher than the 1981 minimum.

A current (1973 or 1977) breakdown of local and foreign industry groups was not available for this analysis. However, a general feeling for low wage impact on local firms can be achieved by using 1975 Economic Development Administration (EDA) tax-sample data to compare local/nonlocal industrial structure with high wage differentials. Forty percent of the locally owned firms across industry groups have an hourly wage (1973) less than the minimum set for January 1978. Only 20 percent of locally owned industries exist in the five highest paying industries. The relatively high percentage of local firms associated with lower average wage industries suggests that locally owned firms will receive a greater impact from minimum wage legislation.

A brief analysis of the number of workers per industry indicates that no size bias is associated with high wage rates or with industries below minimum wage. The range of average workers per unit in the highest and lowest industries is from 147 to 16, and 130 to 8, respectively. At this level of analysis, it does not statistically appear that minimum wage increases will discriminate against smaller firms. However, there are indications that these "averaging" calculations may distort the picture. An increase in minimum wage rates for the small firms tends to force wages up across the board as workers negotiate for the same relative salary differentials that existed before minimum wage increases.

²Total costs were estimated using total sales minus net earnings (profits) calculated from 1977 worksheet estimations. Puerto Rico Planning Board, *Income and Product Accounts* (unpublished worksheet data).

INTEGRATED ANALYSIS AND CONCLUSIONS

The preceding analysis demonstrates that (a) there are wide variations in the benefits provided Puerto Rico by various industries; (b) provision of such benefits is conditioned and constrained by a number of factors; and (c) there are variations in the degree of risk or vulnerability to Puerto Rico involved in different directions or emphases in the development of the internal composition or structure of the manufacturing sector. Variations arise from such factors as source of investment (i.e., by residents or nonresidents), the characteristics of individual industries, profit levels, comparative rates of profits as between the island and the mainland, market and demand conditions, and the nature of investment incentives utilized.

The following conclusions also emerge from that analysis:

The industries now making the largest contributions to Puerto Rican income resulting from employment, high wages, or the number of plants located on the island are:

- Apparel
- Electrical machinery
- Pharmaceuticals
- Professional and scientific instruments
- Food products

In order to be productive of a high absolute level of income to Puerto Rico, very highly capital-intensive industries should:

1. Have substantial linkage to other island industries,
2. pay high wages,
3. have a large number of plants, or
4. provide substantial tax revenues.

Industries making the largest contribution to Puerto Rican income are, of course, very important to Puerto Rico's development. However, policy toward them and the extent of their contribution may vary by industry group, source of investment, and other factors.

A summary which ranks industry group contribution to income and shows the way in which other factors may condition the relative importance of the various industries is contained in table 11.

IMPLICATIONS FOR GOVERNMENTAL POLICY

The analysis provided in the previous pages is based on fragmentary and noncomparable data. It is

Table 11.—Ranking of Industry Groups by 1977 Contributions to Labor Income and Summary of Factors Conditioning Their Relative Importance to Puerto Rican Development

Industry groups ranked by contribution to Puerto Rican income in 1977	Labor capital intensity	Puerto Rican profit rates	Puerto Rico profit rate compared with mainland rate (after tax)	Market potential	Sensitivity to increased wages
Apparel	High labor	High	Well above	Good	High
Electrical machinery	High capital	High	Well above	High	Some
Food products	Medium to high labor	Low medium	Above	Varied	Med. varies by prod.
Pharmaceuticals	Very high capital	High	Above-well above	High	Very low
Instruments	Low capital	Very high	Well above	Varied	Medium
Stone-clay-glass	High labor	Low	Above	Limited by local market	Medium
Petrochemicals	High capital	Low	Low	High	Very low
Petroleum refining	High capital	High	Above-well above	Good, limited by local market	Low
Machinery	Labor	Low-high	Well above	Good, limited by local market	Low
Fabricated metals	High labor	High-high	Well above	Good, limited by local market	Low
Printing and publishing	Labor	High	Above-well above	Limited	High
Tobacco products	Labor	High	Above	Good	Medium
Rubber and plastics	Labor	Medium	Well above	Limited	High
Textile mill products	Labor	Medium	Well above	Good	Medium
Sugar	Labor	Low	Above	Low	High
Leather products	High labor	Low-medium	Above	Good	Very high
Soft drinks	Capital	Low-medium		Good, limited by local market	High
Wood and furniture	High labor	High-medium		Limited by local market	High
Other chemicals	Labor			Good	Low
Alcoholic beverages	Low capital			Good, limited by local market	Medium
Beer	Labor			Limited by local market	
Primary metals	Labor	Low	Low	Good, limited by local market	
Paper and paper products	Labor	Medium		Varies by project	
Transportation equipment	Labor	High-medium	Well above	Good, limited by local market	Medium

Potential for tax revenues	Sensitivity to trade policy	Dependence on incentives	Vulnerable to tax changes	
			20-percent rate ¹	40-percent rate ¹
Apparel	Some	Special incentive tax exemption	No	Possibly yes
Electrical machinery	High	Tax exemption	No	Probably yes
Food products	Some	Special incentive tax exemption	Yes for some products	Yes for some products
Pharmaceuticals	Very high	Tax exemption	No	Probably yes
Instruments	Medium	Tax exemption	No	Probably yes
Stone-clay-glass	Little	Special incentive tax exemption	Possibly yes	Probably yes
Petrochemicals	Little	Tax exemption, special pricing	Probably yes	Probably yes
Petroleum refining	Little	Tax exemption, special pricing	Probably yes	Yes
Machinery	Medium high	Tax exemption	Probably no	Probably yes
Fabricated metals	Medium	Tax exemption	Possibly no	Yes
Printing and publishing	Little	Tax exemption	No	Probably no
Tobacco products	Medium	Special incentive	Probably no	Yes
Rubber and plastics	Some	Special incentive tax exemption	No	Possibly yes
Textile mill products	None	Special incentive tax exemption	Possibly yes	Possibly yes
Sugar	Little	Special incentive tax exemption	Yes	Possibly no
Leather products	Little	Tax exemption	No	Possibly no
Soft drinks	Little	Special incentive tax exemption	Possibly yes	Yes
Wood and furniture	Little	Special incentive tax exemption		
Other chemicals	Little	Tax exemption		
Alcoholic beverages	Little	Tax exemption		
Beer	Little	Tax exemption		
Primary metals	Little	Tax exemption		
Paper and paper products	Little	Special incentive tax exemption	Possibly yes	Probably no
Transportation equipment	Little	Tax exemption	Possibly yes	Probably yes
			No	No

¹ Puerto Rican corporate profit tax rates used for analysis.

Source: Derived from analysis.

also incomplete and leaves out many factors which must be taken into account in formulating governmental policy toward and programs affecting the manufacturing sector. The analysis is, in many cases, too aggregated and needs to be carried to 3- and, perhaps in some cases, 4-digit codes for some industries. *As a result, it cannot serve as a basis for final policy and program formulation.* It may, however, have significance for government policy in a number of ways. First, it points to specific questions concerning current and prospective policy which should be examined. Second, it indicates that there are certain options as to sector policy and taxation and incentive programs which should be further explored. Third, it is suggestive of the kind of analysis which should be made, using more adequate data and methodology, to provide a basis for policy and program formulation.

Questions for Examination

Questions of current and prospective policy toward the manufacturing sector which the analysis suggests may need consideration related to:

1. The desirability of dependence upon external investment for development of the sector and the practicality of development of a more indigenous sector based on more local capital accumulation and investment.

2. The implications of a policy emphasizing industries having substantial external investment requirements, low labor absorption, low interindustry linkages, etc., subject to adverse external actions by corporate and/or public policies unrelated to economic conditions on the island.

3. The possible effects of rising wage rates and the full application of Federal minimum wage standards to Puerto Rico on the competitive position of particular industries and the nature of industries operating in Puerto Rico.

The analysis indicates that, in principle, there is desirability, in terms of increasing direct benefits to Puerto Rico and of increasing stability and reducing risks from changes in external circumstances, for increasing Puerto Rican investment in manufacturing. The scope of this study, however, does not permit an examination of such things as the feasibility of increasing local capital accumulation, the need for supporting systems outside the sector (e.g., systems of distribution and marketing, nonmanufacturing tax systems, financing mechanisms and policies and practices, government investment priorities, etc.) which would be necessary to reach conclusions as to the practicability of adoption of government programs for increasing such investment.

The examination of wage rates suggests that increasing wage rates could present serious problems for most industries in Puerto Rico. It also indicates

that high wage rates may be making tax exemption an increasingly predominant fact in decisions as to location in Puerto Rico. Finally, it suggests that full application of Federal minimum wage standards to Puerto Rico may have significant adverse affects in industries which historically have made and are now making significant contributions to Puerto Rican income; and it is likely to reinforce a tendency toward substitution of nonresident capital for local labor.

Options for Consideration

The fact that analysis discloses that there are wide variations among industries in terms of their benefits to Puerto Rico and of the conditions which make possible or constrain their ability to produce such benefits suggests that, in addition to the option of continuation of the present policy of making little distinction among industries in incentive programs offered, it might be desirable to consider an alternative under which governmental emphases and programs are differentiated by classes of industries in accordance with their relative contributions to Puerto Rican development.

Adoption of such an option would require an incentives system which differentiates among industries. For example, direct subsidies or elongation of the tax exemption (subsidy) period might be useful in attracting certain types of industries to the island. The elongation of the exemption period is already used on the island to locate industries in various island geographic zones. Also, it might be found that industries with relatively low required risk premiums may be induced to the island with a lower exemption. On the other hand, industries with relatively high required risk premiums would have to have complete exemption plus direct subsidies to be attracted to the island. The purpose would be to maximize the income and revenue base available to Puerto Ricans, not to discourage industries from locating on the island.

Research, Analysis, and Data Needs

The analysis undertaken in this study has suffered from the lack of appropriate and verifiable data, making conclusive responses to issues nearly impossible.

Sectoral productivity measures were seriously deficient, because capital utilization rates, standard hourly work weeks, and even hourly wage rates were difficult to obtain and verify. Industrial investment data is nonexistent or weak, as is final sales and capital consumption data. Undocumented worker data was not available, particularly in industries where piecework or household production can be undertaken. Also, sectoral wage and salary data could be improved for the industrial sector as a whole.

Output per man-hour data is essentially weak, as are unit labor cost estimates. Implicit price deflators for the sector are weak, particularly where the import content of production is substantial.

Another area of concern is the measurement of income flows to nonresidents as a means of evaluating investment decisions. Research activities in the sector are hampered by the lack of appropriate and timely data.

The Commonwealth should undertake efforts to unify data collection activities to improve the analytical base for policy guidance. Adequate financial support for these activities appear to be an area of shortfall.

In the area of analysis, consideration should be given to a more elaborate comparison of relative rates of profits among industries and between Puerto Rico and mainland industries, which was attempted in a preliminary manner above. In addition, any variations from industry to industry in costs to Puerto Rico

not taken into account in investment data used should be brought into the analysis. Examples include such things as the necessity for provision of economic infrastructure, costs of environmental degradation which may vary greatly from industry to industry, and costs of any promotion programs. There would also be a need to take market prospects into account. Obviously, there would be little point in trying to stimulate an industry whose characteristics are such as to make it, in principle, highly desirable for Puerto Rico but whose competitive status with other producers is questionable. Account would also have to be taken of the ability of the industry to produce tax revenues. The possibility of Puerto Rican income taxes and the return of Federal excise taxes are cases in point. Table 11 illustrates the factors to which consideration would be given. Finally, account would have to be taken of any substantial differences among industries in their indirect income and employment generation effects.

Chapter V.—Competitiveness of Puerto Rican Industry

INTRODUCTION

In the previous chapters, an effort was made to clarify and evaluate industry group contribution to overall economic development in Puerto Rico. The "comparative analysis" of industries *on island* must be complemented by an evaluation of the competitive position of island industries with the U.S. mainland and international markets. The purpose of such an analysis is to clarify some of the major locational factors considered by industries interested in moving to Puerto Rico. The results will also assist in evaluating market competitiveness associated with commodities produced by Puerto Rico.

The following chapter focuses on the answers to a series of questions frequently asked with relation to industrial viability or competitiveness in Puerto Rico.

- Are Puerto Rican industries in general, or industry groups in particular, becoming less competitive because of increased labor costs on the island?
- Is the productivity of Puerto Rican labor increasing or decreasing? In general, are Puerto Rican workers competitive with U.S. mainland employees in terms of productivity?
- Are Puerto Rican industries more or less profitable than similar industries on the mainland? Is this profitability difference increasing or decreasing?
- Are power (energy) cost differentials increasing or decreasing between Puerto Rico and the mainland?

The competitiveness of Puerto Rican industries in the international business environment is a particularly important factor in the formulation of the island's development policy. Too often, however, Puerto Rico's competitiveness is viewed or characterized by a single variable such as labor costs.

Given the potential for drawing biased conclusions from a simplified factor set, several analytical

assumptions which underlie the analysis are outlined below.

First, the primary market area evaluated in this analysis is the U.S. mainland. This market orientation is emphasized because the preponderance of Puerto Rican trade is linked to the mainland. The U.S. market emphasis is important when evaluating the competitiveness and specific factor costs on Puerto Rico. For example, Puerto Rican wages may not be competitive with Latin American countries, but highly competitive with U.S. wages. Other things being equal, to suggest that an industry is not viable for Puerto Rico because wage scales are lower in other Latin American countries often misses the point that such industries are viable in the United States at much higher wage scales. (Notwithstanding, Puerto Rican products must be price and quality competitive with products in the world market.)

Second, it is assumed that, in general, industries locate in areas where total factor costs are minimized, assuming demand factors permit adequate aftertax profits. While such an assumption simplifies the analysis, often a mix of "satisfactory" rather than "optimal" requisites influence corporate location decisionmaking. U.S. corporations operating in foreign areas must consider many intangible factors which provide satisfactory, rather than optimal solutions to locational problems. Many of these intangibles are also associated with industrial location in Puerto Rico. However, in many instances, factors which inhibit industries from locating in Puerto Rico act to prohibit industries from locating in other Latin American countries. Such factors include security-safety, political stability, labor skill and entrepreneurial ability, language, educational-literacy levels, innovative capabilities, business environment, financial-institutional support, infrastructural requirements, regulations and controls, transportation-communication stability, educational-recreational-commercial environment for U.S. administrators and families, economies of agglomeration, weather-climate, insect-pest-disease control, general environmental quality, social-cultural differences,

and public acceptance. None of these factors, and this is not an exhaustive list, are evaluated in this chapter.

Third, product competitiveness in the world market cannot be realistically evaluated through an analysis of factor cost. Statistics on production cost factors, such as land, labor, capital, and power are presently difficult to compare.

Fourth, two additional factors which influence the competitive position of Puerto Rican industries are trade and tariff regulations/agreements, and tax policies. The major impacts of trade and tariff agreements are discussed in chapter IX "U.S. Foreign Trade Policy in Puerto Rican Industry." The influence and utilization of tax incentives to increase the industrial profitability (competitiveness) in Puerto Rico, are discussed in chapter VI "Industrial Incentives," and a brief comparison of tax incentives offered in regional countries and selected States are included in chapter XI, "Administrative Analysis."

The first section of this chapter briefly reviews the economic and political factors which in general influence the competitiveness of Puerto Rican industries. The second section focuses specifically on the competitive cost factors referenced earlier: Wage rates, productivity, profitability, and energy cost differentials.

GENERAL CONDITIONS WHICH INFLUENCE INDUSTRIES' COMPETITIVE POSITION IN PUERTO RICO

The competitive position of industries located in Puerto Rico is influenced by the island's insularity, cultural history, and unique political-economic association with the United States.

Insularity

Puerto Rico's insularity, the barrier of ocean distances between the U.S. mainland and Puerto Rico, and its geographic location relative to Central and Latin American countries act in both a positive and negative fashion to influence industrial growth. With respect to the U.S. mainland market, the distances, the cost of transportation, the difficulties in communication, and the lack of person-to-person contact constrain operations in Puerto Rico.

On the other hand, the regional location and the long association with the U.S. mainland provide Puerto Rico with the resource and skill base to act as a link or bridge economy in the development of the Caribbean region. As U.S. Federal interests in-

crease in the Caribbean, Puerto Rico serves to link the relatively highly developed economy of the United States to developing economies of the Caribbean region. Puerto Rico offers a pool of skilled workers and managers with a bilingual ability to convey ideas, innovations, technology, trade and marketing expertise from English- to Spanish-speaking regions.

Resource Base

One of the more difficult obstacles to overcome with respect to the industrialization of Puerto Rico is the lack of natural resources. At present, Puerto Rico has only a small mineral, and no carbon (energy), wood or fiber resource base. The lack of natural resources inhibits the growth of a localized industry which could take advantage of the increased value added associated with the processing of primary inputs.

Relative Factor Supply

A review of additional factors which facilitate the development of industry in Puerto Rico reveals constraints similar to the scarcity of natural resources. Puerto Rico is limited by the availability of local capital, the availability of land, particularly in the larger northern metropolitan areas, the lack of a local technical scientific structure from which to draw innovation and technology, and to some extent a mature, highly skilled labor force.

The Federal Relationship

Puerto Rico has shared an extended economic relationship with the U.S. mainland. The open economy and free migration of workers have historically provided a safety valve for the unemployment and overcrowded underdeveloped conditions existing in Puerto Rico. In many respects, Puerto Rico has also benefited from the economic and political association with the United States in that it has the opportunity to participate in federally sponsored assistance and welfare programs.

On the other hand, Puerto Rico cannot control its own monetary policy, its own tariffs or tariff agreements, its minimum wage rates, or other policy tools often utilized to protect infant industries. Puerto Rico is also constrained by U.S. regulations which control access to the island, transportation rates, environmental and safety requirements, energy use, and conservation incentives, etc.

Most of the general conditions listed above, which affect Puerto Rico's competitive position, cannot be qualified and compared with the business or industrial environment found on the U.S. mainland. There is, however, some degree of data comparability

among four major economic factors which can be used to determine selected aspects of the competitiveness of Puerto Rican industries. The following section ranks each of the industries against the set of competitive factors. The four major competitive factors considered are: (1) *labor cost*, (2) *productivity*, (3) *profitability*, and (4) *fuel and power costs*.

LABOR COSTS

Wage Rates

In discussions concerning the competitive position of Puerto Rican industries, the factor most often referred to as the indicator of Puerto Rico's poor competitive position is the relatively high wage rate. Puerto Rican minimum wage (\$2.65/hr, January 1978) is often contrasted with wage rates in the Caribbean and Central American countries. The implication is that "labor-intensive" industries will expand to cheaper labor areas and not to Puerto Rico, and that labor-intensive industries now located in Puerto Rico may eventually leave.

The drawing power of low cost labor becomes an important policy consideration because Puerto Rico has used lower wage rates to attract U.S. industries to the island.

In general, Puerto Rican wage rates remain competitive with those in the United States and many developed countries, though increasing wage trends on the island are dampening this advantage. Table 1 presents the estimated hourly compensation of production workers in manufacturing for 28 countries in 1976. The 28 countries were selected on the basis of data availability. They do not represent an unbiased distribution. The countries listed were drawn from a sample of 66 nations. With the exception of Sri Lanka and the Philippines, all 28 countries have a GNP per capita greater than Korea (\$560/yr.).

Table 1.—Estimated Hourly Compensation of Production Workers in Manufacturing; 28 Countries, 1976

[In U.S. dollars]

1. Sweden	8.27	16. United Kingdom	3.11
2. Norway	7.66	17. Puerto Rico	2.86
3. Canada	7.32	U.S. minimum wage ¹	2.65
4. Belgium	7.09	18. Ireland	2.63
5. United States	6.84	19. Israel	2.18
6. Netherlands	6.74	20. Greece	1.55
7. Denmark	6.71	21. Portugal	1.55
8. Germany	6.62	22. Hong Kong	.85
9. Switzerland	6.42	23. Singapore (1975)	.77
10. Australia	5.70	24. Turkey (1975)	.77
11. Finland	5.02	25. Taiwan	.58
12. Austria	4.68	26. Korea	.52
13. France	4.65	27. Philippines	.28
14. Italy	4.23	28. Sri Lanka	.23
15. Japan	3.29		

¹ Minimum wage January 1978.

Source: U.S. Department of Labor, Bureau of Labor Statistics, Office of Productivity and Technology, June 1977, *Unpublished Data*.

Therefore, comparing Puerto Rico with the 28 countries listed reflects a favorable competitive wage position.

It should also be noted that the definition of the terms "earnings," and "hourly compensation" changes from country to country, allowing only a very general interpretation of the tabular material.

Second, the specific figures quoted often represent averages and should be considered only as a relative indication of the countries' ranking.

Third, often the estimated hourly compensation figures vary within an individual country. For example, the Puerto Rican figures range from \$2.86 per hour to \$3.13 per hour, depending on the source. The Puerto Rican wage rates utilized in the comparisons were taken from the Puerto Rican Department of Labor Statistics.¹

Puerto Rico ranks 17th out of 28 countries in hourly compensation for production workers in manufacturing. The imposition of minimum wage on January 1, 1978, did not change Puerto Rico's relative position. Another important economic factor highlighted by the table is that those countries which are most competitive in leather and leather products, apparel, textiles, and other labor-intensive industries, have much lower wage rates than those of Puerto Rico. This is particularly true of Taiwan, Korea, Singapore, and Hong Kong, who directly compete with Puerto Rico in the textile and apparel industries, and with Taiwan and the Philippines in the leather and leather products industries, specifically shoes.

Table 2 shows a more specific range of hourly compensation with respect to 13 countries and 5 specific industry groups. The Puerto Rican wage rates are followed by parentheses () which identify the relative rank of the Puerto Rican wages.

For these specific countries, the Puerto Rican wages remain highly competitive. Even in the textile, apparel, and leather industries, an increase to \$2.65 minimum wage in January 1978 would do little to change Puerto Rico's position. In textiles, Puerto Rico would move to seventh rather than eighth place; in apparel it would remain the same; in leather and leather products, it would rise to eighth, rather than ninth place.

As in table 1, no specific definition of industrial competitiveness can be isolated from the table. Hong Kong, Japan, Korea, Taiwan, and Spain, for the most part, remain in a better competitive position than Puerto Rico with respect to apparel, textiles, and leather industries. In electronics, only Japan and the United Kingdom have wage rates lower than Puerto Rico, and only the United Kingdom carries a wage rate lower than Puerto Rico in chemicals. While

¹ *Census of Manufacturing Industries*, Puerto Rican Department of Labor, San Juan, various years, 1967-76.

Table 2.—Estimated Hourly Compensation of Production Workers for Selected Industries, 1976—13 Countries

Country	Textiles	Apparel	Leather	Electronics	Chemicals
Puerto Rico	¹ \$2.59 (8)	¹ \$2.57 (7)	¹ \$2.40 (9)	\$3.35 (7)	\$4.28 (8)
United States	4.53	4.13	4.25	6.50	7.78
Canada	5.30	4.62	² 4.55	6.74	7.73
Hong Kong	.90	.80	—	—	—
Japan	2.34	1.68	2.63	3.02	4.64
Korea	.55	.40	.50	—	—
Taiwan	.50	.49	.49	—	—
France	3.80	3.33	² 3.58	4.39	5.50
Germany	5.50	4.94	² 4.79	6.24	7.62
Italy	3.51	2.75	² 3.19	4.57	5.03
Spain	2.10	1.70	1.77	—	—
Sweden	7.59	6.94	² 7.24	7.87	8.28
United Kingdom	2.62	1.84	² 2.69	2.90	3.48

¹ Below minimum wage established January 1978, \$2.65.

² Wage information only available for leather furniture.

() Indicates rank of Puerto Rico among 13 countries.

Source: U.S. Department of Labor, Bureau of Labor Statistics, Office of Productivity and Technology, 1976, *Unpublished Data*.

Italy, Spain, Taiwan, and Korea remain competitive with Puerto Rico, the wage dispersion among these countries is much greater than the wage differences between the United States and Puerto Rico.

Table 3.—Estimated Average Hourly Earnings Per Production Worker for Manufacturing, Selected Industries 1976, 12 Latin American Countries

Country	Manu- facturing	Textiles	Apparel	Leather
Puerto Rico	\$2.86	¹ \$2.59	¹ \$2.57	¹ \$2.40
Argentina	.66	.58	.66	.65
Brazil	.72	.50	.41	.51
Colombia	.46	.46	.29	.36
Costa Rica	.80	.40	.56	.51
Dominican Republic	² .45	² .76	² .66	² .63
El Salvador	¹ .44	² .46	² .43	² .43
Guatemala	.52	¹ .46	¹ .41	¹ .41
Mexico	1.43	² 1.10	—	—
Nicaragua	.79	.69	.54	.47
Panama	² .97	² 1.09	² .82	² .91
Venezuela	1.92	1.63	1.63	—
Honduras	—	.55	—	—

¹ 1975 data.

² 1974 data.

Source: U.S. Department of Labor, Bureau of Labor Statistics, Office of Productivity and Technology, August 1975, *Unpublished Data*.

Table 3 narrows the international arena to 12 Latin American countries, and presents the wage differential between three specific sectors and the manufacturing industry total. These countries, in

terms of proximity to the United States, and in terms of product and market location competitiveness, illustrate the dilemma facing Puerto Rico with respect to wage rates and other factors of production. For manufacturing in general, and for each of the labor-intensive industries profiled, Puerto Rico stands as much as four times greater in salaries and wages paid to workers. In terms of specific industry groups identified, textiles, apparel, and leather, the impact of a \$2.65 minimum wage will increase the wage differential between the two countries. When Puerto Rico is compared with these 12 Latin American countries, and wage rates are the determining factor for industrial location or pricing of commodities, the generalization that Puerto Rico is not competitive, at least in the manufacturing sector as a whole, and in textiles, apparel, and leather, as separate industry groups, holds true. However, if the United States continues to be identified as the primary market for Puerto Rican goods and U.S. industries remain the primary competitor for Puerto Rican industries, then table 3 bears little relationship to the potential viability of industries in Puerto Rico with respect to U.S. markets.

Table 4 presents the average hourly earnings for manufacturing industries in the United States and Puerto Rico. This particular table shows a time series

Table 4.—Average Hourly Earnings for Manufacturing Industries, United States and Puerto Rico

Year	U.S. minimum wage	Puerto Rico average hourly earnings	U.S. minimum wage Puerto Rico hourly earning differential	U.S. average hourly wage	Minimum wage U.S. hourly earning differential	Puerto Rico/ U.S. hourly wage differential (percentage)
1950	\$0.75	\$0.42	\$0.33	\$1.50	\$—0.75	28
1955	1.00	.56	.44	1.91	— .91	28
1960	1.00	.94	.06	2.30	—1.30	41
1965	1.25	1.26	.01	2.64	—1.39	48
1970	1.60	1.78	— .18	3.37	—1.77	53
1975	2.10	2.59	— .49	4.40	—2.30	53
1976	2.30	2.86	— .56	5.28	—2.98	54
1977	2.30	3.11	— .81	5.60	—3.30	56

Source: U.S. Department of Labor, Bureau of Labor Statistics, *Employment and Earnings* and Commonwealth of Puerto Rico, Bureau of Labor Statistics.

of growth comparisons between U.S. minimum wage, U.S. average hourly wage, and Puerto Rican average hourly wage. The table highlights some interesting comparisons. First, Puerto Rican wage rates are much lower than wages in the United States. In one respect, the difference appears to be increasing. In 1950, for example, the absolute wage difference was \$1.08. By 1977, the absolute difference was \$2.49. In absolute terms, then, the competitive position of wages between Puerto Rico and the United States has improved in favor of the Puerto Ricans.

The relative rate, however, has changed significantly as the wage base increased over the 27 years. In 1950, Puerto Rican wages represented 28 percent of the U.S. hourly wage. By 1977, Puerto Rican wages were 56 percent of the U.S. wage. If wage differential is an important factor affecting locational decisionmaking, the relative impact of a lower Puerto Rican wage carries less weight in 1977 than it did in 1950, but in the period since 1970 the relative differential between the United States and Puerto Rico has not substantially changed.

Table 5.—Average Hourly Earnings by Industry Group, 1967–76, United States and Puerto Rico

Industry group	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	Percent- age change 1967–76
Food:											
United States	\$2.64	\$2.80	\$2.96	\$3.16	\$3.38	3.59	3.82	\$4.16	\$4.57	\$4.96	88
Puerto Rico	1.50	1.63	1.73	1.82	—	2.07	2.23	2.42	2.60	¹ 2.86	91
Tobacco:											
United States	2.27	2.48	2.62	2.91	3.16	3.47	3.74	4.10	4.51	4.91	116
Puerto Rico	1.20	1.34	1.47	1.49	—	1.63	1.81	1.96	2.21	¹ 2.41	101
Textiles:											
United States	2.06	2.21	2.34	2.45	2.57	2.74	2.95	3.19	3.40	3.67	78
Puerto Rico	1.37	1.50	1.56	1.61	—	1.79	1.94	2.10	2.15	¹ 2.36	72
Apparel:											
United States	2.03	2.21	2.31	2.39	2.49	2.62	2.78	2.99	3.19	3.41	68
Puerto Rico	1.30	1.47	1.58	1.60	—	1.77	1.83	1.97	2.14	¹ 2.34	80
Lumber/wood:											
United States	2.37	2.57	2.74	2.96	3.17	3.36	3.64	3.91	4.28	4.71	99
Puerto Rico	1.23	1.38	1.48	1.62	—	1.79	1.91	2.14	2.27	¹ 2.54	107
Furniture:											
United States	2.33	2.47	2.62	2.77	2.90	3.06	3.26	3.50	3.75	3.98	71
Puerto Rico	1.38	1.48	1.67	1.73	—	1.94	2.00	2.18	2.33	¹ 2.45	78
Paper:											
United States	2.87	3.05	3.24	3.44	3.67	3.94	4.19	4.51	4.99	5.43	89
Puerto Rico	1.79	1.85	1.99	2.05	—	2.36	2.49	2.72	2.85	3.07	72
Printing:											
United States	3.28	3.48	3.69	3.92	4.20	4.48	4.68	4.97	5.36	5.69	73
Puerto Rico	1.87	2.03	2.14	2.18	—	2.67	3.05	3.10	3.23	3.74	100
Chemicals:											
United States	3.10	3.26	3.47	3.69	3.94	4.21	4.48	4.85	5.37	5.89	90
Puerto Rico	1.77	1.98	2.08	2.26	—	2.64	2.77	3.22	3.64	3.90	120
Petroleum:											
United States	3.58	3.75	4.00	4.28	4.57	4.93	5.21	5.61	6.42	7.14	99
Puerto Rico	3.04	3.06	3.34	3.20	—	4.00	4.32	4.56	5.28	6.01	98
Rubber:											
United States	2.74	2.92	3.07	3.20	3.40	3.60	3.80	4.03	4.35	4.63	87
Puerto Rico	1.32	1.45	1.59	1.73	—	1.91	2.09	2.25	2.56	2.75	108
Leather:											
United States	2.07	2.23	2.36	2.19	2.60	2.71	2.81	3.01	3.23	3.44	66
Puerto Rico	1.17	1.31	1.50	1.55	—	1.62	1.69	1.84	2.02	¹ 2.18	86
Stone-clay-glass:											
United States	2.82	2.99	3.19	3.40	3.67	3.94	4.21	4.52	4.84	5.29	88
Puerto Rico	1.78	1.89	2.00	2.12	—	2.51	2.63	2.99	2.93	3.15	77
Primary metals:											
United States	3.34	3.55	3.79	3.93	4.23	4.67	5.04	5.60	6.17	6.80	103
Puerto Rico	1.79	1.93	1.96	2.04	—	2.28	2.50	2.69	2.88	3.17	77
Fabricated metals:											
United States	2.98	3.16	3.34	3.53	3.74	4.00	4.26	4.59	5.04	5.43	69
Puerto Rico	1.76	1.93	1.97	2.04	—	2.34	2.56	2.82	3.02	3.21	82
Machinery except electrical:											
United States	3.19	3.36	3.58	3.77	3.99	4.28	4.56	4.92	5.36	5.76	81
Puerto Rico	1.76	2.04	2.31	2.24	—	2.83	2.85	2.90	3.20	3.48	98
Electrical machinery:											
United States	2.77	2.93	3.09	3.28	3.48	3.68	3.89	4.17	4.58	4.91	77
Puerto Rico	1.61	1.78	1.84	1.91	—	2.16	2.24	2.55	2.82	3.05	89
Transportation:											
United States	3.44	3.69	3.89	4.05	4.41	4.73	5.07	5.48	6.02	6.54	90
Puerto Rico	1.71	1.94	2.12	2.22	—	2.35	2.63	2.87	2.87	3.13	83
Instruments:											
United States	2.85	2.98	3.15	3.35	3.53	3.73	3.90	4.20	4.56	4.87	71
Puerto Rico	1.57	1.73	1.79	1.92	—	2.15	2.36	2.57	2.81	3.05	94
Miscellaneous manufacturing:											
United States	2.35	2.50	2.66	2.83	2.97	3.11	3.27	3.50	3.79	4.01	71
Puerto Rico	1.30	1.46	1.57	1.66	—	1.91	2.07	2.40	2.59	2.78	113

¹ Below U.S. minimum wage, January 1, 1978, \$2.65.

Source: *Handbook of Labor Statistics 1976*, U.S. Department of Labor, Bureau of Labor Statistics; Puerto Rico Department of Labor, *Census of Manufacturing Industries*, San Juan, various years, 1967–76.

In terms of a wage trend, the average hourly earnings in Puerto Rico are increasing at a much more rapid rate than those in the United States. U.S. wages increased 273 percent from 1950 to 1977, while Puerto Rican average hourly wages increased 640 percent over the same period. Moreover, between 1965 and 1977 the Puerto Rican wage rate has increased at an average annual rate of 7.5 percent, compared to 6.6 percent for the same sector in the United States.

It should also be noted that while the imposition of U.S. minimum wage will be detrimental to particular Puerto Rican industries, the overall or average manufacturing wage has been above the U.S. minimum wage since 1970.

In summary, Puerto Rican wage rates appear to remain highly competitive with U.S. wages. In 1977, the average hourly earnings for manufacturing industries was still only 56 percent of U.S. average hourly earnings. At the same time, it appears that the average wage in Puerto Rico is generally becoming greater than the minimum wage, although the imposition of a \$2.65 minimum wage level on January 1, 1978, will retard this trend to some degree.

Table 5 (p. 57) compares U.S. and Puerto Rican average hourly earnings for production workers and illustrates the trend of wages by industry group for the 1967-76 time period. In absolute terms, U.S. wages have increased relative to Puerto Rican wages for all industries. For example, the wage differential in the food industry increased from \$1.14 in 1967, to \$2.10 in 1976. Textiles moved from \$.69 in 1967, to \$1.31 in 1976. Apparel increased from \$.73 in 1967, to \$1.07 in 1976.

In terms of rate of growth, seven industries indicate a more rapid rate of salary increase in Puerto Rico than on the mainland. These industries are: tobacco, textiles, paper, petroleum, stone-clay-glass, primary metals, and transportation. In all other industries, the rate of salary increase in the United States exceeded that of Puerto Rico.

Table 6 presents the Puerto Rican hourly wage as a percent of U.S. hourly wage for selected years 1967-76 using table 5 as the base table. Again, the seven industry groups in Puerto Rico which increased their relative wage rates (in Puerto Rico) remain more competitive in 1976 than in 1967. Using wage rate differentials as an indicator of industry competitiveness, the competitive position of all of these industries is better in 1976 than in 1967. However, the competitiveness of a Puerto Rican location would best be determined by a comparison of unit labor costs between areas. Unfortunately, data is not available for this purpose; so the above analysis is used as an indicator of competitiveness.

The industry groups in table 6 are also arranged in rank order of the relative proportion of Puerto

Table 6.—Puerto Rican Hourly Wage as a Percentage of U.S. Hourly Wage for Selected Years 1967-76, by Industry Group

Industry group	1967	1970	1972	1974	1976
Primary metals	54	52	49	48	47
Transportation	50	55	50	52	48
Tobacco	53	51	47	48	49
Lumber/wood	52	55	53	55	54
Paper	62	60	60	60	57
Food	57	58	58	58	58
Fabricated metals	59	58	59	61	59
Stone-Clay-Glass	63	62	64	66	60
Machinery except electrical	55	59	66	59	60
Electrical machinery	58	58	59	61	62
Furniture	59	62	63	62	62
Leather	57	62	60	61	63
Instruments	55	57	58	61	63
Rubber	48	54	53	56	63
Textiles	67	66	65	66	64
Printing	57	56	60	62	66
Chemicals	57	61	63	66	66
Apparel	64	67	68	66	69
Miscellaneous manufacturing	55	59	61	66	69
Petroleum	85	75	81	81	84

¹ Below U.S. minimum wage January 1, 1978; \$2.65/hr.

Source: Table 5.

Rican to U.S. wage rates, assuming that the industries most competitive in Puerto Rico with respect to the United States are those with the lowest proportion of U.S. wage rates.

The average wage of three of the most competitive industries, tobacco, lumber and wood, and food, remain below U.S. minimum wage. In the future, the relative position of these industries may change slightly, but wage competitiveness should remain favorable as far as the total industrial structure is concerned.

All of the Puerto Rican industries have lower relative wage rates than those of the United States. Seven of the industries show a better competitive position than they did in 1967. The industries with the greatest wage increases include rubber, miscellaneous manufacturing, printing, chemicals, and instruments.

Specific market area competitiveness is another important factor to consider when evaluating wage rates. For those industries identified as labor intensive, i.e., apparel, textiles, leather and leather products, the Southeastern States, both because of their geographic location and their concentration or industrial mix, appear to be highly competitive with Puerto Rico. Table 7 presents the average hourly wage for selected industries in selected Southern States.

As the table indicates, Puerto Rico remains below average in each of the separate industry groups. The table also illustrates the range of wage rates throughout the United States, in contrast with Puerto Rican wage rates. For example, the range of wages between all industries in the United States is \$2.17 between the \$6.00 wage rate offered in Indiana and the \$3.83 offered in Mississippi. At the same time, the wage rate range between the United States and Puerto Rico is only \$.97.

Table 7.—Average Hourly Wage, Selected Industries, Selected States

Industry	Puerto Rico	Alabama	Florida	Kentucky	Indiana	Mississippi	South Carolina	Texas	Virginia	Tennessee	Georgia
1977											
Textiles	\$2.61	\$4.13	—	\$3.64	—	\$3.71	\$4.28	\$3.77	\$3.99	\$3.88	\$4.00
Apparel	2.42	3.35	—	3.51	\$3.41	3.08	3.20	3.38	—	—	3.19
Lumber/wood	2.55	—	\$4.04	4.30	—	3.89	3.55	3.74	3.41	3.76	4.01
Leather	2.33	—	—	3.56	—	—	—	3.07	2.88	3.57	3.16
1976											
All industries	2.86	4.46	4.36	5.14	6.00	3.83	3.91	4.98	4.30	4.24	4.10

1976 (All industries) Range between States \$2.17.

1976 (All industries) Range between States and Puerto Rico \$0.97.

Sources: 1977 Statistical Abstract of the United States, Economic Analysis of the Industrial Incentives Program of Puerto Rico, Administration for Economic Development, Office of Economic Studies, February 1978.

It would appear then that the industrial concentration would push toward those States with relatively lower wage rates on the continental United States, and in turn relocate to Puerto Rico for an even cheaper wage rate.

However, almost every State in the mainland maintains a heavy industrial concentration (in apparel, for example), indicating that high wage rates do not necessarily identify areas where the emigration of labor-intensive industries may occur.

Employment Compensation (Benefits)

A second factor to be considered when comparing labor cost differentials between the United States and Puerto Rico is the cost of benefits, both payroll and nonpayroll, contributed by the employer. Comparable statistics on benefits for both Puerto Rico and the United States are difficult to find. Often quoted differences and benefit packages do not reflect the total benefit package received by U.S. employees. In addition, mandatory benefit packages in Puerto Rico have been estimated for all legally required payments. These mandatory benefits set a floor on benefit packages for specific categories. Over the years, the floor has been renegotiated higher than the mandatory wage level. Therefore, the indication of mandatory wages in Puerto Rico does not fully represent the total benefit package offered by industries who have operated in Puerto Rico over a number of years. Given these two constraints, the ability to determine the Puerto Rican benefit package and the noncomparability between U.S./Puerto Rican benefit packages, an evaluation is difficult. Some idea of the relative benefit package costs can be estimated, however, by comparing particular portions of each benefit package.

Table 8 compares specific benefit categories as a percentage of total payroll in both the United States and Puerto Rico. It details the benefits paid by each of the industry groups. The summary of all industries gives a good indication of the trend of the tabular material. The comparison of legally required

payments between the United States and Puerto Rico indicates that Puerto Rican benefits are generally twice that of the United States. The mandatory benefit package for Puerto Rico averages about 16 percent, while the U.S. benefit packages approximate only 9 percent of total payroll cost.

In the secondary category, "Paid vacations," two U.S. industry groups offer better benefits than industries in Puerto Rico.

In the "Paid sick leave" category, the Puerto Rican benefits far exceed those of the United States. While Puerto Rican benefits vary from 1.7 percent of the payroll in the apparel industry, to 6 percent of the payroll in the lumber and wood products industry, the average percentage of payroll for "Paid sick leave" is 4.4 percent in Puerto Rico and .8 percent in the United States.

By adding only the comparable benefits in each of the three categories, the Puerto Rican benefit package exceeds the United States by about 10 percent of payroll cost. Across the board, mandatory payments in Puerto Rico have increased the cost of the Puerto Rican benefit package.

It should be remembered that the figures quoted probably underestimate the cost of the Puerto Rican benefit package. Only the mandatory requirements are represented, and the negotiated payments above those required have been reported higher in most of the industries surveyed.

A second factor that should be considered is that legally required U.S. benefit payments do not represent the total benefit package afforded U.S. workers. Total employee benefits in the United States represent 16 percent higher payroll costs than the Puerto Rican benefit packages. Total employee benefits for all industries are 36.1 percent of the payroll, while Puerto Rican benefit packages remain 24.1 percent.

Comparison are difficult because the estimations of U.S. benefits are based on a survey by the U.S. Chamber of Commerce using a sample of only 761 companies. The U.S. survey also did not include

Table 8.—Comparable Benefits Categories as Percentage of Payroll, United States-Puerto Rico, 1976

Industry	Legally required payments ¹		Paid vacations		Paid sick leave ²		Total comparable compensation		U.S. total employee benefits	Total employee benefits southern region ³
	United States	Puerto Rico	United States	Puerto Rico	United States	Puerto Rico	United States	Puerto Rico		
Food	9.0	16.6	5.0	3.8	1.0	4.3	15.0	24.7	36.2	29.5
Tobacco	9.0	16.3	5.0	3.5	1.0	3.7	15.0	23.5	36.2	29.5
Textiles	8.8	14.1	3.5	4.6	.4	3.4	12.7	22.1	27.8	24.4
Apparel	8.8	14.1	3.5	4.6	.4	1.7	12.7	20.4	27.8	24.4
Lumber	8.4	16.8	5.7	5.8	.7	6.0	14.8	28.6	32.7	28.0
Furniture	8.4	—	5.7	—	.7	—	14.8	—	32.7	28.0
Paper	8.4	16.3	5.7	4.6	.7	2.6	14.8	23.5	32.7	28.0
Printing	7.4	13.7	5.3	4.6	1.1	2.6	13.8	20.9	32.2	—
Chemicals	7.9	14.3	6.2	3.9	1.9	4.4	16.0	22.6	42.2	38.5
Petroleum	6.4	13.3	6.5	3.8	1.9	3.9	14.8	21.0	39.2	40.5
Rubber	9.3	15.1	5.8	3.5	.6	4.2	15.7	22.8	40.4	—
Leather	9.3	16.7	5.8	1.9	.6	2.1	15.7	20.7	40.4	—
Stone-Clay-Glass	9.4	15.3	5.5	5.8	.5	5.2	15.4	26.3	35.1	34.5
Primary metals	9.5	16.1	5.6	3.1	.4	4.0	15.5	23.2	40.6	42.7
Fabricated metals	9.3	15.8	5.5	3.1	.4	4.0	15.2	22.9	35.1	30.5
Machinery except electrical	8.3	14.4	5.5	3.1	.5	4.4	14.3	21.9	36.1	25.7
Electrical machinery	8.1	14.8	5.4	3.1	1.1	4.9	14.6	22.8	35.0	30.4
Transportation	10.3	17.4	5.4	3.1	.8	4.4	16.5	24.9	39.9	37.9
Instruments	8.1	14.9	5.2	3.1	.7	5.1	14.0	23.1	34.8	27.9
Miscellaneous manufacturing	—	—	—	—	—	—	—	—	—	—
All industries	8.8	15.9	5.4	3.8	.8	4.4	15.0	24.1	36.1	32.7

¹ Employers share only.

² Includes maternity leave.

³ Includes Alabama, Arkansas, Delaware, D.C., Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia.

Source: *Employment and Earnings*, October 1977, U.S. Department of Labor, Bureau of Labor Statistics; *Employee Benefits 1975*, The Chamber of Commerce of the United States of America, 1976; *Cost of Mandatory Fringe Benefits*, Commonwealth of Puerto Rico, Economic Development Administration, Office of Economic Research, General Economic Division, July 1976.

firms with less than 100 employees. Thus, the sample survey for U.S. firms tends to represent a larger firm size than the representative survey of Puerto Rican industries.

Total Compensation

While additional information is necessary to clarify the differentials between U.S./Puerto Rican benefit packages, it does seem obvious that U.S. benefits and Puerto Rican benefits, if not on parity, would tend to be biased in favor of the Puerto Rican competitiveness. That is, the total U.S. benefit package would tend to be slightly greater. Even in the Southern States where unionization employee benefits do not represent older industrial core areas of the United States, the benefits paid to workers are substantially higher than in Puerto Rico.

The inability to differentiate between the actual benefit cost or to determine the relationships among wage and salary differentials does not entirely disrupt labor cost comparisons. Estimates of total compensation costs in both Puerto Rico and the United States are available for selected years. In this respect, table 9 presents a comparison of total labor costs for 1973 and 1976.

Table 9 is arranged in two sections: The lead section presents the industry groups which are achieving a better competitive position relative to total

labor costs in the United States. The printing, petroleum, lumber and furniture, food, machinery except electrical, stone-clay-glass, rubber, fabricated

Table 9.—Comparison of Total Labor Costs, United States and Puerto Rico

Total compensation in Puerto Rico as a percentage of total compensation in the United States

Industry	Industry groups with decreasing relative labor costs	
	1973	1976
Printing	80	59
Petroleum	73	61
Lumber/furniture	61	52
Food	65	57
Machinery except electrical	(1974) 46	43
Stone-Clay-Glass	69	67
Rubber	53	52
Fabricated metals	52	52
Electrical machinery	49	49
Industry	Industry groups with increasing relative labor costs	
	1973	1976
Textiles	56	64
Miscellaneous manufacturing	55	63
Transportation	(1974) 55	63
Tobacco	36	43
Chemicals	54	59
Leather	52	57
Apparel	57	59
Paper	50	(1975) 52
Primary metals	63	65
Instruments	37	39

Source: *Survey of Current Business*, July 1977; Puerto Rican Statistical Information Work Sheets, Planning Bureau, January 1978.

metals, and electrical machinery industries are all industries which have decreased their labor cost relative to the United States in the 1973-76 period.

The second group includes those industries which are increasing their relative labor costs with respect to the United States and thereby losing their competitive position to some degree (assuming no major improvement in labor productivity in either area has altered unit labor cost comparison). Important industries to Puerto Rico in this group are the textile, apparel, and leather industries, where the wage cost as a total cost of production is high.

A rank order of the industries according to their 1976 proportion of cost to the United States identifies instruments, tobacco, machinery except electrical, electrical machinery, lumber and furniture, rubber, and fabricated metals as the more competitive industries.

In summary, the actual wage costs and benefit packages separately present only part of the total cost of labor. Many other competitive factors, beside wage costs, are involved in plant location decisions, including the ease of skill acquisition, management trainability, productivity of workers, etc. However, information on productivity by sector, unit transportation costs, technology, product identifiability, etc. were difficult to acquire and evaluate for this sector; therefore the analysis concentrates on wage trends. Obviously, a high wage area in general does not necessarily preclude the operation of a low wage industry. However, the market tendency would be to drive out noncompetitive low wage industries which has been the case for certain apparel and textile industries where relative wage costs in Puerto Rico compared to countries benefited by GSP are higher.

Comparisons of wage costs and benefit packages often tend to distort the competitive position of Puerto Rican industry groups. However, a comparison of the total compensation paid to employees in each of the industry groups presents one aspect of wage-cost competitiveness. Those industry groups which have relatively low labor costs, compared with the United States, and at the same time have decreasing labor costs, 1973-77, include: Machinery except electrical; electrical machinery; lumber and furniture; rubber; fabricated metals; and food. Industries which have relatively low labor costs in proportion to the United States, but have increasing relative labor cost trends include: Instruments tobacco; paper; and leather.

A third set of industries may be identified whose relative labor costs are still below U.S. levels but may be less competitive. Industries with a relatively high ratio of labor costs with respect to the United States, and increasing labor cost trends include: Printing, petroleum, stone-clay-glass, chemicals,

apparel, miscellaneous manufacturing, transportation, textiles, and primary metals. The labor-intensive industries of apparel and textiles both have a relatively high proportion of labor cost with respect to the United States, and increasing costs over the 1973-76 period.

Summary—Competitive Labor Costs

International comparisons of wage rates are not an adequate index of industrial competitiveness. Wage rates or total compensation figures have limited comparability among nations. A number of additional locational factors must be taken into account when an industry relocates or establishes a subsidiary. In addition, estimations or assumptions of product competitiveness based on lower labor costs alone are tenuous.

The impact of regional wage disparity, however, cannot be discounted. Historically, Puerto Rico has already lost some industries to other Caribbean countries. An example is the home needle craft and handstitching of leather sports products.

A number of labor-intensive industries in Puerto Rico are presently changing their production systems in order to take advantage of the lower wages in nearby countries by transferring labor-intensive production operations off-island, with final processing, packaging, marketing, distribution, and administrative functions being carried on in Puerto Rico. Wages in Latin American countries range from 15 percent to 30 percent of wages in Puerto Rico, and these wage differentials alone could push some firms off-island.

The problem facing planners and policymakers in Puerto Rico is the necessity to define as clearly as possible those firms or industry groups whose primary locational criteria are low labor costs. A list of labor-intensive industry groups or those industries with the largest percentage of value added associated with labor costs include: Lumber and wood (54 percent); furniture (54 percent); leather (52 percent); rubber and plastics products (51 percent); paper (46 percent); transportation (46 percent); apparel (44 percent); textiles (42 percent); stone-clay-glass (40 percent); and printing (40 percent). These industry groups would appear to be sensitive to international wage differentials.

International labor cost competitiveness has not historically been the primary locational factor for firms coming to Puerto Rico. Rather, lower wages relative to U.S. mainland labor costs have been a locational incentive. In this respect, labor-intensive industries in Puerto Rico can best be compared with indices of total labor cost differentials between the United States and Puerto Rico to identify sensitive industry groups.

Rank Ordering of Industries by Labor Costs

Labor-intensive industries (K/L) ¹	Ranking of industries (Based on the ratio of Puerto Rico to United States labor costs) ²
Lumber and wood	Stone-Clay-Glass
Furniture	Primary metals
Leather	Textiles
Rubber and plastics	Transportation
Paper	Miscellaneous manufacturing
Transportation	Petroleum
Apparel	Apparel
Textiles	Chemicals
Stone-Clay-Glass	Printing
Printing	Leather
Miscellaneous manufacturing	Food
Food	Paper
Fabricated metals	Fabricated metals
Tobacco	Rubber and plastics
Machinery except electrical	Lumber and wood
Instruments	Electrical machinery
Primary metals	Machinery except electrical
Electrical machinery	Tobacco
Petroleum	Instruments
Chemicals	

¹ Source, table 22.

² Source, table 9.

Underlined industry groups indicate those industries with improving labor costs relative to the United States, 1973-77.

This comparison does not identify any industry group that is both labor intensive and has a relative low labor cost ratio—Puerto Rico to United States. From the general position of industries, however, those which are wage competitive and those which are wage sensitive can be identified.

COMPARISON OF PRODUCTIVITY TRENDS AND LEVELS OF THE UNITED STATES AND PUERTO RICO

The dominance of the manufacturing sector in Puerto Rico's development strategy should have necessitated the collection of data to analyze the results of this process. Unfortunately, the collection of adequate and verifiable data was not given needed attention and support. Where data were collected its adequacy for policy guidance was limited. As a result, the strategy of industrialization has been played out under uncertainty. One area of inquiry arises in productivity analysis where cross-sectional and time analysis are important to the evaluation of industrial competitiveness. Another useful analysis, for example, examines the impact of wage trends on industrial plant locations and the retention of these plants on the island.

The analysis of productivity in this section is preliminary and suffers from certain data weaknesses.

However, given the nature of policy decisions on the island, it is felt that a reasonable beginning can be made here to make explicit certain assumptions entertained by policymakers since the inception of the industrialization process. No firm conclusions are drawn, but Puerto Rican officials should begin to focus on the issues involved in developing a sound analytic base for choosing industries to locate on the island.

Before proceeding further, a number of problems with the data should be noted. Among the problems are: (1) the lack of comparable data for the mainland and Puerto Rico; (2) the lack of data below the 2-digit level for output measures; (3) the extreme difficulty in developing capacity utilization figures (as a result fluctuations in employment are used as proxies for cyclical effects); (4) the inadequacy of the price deflators at the individual industrial level and the concomitant difficulties with deflators at the aggregate industrial level; (5) insufficiency of measures for capital stock data and measures to determine the impact of skill acquisition through on-the-job training or formal training programs; and (6) the lack of policy interest in this critical area of analysis. Notwithstanding the inherent difficulties of this task the following analysis is useful and will focus the attention of Puerto Rican analysts for future study.

It appears from the analysis that labor productivity has risen at a fairly fast clip in the period 1965-77. On the basis of the 2-digit SIC level of classification to measure output per man-hour in constant 1954 dollars, the increase in labor productivity was at an average annual rate of about 5.8 percent for the whole manufacturing sector.

The study uses production workers as the basis for calculating man-hours. Table 10 indicates the ratio of production workers to total employment in each of the industry groups.

The change in the relative share of production workers to total employees is shown for Puerto Rico in the first four columns and for the United States in the last column. The difference on average between the mainland and Puerto Rico is about 12 percent for the sector as a whole. In certain industries, for example, electric machinery and instruments, the relative share difference is quite significant. The relative newness of these specific industries to Puerto Rico's economy and their production orientation rather than marketing and repair orientation would tend to explain the high ratio. Moreover, the rather lower hourly compensation relative to the mainland would appear to be a significant explanation for the plants' location on the island.

Industries which appear more production-oriented, as indicated in table 10, include food and food products, textiles, printing and publishing, petroleum,

**Table 10.—Production Workers/Total Employment
by Major Industry**

[In percentages]

SIC Industry	Puerto Rico				United States
	1965	1970	1974	1975	1975
20 Food	65.4	64.6	70.0	68.2	67.8
21 Tobacco	95.7	98.4	94.3	93.4	82.8
22 Textiles	93.3	92.9	92.0	93.0	86.8
23 Apparel	95.1	94.7	93.4	93.8	86.0
24 Wood products	72.8	67.9	70.2	71.7	82.2
25 Furniture	80.1	75.7	78.6	77.8	82.2
26 Paper	76.7	73.1	71.7	72.1	75.1
27 Printing	60.9	58.6	57.8	61.1	59.0
28 Chemicals	63.2	64.9	68.6	65.6	56.3
29 Petroleum	59.9	48.7	56.4	56.2	63.3
30 Rubber and plastics	91.2	88.5	86.7	82.0	76.7
31 Leather	94.3	94.2	94.3	93.5	85.4
32 Stone-Glass-Clay	81.5	77.6	75.3	75.7	79.0
33 Primary metals	81.5	81.0	77.5	76.0	78.0
34 Fabricated metals	73.9	76.2	77.7	77.1	75.0
35 Machinery except electrical	76.6	76.3	78.8	76.5	65.1
36 Electrical machinery	86.2	86.3	81.7	86.2	64.7
37 Transportation	80.1	77.2	78.4	78.0	69.6
38 Instruments	88.4	90.3	86.8	87.6	60.0
39 Miscellaneous mfg.	92.1	90.9	88.5	90.4	76.3
Total	84.4	83.4	81.9	81.9	73.1

rubber and plastics, leather, stone-clay-glass, primary metals, electrical machinery, transportation, and instruments. The 1975 comparisons between the structure of Puerto Rican industries and the United States indicate that only five industries in Puerto Rico have a lower ratio of production workers to total employment than in the United States. These industries include wood and wood products, furniture, paper, petroleum, stone-clay-glass, and primary metals. The remainder of Puerto Rican industries are structured more as production units relative to similar industries on the mainland. This is a direct outcome of corporate decision to use Puerto Rico as a production center rather than move headquarters or other functions to the island, such as sales units for Latin America, etc. The greatest distortion occurs in scientific instruments, electrical machinery, ma-

chinery except electrical, tobacco, chemicals, and transportation industries. Previous analyses of these industry groups indicate that the chemical industry (particularly pharmaceuticals), the instruments industry, and the electrical machinery industry also represent high growth industries in Puerto Rico today. It may be assumed that high growth industries are likely to be enclave industries representing primary production units rather than total industrial complexes.

The information available through some surveys suggests that worker productivity in Puerto Rico compares favorably to the mainland work force. As noted above, the data to measure, even tentatively, this proposition is nearly nonexistent or of limited value. For the industrial sector in aggregate terms the 5-year surveys of the manufacturing sector conducted by the Bureau of the Census do provide a source of benchmarking data (some sources believe the Census is not useful because the Census may not do as thorough a job on the island as on the mainland). In any event, using data from the survey and comparing this to sectoral gross domestic product (GDP) data, the analysis shows a discrepancy of 20 percent with the GDP lagging behind the Census data. At the 2-digit subsectoral level the discrepancies increase drastically to as much as a 52-percent difference in the value of industry product and industry value added from the Census. Cross checks of social security compensation data and employment data are not sufficient to explain the above data discrepancy and estimates of depreciation, interest, profit, and inventories appear very weak. It is possible that both Planning Board and Census estimates could be subject to substantial error. However, the Study Team was unable to satisfactorily evaluate the discrepancy.

The capital stock estimates used in table 11 are derived from the analysis in chapter II of the Gen-

Table 11.—Manufacturing Sector Aggregate Measures of Labor Productivity

Year	Production worker man-hours (millions)	Hourly wage rate (dollars)	Gross capital stock machinery/equipment (millions of 1954 dollars)	Output (GDP) 1954 (millions of dollars)	K/L	O/L ¹ (Man-hours)
1965	172.1	1.26	1,184.8	588.9	13,124.6	3.42
1966	185.1	1.31	1,298.6	620.7	13,458.1	3.35
1967	196.4	1.43	1,431.6	680.4	14,030.0	3.46
1968	207.5	1.59	1,551.0	765.2	14,376.6	3.68
1969	222.3	1.71	1,711.1	855.5	14,782.7	3.85
1970	218.0	1.78	1,896.7	945.1	16,579.8	4.34
1971	215.3	1.93	2,083.6	948.9	18,434.9	4.41
1972	224.4	2.04	2,275.8	1,093.1	19,559.1	4.87
1973	238.0	2.17	2,457.7	1,218.0	19,834.9	5.12
1974	239.6	2.40	2,561.7	1,314.9	20,247.7	5.49
1975	220.7	2.59	2,632.1	1,256.0	22,656.5	5.69
1976	219.5	2.86	2,709.3	1,400.6	23,902.9	6.38
1977	229.8	3.11	2,790.4	1,545.0	23,665.1	6.72

¹ Output valued in 1954 dollars divided by production worker man-hours (column 4 divided by column 1).

Source: Puerto Rico Planning Board and Pomento.

eral Economic Assessment. The estimates are explained in that chapter. For purposes of this analysis, the assumption is that the current cost capital series for machinery and equipment reflects private sector accumulations. Exclusion of plant from the investment is assumed because of PRIDCO's role in building and leasing plants for the private investor.

An average annual increase of 5 percent in capital per employee in the period 1965 to 1977 probably implies a rise in labor productivity. This rising ratio is normal during the industrialization process. Comparable increases have taken place in the United States and other industrial countries during the early period of industrialization. The analysis suggests that output per man-hour would show an increase over this period. Output per production worker man-hour did in fact increase during this period at an average annual rate of nearly 6 percent. This increase implies, also, an improvement in factors affecting the labor force, such as training, general skill acquisition, improved health, better management and organization, etc.

During this period hourly wage rates rose on the average 7.2 percent in nominal terms. Real hourly wages may have increased about 4 percent, assuming the consumer price index is an acceptable deflator. Real output increased by 8.4 percent annually, indicating a decline in the real relative share of labor in this period. Employment of production workers in the sector increased an average about 2.3 percent. The substitution of capital for labor appears to have taken place, confirming the proposition put forward in chapter I that the manufacturing sector will require a substantial expansion to provide increased employment. However, the burden of employment creation should not be placed solely on this sector of the economy, or other sectors such as services, commerce, and even agriculture.

Table 12 is an index of output per man-hour in the manufacturing sector for the United States and Puerto Rico. With reference to 1967 as the base year, output per man-hour in the United States increased at an average annual rate of 5.4 percent for the period 1970 to 1977. In contrast, output in Puerto Rico increased at an average annual rate of 6.5 percent. The recent rapid compositional change in the structure of Puerto Rico's manufacturing sector — particularly the increase of investment in the relatively more capital-intensive industries on the island would appear to explain the difference between the island and the mainland. Obviously, the aggregate productivity indices are distorted by structural differences between the economies of the island and the mainland. Moreover, the inclusion of the pharmaceutical companies in the index for the island tends to exaggerate the increase in output per man-hour. However, as noted later,

Table 12.—Real Output Per Manhour in Manufacturing

Year	Output per man-hour ¹	
	United States	Puerto Rico
1970	116.5	125.4
1971	117.6	127.5
1972	118.1	140.8
1973	123.2	148.0
1974	143.1	158.7
1975	152.4	164.5
1976	158.3	184.4
1977	168.3	194.2
Average annual increase (percentage) —	5.4	6.5

¹ Output is the gross domestic product for the manufacturing sector in millions of 1967 dollars. The output measure for Puerto Rico was converted from 1954 dollars to 1967 dollars through chain-linking the price indices.

Source: Bureau of Labor Statistics, Puerto Rico Planning Board.

employment in this subsector since 1970 has increased more rapidly than overall employment in the sector.

SOME PRELIMINARY ANALYSIS OF INDIVIDUAL INDUSTRIES

As noted in the previous section, a meaningful analysis of manufacturing sector and individual industry competitiveness with mainland or third country producers is impossible given the data problems, not only in Puerto Rico, but for other countries. Comparisons at the 2-digit SIC level are nearly meaningless. For example, comparisons were attempted for SIC 20 (Textile Mill Products) between the mainland and Puerto Rico. The results were substantially misleading, because the structure of the industry on the island is different from that on the mainland. Knit mills provide about 74 percent of the value of the sector's output on the island, while on the mainland the percentage is 24 percent. Within the SIC 225 enumeration hosiery provides about 56 percent of the shipment value, whereas on the mainland this sector is much less important. Other problems for comparisons were the weightings for the price deflators for Puerto Rico, which are presently based on 1954 product account data. These problems were sufficiently profound to prevent a meaningful comparison.

However, the Puerto Rican data was used to evaluate the trend in output per man-hour and hourly wage rates for the period 1965–77. These data should be used with caution; nevertheless, the trend values may be less distorted than the estimated levels. Hourly wage rates for production workers appear to have risen 6.5 percent, while real output per man-hour has risen 5.5 percent. Adjusting the hourly wage rate by the Puerto Rican CPI, real wages may have risen between 2.5 percent to 3 percent. This latter increase may suggest a reason for the continu-

Table 13.—Labor Productivity in the Apparel and Related Industries

Year	Production workers man-hours (in thousands)	Output (millions of 1954 dollars)	Output/labor man-hours	Hourly wage rates (in dollars)
1963	42,496.9	81,295	1.91	
1964	46,225.0	90,014	1.95	
1965	48,172.9	92,751	1.93	1.15
1966	53,913.4	100,867	1.87	1.18
1967	57,899.5	117,462	2.03	1.30
1968	61,434.1	143,144	2.33	1.47
1969	68,094.8	172,710	2.54	1.58
1970	65,355.7	188,855	2.89	1.60
1971	62,225.3	174,850	2.81	1.70
1972	61,825.4	188,682	3.05	1.77
1973	66,108.2	200,357	3.03	1.83
1974	66,232.9	219,841	3.32	1.97
1975	59,086.3	195,438	3.31	2.14
1976	62,754.2	231,791	3.69	2.34
1977	62,453.2	243,641	3.90	2.52
1965-77		2.3	26.0	26.8

¹ Employment increase in percentage.

² Output increase in percentage.

³ Average annual increase in percentage.

Source: Puerto Rico Planning Board.

ing operation of the textile industry, notwithstanding the rise in the cost of raw materials (synthetic fibers). However, employment is barely above the level prevailing in 1963 and sharply down from the peak of 7,789 reached in 1971. As the wage rate has risen, among other cost factors, employment generation in the sector appears to be declining. The long-term competitiveness of this industry must be thoroughly evaluated by policymakers in anticipation of possible further erosion of employment opportunities.

Table 14.—Beforetax Profits to Sales, United States and Puerto Rico by Industry Group

[in percentages]

	1973 Puerto Rico	(EDA) 1973 Puerto Rico	1973 United States	(EDA) 1975 Puerto Rico	1975 United States	1976 Puerto Rico	1976 United States
Industry groups with greater profitability in Puerto Rico:							
Chemicals	31.6	46.6	12.0	32.6	12.2	35.1	12.2
Electrical machinery	25.0	25.7	7.9	33.9	5.8	25.1	7.8
Instruments	24.5	29.7	15.0	27.1	12.6	28.2	13.5
Machinery except electrical	19.0	34.0	10.2	21.9	10.2	23.0	12.0
Fabricated metals	14.4	18.2	7.3	16.6	6.1	15.3	8.3
Rubber	2.1	2.4	7.1	14.8	5.3	12.5	6.6
Textiles	10.1	11.6	5.2	4.5	2.8	10.0	4.5
Food	5.5	12.9	4.7	7.8	5.4	8.3	5.7
Industry groups with greater profitability on the mainland:							
Petroleum	7.5	15.2	9.2	2.7	10.8	1.4	12.3
Primary metals	5.2	10.8	7.2	3.2	6.3	2.2	5.5
Tobacco	10.6	10.5	10.3	12.4	16.8	13.7	15.4
Paper	3.8	12.6	9.3	5.5	9.0	8.2	9.0
Stone-Clay-Glass	4.7	25.2	8.1	2.5	4.9	4.3	7.9
Printing	5.6	22.6	8.6	24.2	8.4	9.2	9.4
Industry groups with insufficient data (1975-76):							
Apparel	11.1	15.6	4.0	12.4	—	11.7	—
Lumber	5.0	—	10.0	15.3	—	2.4	—
Furniture	6.0	10.7	6.4	15.3	—	2.4	—
Leather	9.3	9.7	4.7	15.2	—	9.2	—
Miscellaneous manufacturing	11.8	18.5	6.2	21.4	—	19.7	—
All industries	13.8	24.7	8.02	17.3	7.4	15.7	8.7

Source: *Quarterly Final Report for Manufacturing, Mining and Trade Corporation*, Federal Trade Commission, 1973-76; "Profits Related to Sales by Industry Group," EDA Puerto Rico, Worksheets, December 1977; Puerto Rican Statistical Information Worksheets, Planning Bureau, January 1977.

Table 13 reviews certain key measures for the apparel industry (SIC 23) in an attempt to analyze trends in productivity and costs in the period 1965-77. Hourly wage rates increased at an average annual rate of 6.8 percent with fringe benefits adding possibly 10 to 15 percent to obtain a labor hourly compensation rate. However, real output per man-hour appears to have increased about 6 percent. Employment in the period increased by 2.3 percent, although it was down about 9 percent from the 1974 employment peak. Since 1974 there appears to be slight increase in the hourly wage rate and some decline in labor productivity suggesting the possibility that the industry may become more sensitive to wage trends. Again the data must be evaluated carefully by policymakers and analysts for the industry to determine long-term competitiveness of this industry, which has an important employment role in the manufacturing sector.

PROFITABILITY

Increased profitability is the primary determinant which enters into a firm's decision to locate in Puerto Rico. Two indices of profitability are presented in this section, profit to sales and profit to equity. Table 14 indicates a beforetax profits to sales for the United States and Puerto Rico by industry group, allowing a comparison for three time periods, 1973, 1975, and 1976, of beforetax profits. (Because of the tax allowances in Puerto Rico, the table assumes that beforetax profits and aftertax profits are similar.)

The comparison of profitability for Puerto Rican industries presents a data comparability problem. Moreover, because the sources of information show substantial differences in calculated profit figures, the following analysis is only indicative of industrial profitability on the island. The rates of profitability could, as a result, be higher or lower than the figures used for the industrial classification, but this fact alone should not prevent analysis using the available data. In other sections of this document sectoral growth in output, etc., are discussed to broaden the perspective on industrial competitiveness.

Listed in table 14 in the first two columns are two sets of data available from Puerto Rico. The first set of 1973-76 statistics, columns 1 and 6, were obtained from the industries' worksheets received from the Puerto Rican Planning Board in January 1977. Columns 2 and 4, marked "EDA 1973" and "EDA 1975" respectively were collected from sample EDA information worksheets that were obtained from EDA in December 1977. The difference between the sample group and the Planning Board's worksheets are sometimes substantial; therefore, both are included for comparative purposes. Table 14 is separated into three groups. The first group is based on the comparison of 1976 statistics for Puerto Rico and the United States and indicates those industry groups with the greatest relative profitability in Puerto Rico. These industries are: Chemicals, electrical machinery, instruments, machinery except electrical, fabricated metals, rubber, textiles, and food. A second set of industry groups is classified according to those with the greatest profitability on the mainland. Leading this group is the petroleum industry, followed by primary metals, tobacco, paper, stone-clay-glass, and printing industries.

A third set of industry groups is identified as those for which data for the 1975-76 time period were not available. These industries indicate, however, that in the 1973 comparisons, apparel, leather, and miscellaneous manufacturing had a better profit to sales ratio than their U.S. counterparts. In general, all industries in Puerto Rico in 1976 indicate almost double the profitability in terms of profit-to-sales than those industries on the mainland. The 1976 comparisons use the total data set obtained from the Puerto Rican Planning Board rather than the sample data set obtained from EDA.

Table 14 compares U.S./Puerto Rican industries before-tax profits to sales. Discounting the tax advantages, eight industry groups in Puerto Rico have a competitive advantage over U.S. counterpart industries. More importantly, however, is the after-tax profits to sales. Table 15 shows that the after-tax profits to sales ratios for industry groups in Puerto Rico increase substantially compared to before-tax profits to sales ratios.

Table 15.—Aftertax Profits to Sales, United States and Puerto Rico by Industry Group

	1973 Puerto Rico	1973 United States	1976 Puerto Rico	1976 United States
Industry groups with greater profitability in Puerto Rico				
Chemicals	31.6	6.8	35.1	7.5
Electrical machinery	25.0	4.3	25.7	4.4
Instruments	24.5	8.3	28.2	8.0
Machinery except electrical	19.0	5.6	23.0	7.5
Fabricated metals	14.4	4.0	15.1	4.8
Rubber	2.1	4.0	12.5	3.8
Textiles	10.1	2.9	10.0	2.4
Tobacco	10.6	5.8	13.7	8.5
Food	5.5	2.6	8.3	3.4
Printing	5.6	4.8	9.2	5.1
Transportation	9.5	3.9	8.4	4.8
Paper	3.8	5.4	8.2	5.8
Industry groups with greater profitability on the mainland:				
Petroleum	7.5	7.6	1.4	7.5
Primary metals	5.2	4.6	2.2	3.9
Stone-Clay-Glass	4.7	4.8	4.3	4.8
Industry groups with insufficient data 1976:				
Apparel	11.1	2.1	11.7	—
Miscellaneous manufacturing	11.8	3.2	19.7	—
Leather	9.3	2.5	9.2	—
Furniture	6.0	3.6	2.4	—
Lumber	6.0	6.3	2.4	—
All industries	13.8	4.7	15.7	5.4

Source: *Quarterly Final Report for Manufacturing, Mining and Trade Corporations*, Federal Trade Commission, 1973-76; "Profits Related to Sales by Industry Group," EDA Puerto Rico, Worksheets, December 1977.

Three industry groups, petroleum, primary metals, and stone-clay-glass, appear to have a relatively poor competitive position with respect to the mainland, even if the tax advantages are considered in the profits to sales ratios.

However, in 1973, all of these industries indicated much greater aftertax profits to sales in Puerto Rico than in the United States.

Aftertax profits to sales in 1973 for these two industries were substantially higher on the island than on the mainland.

Of more importance to the investor is an indication of aftertax profits to equity. Table 16 shows a comparison of aftertax profits to equity for both the United States and Puerto Rico. Ten industries, arranged by the 1976 proportion of aftertax profits to equity, have an equal, or greater profitability in Puerto Rico. The fabricated metals industry indicates a break-even point with similar returns to equity for the United States and Puerto Rican industries. Transportation, instruments, electrical machinery, printing, rubber, and food industries show the greatest advantage when comparing aftertax profits to equity between the United States and the island.

Five industry groups have greater profitability (profits to equity) on the mainland. Particularly important in this industry group is the petroleum industry, long considered a lead industry in Puerto Rico. The lack of profitability is also reflected in the

Table 16.—Aftertax Profits to Equity, United States and Puerto Rico

	1973 Puerto Rico	1973 United States	1976 Puerto Rico	1976 United States
Industry groups with greater profitability on Puerto Rico:				
Transportation	44.3	13.0	58.8	15.9
Instruments	23.7	15.9	23.1	14.7
Electrical machinery	26.7	13.1	20.6	12.5
Printing	31.6	12.9	21.4	15.1
Rubber	4.5	12.5	15.2	10.8
Food	13.5	12.8	17.2	14.9
Chemicals	34.1	14.8	17.6	15.5
Machinery except electrical	18.2	13.4	17.3	15.5
Tobacco	26.3	14.8	16.0	15.9
Fabricated metals	21.9	13.9	15.4	15.4
Industry groups with greater profitability on the mainland:				
Stone-clay-glass	23.5	11.2	2.4	11.9
Petroleum	25.3	11.6	6.9	14.4
Primary metals	46.3	10.1	2.4	8.3
Paper	23.0	12.9	11.5	13.8
Textiles	19.3	9.0	6.4	8.0
Industry groups with insufficient data—1975-76:				
Miscellaneous manufacturing	26.3	11.5	40.0	—
Apparel	23.7	10.8	21.0	—
Leather	16.0	9.4	22.0	—
Furniture	15.4	13.2	22.1	—
Lumber	—	22.4	20.5	—
All industries	25.6	12.8	16.7	14.0

Source: *Quarterly Final Report for Manufacturing, Mining and Trade Corporations*, Federal Trade Commission; "Profits Related to Average Equity by Industry Group" EDA Puerto Rico, Worksheets, December 1977.

growth rates associated with textiles over the last decade. The emigration of the textiles industry from Puerto Rico may be a continuing process.

Insufficient data exist for five industry groups to determine if 1976 aftertax profits to equity for Puerto Rican industries are competitive with those in the United States. This category includes the apparel and leather industries, often considered to operate with marginal profits in Puerto Rico. In 1973, the profit to equity rates for both of these industries were almost twice that of U.S. counterparts.

The impact on profitability in the petroleum industry resulting from the new petroleum pricing is evident in the drop from 25.3 percent profit to equity in 1973 in Puerto Rico (11.6 percent profit to equity in 1973 in the United States) to 6.9 percent 1975 profits to equity in Puerto Rico (14.4 percent 1976 profits to equity in the United States).

Table 16 also illustrates the general erosion or reduced competitiveness in all Puerto Rican industries during the 1973-76 time period. The index for all industries in 1973 shows a 13.8 percent difference in aftertax profits to equity between Puerto Rico and the United States. By 1976, that percentage was reduced to 2.7 percent. Although problems of aggregation easily distort profitability of particular industries or firms, the general trend is unmistakable. Except for the transportation, rubber, and food industries,

the competitive position of Puerto Rican industries is declining in comparison to their U.S. counterparts.

In summary, profitability remains the single most important variable considered by industry or manufacturers relocating or beginning operations in Puerto Rico. The profits to equity ratios identify five industry groups which have lower aftertax profitability in Puerto Rico than in the United States: Textiles, paper, primary metals, petroleum, and stone-clay-glass. The case of the petroleum industry represents the pricing anomaly of this energy source on the mainland. In two of these industry groups, paper and petroleum, the profit margin favorable to the United States has grown from 1973-76.

A second group of industries also has decreasing profit margins, although profitability is still greater in Puerto Rico (1976); this group includes fabricated metals, tobacco, machinery except electrical, chemicals, and printing industries. Firms within these industry groups will experience increased competitiveness with the U.S. mainland if the present trend continues.

Nine industries have higher returns to equity in Puerto Rico than in the United States (1976). In order of greatest profit margin, these industries include: Transportation (47.9 percent differential), instruments (8.4 percent), electrical machinery (8.1 percent), printing (6.3 percent), rubber (4.4 percent), food (2.3 percent), chemicals (2.1 percent), and machinery except electrical (1.8 percent).

ENERGY COSTS

Another potential indicator of the competitive position of Puerto Rican industries is electrical power or energy costs. These costs have become accentuated in the production processes because of the petroleum price increases in 1973-74. This fuel price increase has increased electrical power costs substantially because all of the generating plants in Puerto Rico use petroleum.

Table 17 depicts the average cost of industrial electric bills for Puerto Rico and the United States for 1963-77. In the table, the average electrical bills for Alabama and Louisiana are presented. Typical industrial electrical bills in these States represent the most and least expensive energy costs on the Gulf Coast. Hawaii is included as a comparable insular area dependent on petroleum as a fuel base for power generation. For each of the geographic areas, three scales of kilowatt-hour usage are presented to indicate the differing rates for industrial use.

In general, the cost of electricity in Puerto Rico in 1977 exceeded all other States represented. The absolute rates in Puerto Rico are \$.02 to \$.03 higher

Table 17.—Typical Industrial Electric Bills, Selected Years 1963 to 1977, Current \$/kWh

	1963	1974	1975	1977	U.S. costs as percentage of Puerto Rican		Percentage increase per kWh 1963-77
					1963	1977	
Alabama: ¹							
30,000 kWh at 150 kW	.016	.023	.034	.038	55	56	138
60,000 kWh at 300 kW	.016	.023	.034	.037	62	63	131
200,000 kWh at 1,000 kW	.010	.020	.031	.033	42	57	230
Louisiana: ²							
30,000 kWh at 150 kW	.020	.023	.024	.031	69	46	55
60,000 kWh at 300 kW	.018	.021	.022	.025	69	42	39
200,000 kWh at 1,000 kW	.016	.019	.020	.023	67	40	44
Hawaii:							
30,000 kWh at 150 kW	.025	.029	.044	.049	86	72	96
60,000 kWh at 300 kW	.024	.027	.042	.047	92	80	96
200,000 kWh at 1,000 kW	.023	.024	.038	.043	96	74	87
U.S. average:							
30,000 kWh at 150 kW	.021	.030	.039	.045	72	66	114
60,000 kWh at 300 kW	.019	.028	.037	.043	73	73	126
200,000 kWh at 1,000 kW	.017	.026	.034	.041	71	72	141
Puerto Rico:							
30,000 kWh at 150 kW	.029	.048	.054	.068	100	100	134
60,000 kWh at 300 kW	.026	.038	.045	.059	100	100	127
200,000 kWh at 1,000 kW	.024	.038	.044	.058	100	100	142

¹ Most expensive Gulf Coast State, 1977.

² Least expensive Gulf Coast State, 1977.

Source: *Typical Electric Bills*, Various Years, 1963-67, Federal Power Commission.

per kWh than in the United States in general, or the Gulf Coast States in particular. The highest comparable electric utility rates are found in Hawaii where the rates are still \$.01 per kWh lower than in Puerto Rico at most scales of consumption.

The rate differentials for both 1963 and 1977 are represented as a ratio of U.S. to Puerto Rican electrical costs, in columns 5 and 7 of the table. Using these ratios, Louisiana stands out as the low cost area.

Louisiana, the least expensive Gulf Coast State, has typical industrial electric bills ranging 60 percent lower than the average industrial electric bills in Puerto Rico. Alabama, the most expensive Gulf Coast State, has electric bills ranging on the average of 40 percent lower than the Puerto Rican cost. The average electric bill for Hawaii, while much closer to the cost of electricity in Puerto Rico, remains 20 percent below Puerto Rican costs for power. Average U.S. electric bills range generally 30 percent cheaper than the typical industrial electric bills of Puerto Rico.

Table 18 also indicates the percentage increase of cost per kWh in 1963 to 1977. At the two larger scales of consumption, the per kWh increase for both the United States and Puerto Rico remain about the same.

Comparisons of the 1963-77 period indicate that the cost of power in Puerto Rico has increased with respect to Louisiana and Hawaii. In fact, the relative cost of U.S. industrial electricity was lower in 1977 than in 1972, at the lowest pricing category (30,000 kWh at 150 kW).

The relative position of Puerto Rican and U.S. electrical cost highlights an important consideration of the changing competitiveness of Puerto Rican industries. *At all three electrical rate categories, U.S. electrical costs, while lower than Puerto Rico's, have remained relatively the same from 1963 to 1977, averaging about 70 percent of Puerto Rican electricity costs.*

Table 18.—Industry Groups Ranked by Fuel Costs: Puerto Rico-United States Comparisons

Industry group	Total fuel costs			Electricity costs		
	Puerto Rico—1972	United States—1971	United States—1975	Puerto Rico—1972	United States—1971	United States—1975
Chemicals	1	2	2	1	2	2
Petroleum	2	6	6	2	11	12
Food	3	3	4	3	3	3
Electrical machinery	4	11	11	4	7	10
Textiles	5	10	10	5	10	9
Apparel	6	15	15	6	15	15
Stone-clay-glass	7	5	5	8	9	8
Fabricated metals	8	9	8	7	8	7
Primary metals	9	1	1	9	1	1
Paper	10	4	3	12	5	4
Rubber and plastics	11	13	12	10	12	11
Instruments	12	17	16	11	18	16
Tobacco	13	20	20	13	20	20
Leather	14	19	19	14	19	19
Printing	15	16	14	17	13	14
Furniture	16	18	18	16	17	18
Machinery except electrical	17	8	9	19	6	6
Miscellaneous manufacturing	18	14	17	18	16	17
Lumber, wood	19	12	13	15	14	13
Transportation	20	7	7	20	4	5

Source: *Census of Manufacturing, Puerto Rico, 1972*, U.S. Department of Commerce, Bureau of the Census; *Annual Survey of Manufacturers, 1974*, "Fuels and Electric Energy Consumed," Preliminary Statistics for the United States, Industry Group Selected Industries, March 1977, U.S. Department of Commerce, Bureau of the Census.

The potential impact of high electricity costs by industry is shown in table 18. This table presents, for each 2-digit industry, a rank order of total fuel costs for three time periods. Information available for Puerto Rican industries was limited to 1972. U.S. industrial fuel costs for 1971 are presented for comparison. U.S. fuel costs for 1975 are presented to determine if any possible structural shift occurred within the industry groups in the 1972-75 time period.

It appears from this table that technological advancement or structural change has not occurred in the U.S. industries from 1971-75. Thus, the cost differences that existed between Puerto Rico and the United States among industry groups in 1972 probably exist today.

The rank order of industries most impacted by fuel costs or electrical energy costs in Puerto Rico include: Chemicals, petroleum, food, electrical machinery, textiles, apparel, stone-clay-glass, fabricated metals, primary metals, and paper.

Exaggerated energy cost differences occur in a number of industries, U.S./Puerto Rico. The U.S. subsidiary industries in Puerto Rico may perform a particular production function which consumes more power or the level of aggregation may totally mask different production processes within one industry group.

Comparisons of the percentage of electricity as total fuel costs for Puerto Rican industries with U.S. industries show that, for the most part, Puerto Rican industries spend more money on electricity than on fuel. (See table 19.) Only four industries in Puerto Rico have a lower percentage of electricity costs to total energy costs than their U.S. counterpart industries. These industries include printing, electrical

machinery, fabricated metals, and stone-clay-glass. The food industry, in the United States and Puerto Rico, consumes about the same proportion of electrical power with respect to total energy cost.

The division of electrical power cost into electrical energy cost and other fuels becomes important when considering the tradeoff between space heating and natural electrical power cost in Puerto Rico. Total fuel costs for industries primarily located in the industrial heartland of the United States are in the northern regions and may spend proportionately less money on electricity for lighting and operation of processing machines, but more on fuel oils for space heating in the winter months.

In order to determine the impact of high electrical costs in Puerto Rico and its influence on the competitiveness of particular industry groups, it is necessary to know not only the absolute cost of fuels (see table 19), but to identify those industries whose fuel costs are high in proportion to total value added. Table 20 shows, for each industry group for selected time periods, the energy costs as a percentage of value added for the U.S. and Puerto Rican 2-digit industry groups. As indicated in the table for all time periods, the top five industries remain constant for both Puerto Rico and the United States. These industries, petroleum, primary metals, paper, chemicals, textiles, and stone-clay-glass, carry the greatest proportion of value added associated with electrical fuel energy costs. Much smaller proportions of energy costs (less than 1.5 percent) are associated with leather, tobacco, furniture, printing, apparel, machinery except electrical, and instruments industries in Puerto Rico.

By comparing table 19 with table 20, and selecting industries that consume the greatest amount of electricity and those whose electrical costs are a high proportion of value added, the industry groups in Puerto Rico that are in a poor competitive position relative to energy costs may be identified; those industries include petroleum, chemicals, textiles, food, and electrical machinery. Miscellaneous manufacturing industries, machinery except electrical, printing, furniture, and transportation, as these industries now exist, have a better position relative to industries in the United States.

Fuel and energy costs are also important when reduced profits and other factors of value added are evaluated. Table 21 shows the percentage of value added associated with labor, fuel and electrical costs, and profits for Puerto Rico in 1972. A high proportion of value added in fuel and electrical energy costs, combined with a high proportion of value added in labor costs, plus a low profit, identifies those industries which are less competitive in Puerto Rico, and therefore sensitive to changes in electricity and energy costs.

Table 19.—Electricity Cost as a Percentage of Total Fuel Costs: United States-Puerto Rico comparisons

Industry group	1972 Puerto Rico	1971 United States	1975 United States
Tobacco	92	51	49
Instruments	90	60	59
Textiles	87	60	60
Furniture	87	64	63
Rubber and plastics	85	67	63
Leather	85	60	58
Apparel	80	75	74
Lumber/wood	78	46	45
Machinery except electrical	77	63	63
Transportation	74	64	61
Printing	72	75	73
Primary metals	71	45	41
Electrical machinery	67	70	70
Paper	61	36	30
Fabricated metals	57	60	57
Chemicals	52	47	43
Food	48	48	43
Petroleum	34	30	23
Stone-Clay-Glass	28	31	30

Source: *Census of Manufacturing, Puerto Rico, 1972*, U.S. Department of Commerce, Bureau of the Census; *Annual Survey of Manufacturers, 1974*, "Fuels and Electric Energy Consumed," Preliminary Statistics for the United States, Industry Group Selected Industries, March 1977, U.S. Department of Commerce, Bureau of the Census.

Table 20.—Industry Group Energy Costs as a Percentage of Value Added: Puerto Rico-United States Comparisons

Industry group	Total fuel costs						Electricity costs						1975 United States	
	1972 Puerto Rican		1971 United States		1975 United States		1972 Puerto Rican		1971 United States		1975 United States		Value added (1972 dollars = 100)	Rank
	Value added	Rank	Value added	Rank	Value added	Rank	Value added	Rank	Value added	Rank	Value added	Rank		
Petroleum	21.9	1	11.3	1	17.0	1	7.4	1	3.4	2	4.0	4	7.1	1
Primary metals	8.8	2	9.9	2	15.0	2	6.1	2	4.5	1	6.2	1	7.1	2
Paper	6.9	3	7.5	4	12.2	3	4.1	3	2.7	3	3.7	5	4.2	4
Chemicals	6.1	4	5.7	5	9.6	5	3.1	5	2.7	4	4.1	3	5.4	3
Textiles	4.1	5	4.0		7.2		3.5	4	2.4	5	4.3	2	4.0	5
Stone-Clay-Glass	3.6		7.7	3	11.9	4	1.4		2.4		3.6		3.8	
Rubber and plastics	3.3		2.8		4.7		2.7		1.9		2.9		3.1	
Food	2.8		2.6		3.9		1.3		1.3		1.7		1.9	
Fabricated metals	2.5		2.0		2.8		1.4		1.2		1.6		1.9	
Electrical machinery	2.3		1.4		2.0		1.6		1.0		1.4		1.4	
Lumber and wood	1.8		4.3		5.4		1.2		2.0		2.4		2.3	
Transportation	1.6		1.4		2.2		1.1		.9		1.4		1.3	
Leather	1.5		1.5		2.2		1.3		.9		1.3		1.1	
Tobacco	1.4		.8		1.3		1.3		.4		.6		.6	
Furniture	1.4		1.6		2.2		1.2		1.0		1.4		1.3	
Printing	1.2		1.0		1.3		.8		1.8		.9		1.0	
Apparel	1.1		1.1		1.5		.9		.8		1.1		1.0	
Machinery except electrical	1.0		1.5		1.8		.7		1.0		1.2		1.2	
Instruments	1.0		1.0		1.4		.9		.6		.8		.9	
Miscellaneous manufacturing	1.0		2.4		2.1		.9		1.6		1.3		1.3	

¹ Estimates for lumber and wood, and furniture are aggregated.

Source: *Census of Manufacturing, Puerto Rico, 1972*, U.S. Department of Commerce, Bureau of the Census; *Annual Survey of Manufacturers, 1974*, "Fuels and Electric Energy Consumed," Preliminary Statistics For the United States, Industry Group—Selected Industries, March 1977, U.S. Department of Commerce, Bureau of the Census.

Industries with relatively high energy costs, but also with high profits to value added ratio include petroleum, chemicals, stone-clay-glass, fabricated metals, and electrical machinery. Of these industries, the chemical, electrical machinery, and fabricated metal industries have such a high profit to value added ratio that additional power costs will not hurt their competitive position. Industries whose

competitive positions are less sensitive to increased power costs are machinery except electrical, apparel, instruments, and miscellaneous manufacturing.

SUMMARY AND CONCLUSIONS

Four major data sets are reviewed in the analysis of the competitive position of Puerto Rican industry. Two cost factors are considered, labor and power. Labor productivity and industry group profitability are the remaining quantifiable factors considered. The analysis has not considered a variety of intangible as well as demand factors that often influence an industry's competitive position.

The analytic results summarized below reflect discussions with industrial leaders and public officials in Puerto Rico, a careful review of available literature, and the analysis documented in this chapter. A summary of the results follows:

1. The data required to conduct a detailed analysis of Puerto Rico's competitive position internationally is not available. The only comparable data available were labor costs for selected countries. These data indicate that Puerto Rico remains competitive in labor costs relative to developed nations.²

¹ Ranked in top 10 industry groups.

² Lumber and wood and furniture and fixtures aggregated in base data set.

Source: *Census of Manufacturing, Puerto Rico, 1972*, U.S. Department of Commerce, Bureau of the Census.

2. The imposition of U.S. minimum wage regulations on Puerto Rico could negatively impact the island's competitiveness in a number of industries. First, the U.S. minimum wage may increase the disparity between Puerto Rico and the Caribbean region. Some production units could relocate to nearby islands; and in some instances (e.g., confectionery, cookies and crackers) final product pricing by the island's industries may not be competitive. Second, while Puerto Rican wage rates remain below U.S. rates, the differential could decrease.

3. A single indicator of the competitive position of Puerto Rican industries is difficult to isolate. However, the profit to equity comparison with U.S. industries is probably the most important investment criterion presented.

4. Wage rate comparisons by industry group between the United States and Puerto Rico indicate that 9 of 20 industry groups reviewed were in a better competitive position in 1977 than they were in 1973 (before minimum wage). Those industries with increasing labor-cost competitiveness and relatively low wage rates with respect to the United States include: Machinery except electrical, electrical machinery, lumber and wood, rubber and plastic, and fabricated metals.

Other industry groups with favorable wage rates include tobacco and instruments.

5. Two quasi-productivity indices are reviewed in the analysis: Value added per employee, and value added per dollar of payroll. Industries which show the greatest productivity advantage over similar U.S. groups using these measures include: Chemicals, fabricated metals, machinery except electrical, and primary metals.

6. Two profitability indices were reviewed. Of these, profit to equity for each industry group is probably the most important. Industries with the best profitability relative to similar U.S. industries include: Electrical machinery, instruments, and apparel.

7. A comparison of energy costs for each industry group shows that the relative competitiveness of energy as a factor of production in Puerto Rico has changed little through 1972. Electrical power costs in Puerto Rico have always been approximately 30 percent higher than average industrial electrical power costs in the United States. OPEC price increases since 1973 may have altered the relative competitiveness of Puerto Rican energy users, even with entitlements. As U.S. oil prices rise to world levels, however, Puerto Rico's relative position may not appear as adverse as the recent past (1974-77) would tend to indicate.

Electrical power costs, however, have increased significantly in Puerto Rico and in the United States from 1963 to 1977. Industries that are most affected by these power cost increases include: Chemicals, instruments, printing, apparel, and miscellaneous manufacturing.

Table 22 ranks industry groups against the four major indicators used in this analysis. The initial column listing is ranked by rate of employment growth from 1967 to 1976. The industry considered most competitive in each category is listed as number one (1).

While comparisons across the data sets are spurious, a number of industry groups in Puerto Rico continue to be strong competitors with respect to their U.S. counterparts. These industries include: Machinery except electrical, instruments, electrical

Table 22.—Competitive Position of Puerto Rican Industries

Ranked by employment growth 1967-76	Labor cost competitiveness	Value added per worker	Value added per dollar of payroll	Profit to sales	Profit to equity	Fuel cost as a proportion of value added
Chemicals	Competitive	Very high	Very high	Very high	Competitive	Low
Machine except electrical	Very high	Very high	Very high	Very high	Competitive	Very high
Instruments	Very high	Competitive	Competitive	Very high	Very high	Very high
Wood products	Very high	Very low	Very low	Very low	Competitive	Competitive
Electrical machinery	Very high	Competitive	Very high	Very high	Very high	Competitive
Petroleum	Competitive	Very high	Competitive	Very low	Low	Very low
Fabricated metals	Competitive	Very high	Very high	Very high	Low	Competitive
Food	Competitive	Low	Very high	Competitive	Competitive	Low
Printing	Competitive	Competitive	Competitive	Low	Competitive	Very high
Paper	Competitive	Low	Very low	Low	Very low	Very low
Primary metals	Very low	Very high	Competitive	Very low	Very low	Very low
Rubber and plastics	Competitive	Very low	Very low	Competitive	Competitive	Low
Apparel	Low	Competitive	Low	Competitive	Very high	Very high
Miscellaneous manufacturing	Low	Competitive	Competitive	Competitive	Very high	Very high
Stone-clay-glass	Very low	Low	Low	Very low	Low	Low
Tobacco	Very high	Very low	Very low	Competitive	Low	Competitive
Furniture	Very high	Competitive	Competitive	Low	Competitive	Competitive
Textiles	Low	Competitive	Competitive	Competitive	Very low	Low
Transportation	Low	Very low	Low	Low	Very high	Competitive
Leather	Competitive	Low	Low	Competitive	Competitive	Competitive

¹ Furniture and wood products combined.

Source: Derived by ILED.

machinery, chemicals, fabricated metals, apparel, and miscellaneous manufacturing industries.

A second set of industries appears competitive but does not carry consistently high ratings in each of the variables considered. The industries in this set include: Printing, furniture, food, rubber and plastics, and leather.

A final set of industries demonstrates a relatively poor competitive position relative to their counterpart industries in the United States. These include: Tobacco, transportation, textiles, wood products, petroleum, primary metals, paper, and stone-clay-glass.

Chapter VI.—The Puerto Rican Industrial Incentives Program

INTRODUCTION

Incentives for investment were a major element in the ambitious Puerto Rican economic development program which was designed to transform the island's economy from an essentially single agricultural crop economy to an industrial economy. The major thrust of Operation Bootstrap was to develop manufacturing as the "lead" sector in the generation of income and employment. The strategy was to develop the sector by exploiting Puerto Rico's cost advantages, especially its low wages, and by taking advantage of its free access to the U.S. mainland's commercial and financial markets.

Chapter V discussed the significance of Puerto Rico's wage structure. This chapter will focus on the financial incentives, the Investment Incentives Act, and Puerto Rico's government loans to industry. From an investment incentives perspective, the most important aspect of the Federal relationship was the ability of subsidiary U.S. domestic corporations investing in Puerto Rico to qualify as "possessions corporation" under section 931 of the Internal Revenue Code, and thus be able to exclude Puerto Rican operations income from corporate taxes. To further increase its attractiveness to external investors, Puerto Rico initiated its own tax incentives program in 1947. Firms meeting certain gross income and line of production requirements and qualified individuals receiving income from these firms became exempted from Commonwealth corporate and partnership income and real property taxes, and from municipal levels. The Commonwealth also began providing real estate facility subsidies, worker training, and industrial loans.

With respect to tax incentives, this chapter (1) describes the nature of the special U.S. tax status accorded possessions corporations, (2) examines the influence of the U.S. and Puerto Rican tax laws on firms' tax planning and investment behavior, (3) provides a conceptual framework for evaluation of

tax incentives, and (4) appraises recently approved modifications in the existing program.¹

FEDERAL AND PUERTO RICAN INDUSTRIAL TAX STRUCTURES

Federal Structure Prior to 1976 Tax Reform Act

Prior to the Tax Reform Act of 1976, most manufacturing corporations in Puerto Rico operated under Section 931 of the Internal Revenue Code as "possessions corporations." In order to qualify for 931 status, a firm was required to meet two gross income tests:

- Eighty percent or more of its gross income, including income from investments, for a 3-year period preceding the close of the taxable year, had to be derived from sources within a U.S. possession; and
- Fifty percent of corporate gross income had to be derived from the "active conduct of a trade business within a possession of the United States."²

Once the status was attained, a Puerto Rican based section 931 corporation could exclude from its gross income any income from sources outside the United States (the 50 States plus the District of Columbia). By avoiding earning or income within the United States, the section 931 firm could be completely exempt from Federal taxes. If these firms were also recipients of a Puerto Rican tax

¹ On June 2, 1978, the Commonwealth Legislature approved several revisions to the existing tax incentives program which were submitted by Governor Romero Barcelo. The new law permits business firms to choose between the existing programs and the newly accepted proposals. Accordingly, references will be made to both the "existing" (pre-June 1978) and "proposed" (post-June 1978) tax exemption programs.

² In addition to Puerto Rico, American Samoa, Guam, the Canal Zone, and certain Pacific Islands are considered as U.S. possessions for tax purposes. The possessions corporation is, however, largely a Puerto Rican phenomenon. Of 624 firms currently operating under the Tax Reform Act of 1976, 612 are in Puerto Rico. Data provided by U.S. Department of the Treasury, Office of Tax Analysis, May 1978.

exemption, as was usually the case, their earnings could be free from any corporate income tax.

The section 931 corporations' earnings were taxable upon being returned to the United States directly, or in the case of a subsidiary, repatriated to the U.S. parent. Dividends paid from a possessions corporation were not eligible for the intercorporate dividends received deduction (unless the subsidiary section 931 failed to meet the 80 percent and 50 percent of gross income tests in the year in which the distribution was made and in the preceding taxable year, in which case it lost its possession corporation status). On the other hand, since a possessions corporation was considered a domestic corporation, no recognition of gain or loss was required by its domestic parent on dividends distributed in complete liquidation into the parent.

A section 931 corporation could participate in the filing of a consolidated return in any year in which it failed to satisfy the section 931 gross income requirements or, as was the usual case, in which it incurred a loss. Thus, the parent of a section 931 corporation could avoid taxes in profitable years and offset losses in unprofitable years.³

Puerto Rican Structure Prior to 1976 Tax Reform Act

The Puerto Rican Tax system consists of income, excise, property, estate and gift, and various license taxes—with income and excise taxes providing almost 80 percent of total tax revenue. The Puerto Rican corporate income tax is similar to that of the United States, except for its rates, depreciation system, and allowance of special industrial incentive exemptions.⁴

The island's first modern industrial incentives law, enacted in 1947, not only provided exemption from income, property, and municipal taxes, but also offered subsidies to new industries in the form of outright cash grants to offset startup costs, real estate facilities, worker training programs, and low interest loans. Although it was initially intended that the tax concessions be phased out by 1962, the Commonwealth further extended the tax incentives in 1954 and 1963. Under existing arrangements provided by the Industrial Incentives Act of 1963,⁵

³ Robert S. Holbrook, "A Study of the Characteristics, Behavior, and Implications of 'Possessions Corporations' in Puerto Rico," A Report to the Office of Tax Analysis, U.S. Department of the Treasury, October 1, 1977, p. 18.

⁴ For further discussion see Fuat M. Ardic and Arthur J. Mann, "Redesigning Puerto Rico's Tax System: An Overview," Bulletin for International Fiscal Documentation, May 1975, p. 188, and Donald W. Klefer, *Treating Puerto Rico as a State Under Federal Tax and Expenditure Programs: A Preliminary Economic Analysis* (Washington, D.C.: Congressional Research Service, Library of Congress, September 1977), Report 77-202-E, p. 9.

⁵ Act 57, Laws of 1963. This discussion is based on information from (a) Commerce Clearing House, Inc., *Topical Law Reports: Puerto Rico* (Chicago: CCH, 1978) and (b) *What You Should Know About Taxes in Puerto Rico*, Department of the Treasury, Commonwealth of Puerto Rico, San Juan, 1976.

qualifying manufacturing corporations are given exemption from the net income tax, real and personal property taxes, and license fees, excise or other municipal taxes levied by any municipal ordinance. In the case of commercial hotels and guest houses, the exemption is limited to 50 percent of these taxes. Liquidating dividends paid by a tax exempt subsidiary to its parent corporation are also exempt, providing the parent owns 80 percent or more of the subsidiary's stock. A U.S. "possessions corporation" thus could have both a Federal tax-free status and be exempt from Puerto Rican taxes. With one important exception (see discussion of the tollgate tax below), these exemptions are still available to most manufacturing firms operating on the island.

Like the exemption itself, the criteria for eligibility for exempt status under the Industrial Incentives Act are quite liberal. To be exempt, a firm need only do one of the following: (1) produce or seek to produce on a commercial scale in Puerto Rico any manufactured product which was not produced on such scale on or before January 2, 1947—the year when the first tax exemption law was enacted; (2) manufacture one or more of 38 designated product categories ranging from tin containers to films; (3) lease property devoted to industrial development; (4) operate a tourist or commercial hotel (subject to certain conditions); or (5) operate various scientific and laboratory concerns.

The length of the tax exemption period ranges from 10 to 30 years, depending on the geographical location of the firm. In general, the exemption period increases as one moves away from the high industrial development zone of San Juan (10 years) toward the industrial development zones on the central and southern parts of the main island (15 to 25 years), or toward the neighboring islands of Vieques and Culebra (30 years).

Commencement of a firm's exemption status begins with the start of business operations. However, an exempt firm may also take advantage of several options to the basic exemption plan in order to increase its profitability. First, the firm may elect to have its exemption postponed up to 4 years in order to defer its tax holiday until its operations become profitable. This option to defer the exemption, however, may be abandoned during this period if the business notifies the Commonwealth. Another option provides for the deferral of income tax only.

Furthermore, two types of partial exemptions are available. The first is open to any firm and provides for the doubling of the exemption period as a trade-off for reducing the size of the exemption from 100 percent to 50 percent. Once a firm elects partial exemption, that election is irrevocable.

A second type of partial exemption can be granted

by the Governor in cases where it is determined that, due to foreign competition, a firm must perform part of its manufacturing process outside Puerto Rico. Under these circumstances, a partial exemption of 60 percent to 70 percent of all exemptions may be granted. The 70-percent factor applies when 50 percent or more of the firm's total cost of labor involved in production of the exempt product is attributable to Puerto Rico. The partial exemption of 60 percent is granted if it is established that the Puerto Rican share of the firm's labor cost is between 40 percent and 49 percent total labor cost.

By statute, these exemptions may be revoked by the Governor under a variety of conditions which define the failure of the firm to comply with its legal obligations. In practice, however, revocation has been rare.

Changes in Corporate Taxation Resulting From 1976 Tax Reform Act

Treatment of Possessions Corporations.—The Tax Reform Act of 1976 replaced IRS Code Section 931 language for corporations with a new section 936, which changes several features of the Federal tax exemption provided to possessions corporations.

The sections 931 and 936 gross income requirements are the same. However, the mechanism for tax abatement is changed. Under section 931, qualifying gross income (non-U.S. source) was simply excluded for tax purposes; under section 936, there is an automatic tax credit. Although a section 936 firm is technically a fully taxable entity, it is permitted a tax credit equal to the U.S. tax due on its section 936 income, i.e., on income from the active trade or business in a possession or from qualified possessions source investment. Income must be derived from the investment of trade or business income from the same possession.

By clearly requiring that the qualified investment funds be derived from the same possession in which the section 936 does business, the practice of section 931 firms receiving tax exempt income and investment outside Puerto Rico is eliminated. For example, this new definition precludes the practice of section 931 firms using financial intermediaries in Guam, a U.S. possession, as a conduit for Eurodollar investments.

Once a corporation elects "possessions status" under section 936, it must maintain that status for 10 years, with revocation possible only with the consent of the U.S. Secretary of the Treasury. Unlike a section 931 firm, the section 936 firm cannot change its filing status in order to become eligible for the dividends received deduction and participate in a consolidated return with its parent. Although this new treatment has a theoretical appeal from the

viewpoint of limiting a firm's ability to flip in and out of possessions status, it will have little practical effect on tax planning behavior of a firm. Changing status under section 931 was usually not practical since the corporation was required to pay U.S. income taxes on its current manufacturing and investment income exempt for Puerto Rican income taxes in the year it did not meet the requirements of section 931.⁶

A significant difference between sections 931 and 936 is that a parent of a section 931 firm was generally ineligible for the intercorporate dividends received deduction. A section 936 firm can distribute its dividends to its U.S. parent at any time and receive: (a) 100-percent dividends received credit if 80 percent or more of the firm is owned by a U.S. corporate shareholder, or (b) an 85-percent credit. Further, these dividends received deductions are available for dividends paid out of both current section 936 earnings and accumulated section 931 earnings. However, unlike section 931, the new law prohibits a parent corporation from taking a foreign tax credit or deduction from section 936 income on taxes levied by a foreign country or possession (e.g., a Puerto Rican levied tax) on section 936 income. The foreign tax credit is available, however, for taxes paid on income ineligible for section 936 status.

Major differences between sections 931 and 936 are summarized in table 1.

Puerto Rican Tollgate Tax.—Section 936 Federal tax treatment of possessions corporations not only continues a tax holiday for these possessions corporations on both nonrepatriated earnings and liquidated dividends, but also provides a tax-free status on dividend repatriations made at any time during its life.

The Commonwealth's reaction to these tax advantages was to enact a basic tax of 10 percent on the amount of Puerto Rican derived earnings repatriated to mainland parents.⁷ This 10-percent tax can be reduced to less than 5 percent (or to zero in the case of complete liquidation) if the section 936 firm's investment portfolio meets certain conditions.

The major features of the tollgate tax statute are as follows:

- A 10-percent tax on dividends paid by a Puerto Rican firm to its nonresident parent (e.g., a firm organized in the United States which does not

⁶ Barry A. Woods and Michael Abrutyn, "How the TRA Changes Tax Climate for Using Possessions and WHTC Corporations," *Journal of Taxation*, February 1977, p. 96.

⁷ Prior to the 1976 Tax Reform Act and Puerto Rico's enactment of the tollgate tax (Acts Nos. 95 and 96, June 1, 1976), the Commonwealth levied a 15-percent tax on dividends paid by Puerto Rican shipping, hotel, or manufacturing firms to nonresident parents. However, that 15-percent tax was applied only if the parent could not claim a foreign tax credit for the Commonwealth tax. As a result, the effective Puerto Rican rate was zero. The 10-percent tollgate enacted with the passage of the Tax Reform Act is applicable even when the nonresident parent is denied a foreign tax credit.

Table 1.—Comparison of Statutory Provisions Under Internal Revenue Code Sections 931 and 936

I. Possessions Corporation (Definition) Section 931	Section 936
<p>A. <i>Domestic Corporation</i> (A corporation organized under the laws of one of the 50 States, D.C., or the Federal Government) must meet two gross income tests.</p> <ol style="list-style-type: none"> 1. 80 percent or more of gross income for a 3-year period immediately preceding the close of the taxable year or applicable part thereof was derived from sources <i>within</i> a U.S. possession. 2. 50 percent of such corporate gross income must have been derived from the "active conduct of a trade or business within a possession of the United States." <p>B. <i>DISC</i>: A corporation which is a DISC, former DISC, or holds stock in a DISC or former DISC is ineligible.</p> <p>C. <i>Consolidated Return</i>: A firm could file a consolidated return with its parent even if:</p> <ol style="list-style-type: none"> 1. It operated at a loss in the return year. <p>D. <i>Dividends Deduction</i>: The parent to be eligible for a dividends received deduction resulted from:</p> <ol style="list-style-type: none"> 1. a failure to qualify of a Section 931 for 2 years. 	<p>A. Same as for Section 931</p> <p>B. Same as for Section 931</p> <p>C. <i>Election</i>: Once a corporation elects "possessions status," that election must remain in effect for 10 years. Revocation is possible with the consent of the Secretary of the Treasury. A possessions corporation may not flip in and out of Section 936 status to file a consolidated return.</p>
II. U.S. Tax Treatment of Possessions Corporations	
<p><i>General</i>: Income exclusion gross income not received in the United States was excluded from gross income for corporate tax purposes if the 80 percent and 50 percent tests were met.</p>	<p><i>General: Possession Tax Credit Mechanism</i></p> <ol style="list-style-type: none"> A. Electing domestic corporations with Section 936 income (meeting the 80-percent and 50-percent requirements) are not fully taxable entities. B. However, Section 936 corporations are permitted an automatic tax credit equal to tax due on their Section 936 income, i.e., from tax on earnings. <ol style="list-style-type: none"> 1. from sources without the United States from the active conduct of a trade or business within a possession and, 2. from "qualified possession source investment income." "Qualified possessions source investment income" is gross income (minus allocable deductions) attributable to the investment in a possession for use therein. Possessions source investment income which fails to satisfy the "for use therein" condition, is subject to U.S. tax and is taken into account for purposes of determining eligibility for the gross income requirement. C. The possessions tax credit cannot be taken against taxes relating to the minimum tax, accumulated earnings tax, or the personal holding company tax, war loss recoveries of foreign expropriation losses—taxes imposed separate from the corporate normal tax and surtax.
III. Repatriation of Earnings	<ol style="list-style-type: none"> A. Section 931 dividends <i>ineligible</i> for the dividends received deduction applied to dividends received by a U.S. (e.g., parent) corporation. B. Any intercorporate dividends received from a Section 931 were subject to the full U.S. corporate tax. However, any Puerto Rico tax paid by the subsidiary for the (Sec. 901, 902) foreign tax credit was allowable.
IV. Liquidation—Sections 931, 936	<ol style="list-style-type: none"> A. Intercorporate dividends <i>can</i> be distributed by a possessions corporation to its parent and receive: <ol style="list-style-type: none"> 1. 100-percent dividends received deduction if the Section 936 is 80 percent or more owned (e.g., wholly owned subsidiary) by U.S. corporate shareholder 2. 85 percent otherwise. B. This intercorporate dividends received deduction is available for dividend distributions paid out of <i>both</i> <ol style="list-style-type: none"> 1. current (Sec. 936) earnings 2. accumulated Section 931 earnings C. No foreign tax credit or deduction may be taken by a parent on taxes levied by a foreign country or possession (e.g., tollgate tax)
<p>Liquidation distributions from and earnings of Sections 936 or 931 firms to the parent are free of U.S. tax under the nonrecognition provisions by which liquidating distributions by a subsidiary to its parent are tax free.</p>	

carry on an active business or trade with the islands) on dividends paid from industrial development income (income exempt from the Puerto Rico income tax). This 10-percent rate also applies to dividends paid from nonexempt incomes generated by hotels, shipping, and manufacturing operations.

- Elimination of the tax exemption on dividends paid from industrial development income to resident foreign corporations (i.e., parent company actively engaged in trade or business in Puerto Rico). These foreign resident firms are, however, permitted an 85-percent intercorporate dividends received deduction. As a result, the maximum rate applied to these firms is 6.75 percent (45 percent \times 15 percent).
- A tax rate of 7 percent is applied to dividends paid to a nonresident parent if: (a) dividends are paid out of accumulated section 931 funds (industrial development income accumulated prior to October 1, 1976) so that (i) no more than 25 percent of such dividends are paid during the year and (ii) an equal amount of funds are invested in Puerto Rico during the taxable year in which the distribution is made; or (b) the dividends are paid out section 936 funds to industrial development income paid to resident or nonresident parent accumulated after September 30, 1976, so that (i) the distribution does not exceed 75 percent total industrial development income accumulated during the year and that (ii) at least 25 percent of the total industrial development income shall be invested in Puerto Rico for a period in excess of 8 years.
- A manufacturer's investment tax credit against tollgate tax equal to 3 percent. A firm may also take a manufacturer's investment tax credit against the tollgate tax equal to 3 percent of the investment made by a U.S. subsidiary in its acquisition, construction, and extension of buildings and other structures used in manufacturing in excess of the subsidiary's investment held on March 31, 1977, or after its second year of tax exemption. This credit may be carried over to following taxable years.
- Full exemption on dividends paid from industrial development income derived from interest received from the following Puerto Rican investments (hereafter referred to as section "2j" investments): (a) obligations of the Commonwealth or any of its instrumentalities or political subdivisions, (b) mortgages secured by the Housing Bank and Finance Agency of Puerto Rico (acquired after March 31, 1977), (c) loans and other securities with mortgage security granted by any Commonwealth or local pension or retirement plan (acquired after March 31, 1977).

Once these tollgate tax rules were established,

legal issues arose regarding the ability of the Commonwealth to tax a firm which had both foreign and Puerto Rican source income and which, ostensibly, paid some of its dividends out of non-Puerto Rican income. Accordingly, the Commonwealth Government issued Administrative Declaration 77-1 in December 1977, which reduced the effective tollgate tax rate on dividends paid by possessions corporations to their U.S. parents not engaged in trade or business in Puerto Rico from a maximum 10 percent, 7 percent to 5 percent, or 3.5 percent. In the case of the U.S. parent actively engaged in trade or business in the island, the maximum tax can be reduced from 6.75 percent to 3.375 percent.

Under the terms of this ruling, a section 936 firm with foreign source income may declare that up to half its repatriated dividends to the U.S. parent are from foreign sources and, therefore, free of the Puerto Rican tollgate. That is, a section 936 may repatriate accumulated earnings derived from non-Puerto Rican sources if it declares a dividend of an identical amount from sources within Puerto Rico. For example, if a firm has \$5 million in foreign earnings (e.g., Eurodollar interest) and \$15 million in Puerto Rican sources, it may declare up to \$10 million in repatriated dividends to its nonresident parent, and allocate half of that repatriated amount to the foreign source income. The result: The tollgate tax is levied on only the Puerto Rican half of the \$10 million. By qualifying under terms of the "normal" 7 percent or zero tax rates, and/or the 3 percent investment credit, the effective rate on the total repatriation can be reduced below 5 percent.

Changes in the Puerto Rican Industrial Incentives Program

In June 1978, the Romero-Barcelo Administration enacted a series of changes in the Puerto Rican tax exemption program into law. The new program provides for a partial, rather than full income and property tax exemption, a modest employment incentive program, and a tax conversion system designed to encourage the change from the "old" to the "new" incentives program. The major reform proposals are summarized below.

1. *Existing Grants Continued.*—Firms operating under earlier tax exemption grants—or which have applications pending under current law—are guaranteed that existing arrangements will be maintained, unless voluntary conversion to the new system is made.

2. *Partial Exemption Income and Property Taxes.*—New grants of tax exemption will vary by location and time periods. The system will provide exemptions from corporate income and property taxes be-

ginning at higher percentages during the early years of operation, and decreasing according to the number of years applicable in the geographical zone in which the firm has been established. The exemption equals 90 percent of corporate taxes in the first 5 years, and 75 percent for the fifth through tenth years for all island locations. After the first 10 years, the exemption vanishes in the "high development" San Juan zone, and declines in the remaining zones (see table 2).

Table 2.—Percentage of Total Exemption by Geographical Location

Zone	Time period (years)				
	1-5 years	6-10 years	11-15 years	15-20 years	20-25 years
High development	90	75			
Intermediate development	90	75	65		
Low development	90	75	65	55	
Viques and Culebra	90	75	65	55	50

Source: Government of Puerto Rico, Industrial Incentive Committee, *Economic Analysis of the Industrial Incentive Program of Puerto Rico*, Administration for Economic Development, Office of Economic Studies, February 1978, p. 328.

Once the initial grant period expires, every manufacturer may apply for 10 years of additional tax exemption based on the following geographical conditions:

Table 3.—Percentage of Extension Exemption by Geographical Location

Zone	Time period (years)	
	1-5 years	5-10 years
High development	50	35
Intermediate development	50	35
Low development	50	45
Viques and Culebra	50	50

Source: Government of Puerto Rico, Industrial Incentive Committee, *Economic Analysis of the Industrial Incentives Program of Puerto Rico*, Administration for Economic Development, Office of Economic Studies, February 1978, p. 334.

3. Municipal and Excise Taxes.—Complete exemption will continue for municipal license fees and taxes and for excise taxes for the duration of the grant.

4. Specific Dollar Exemption.—Corporations earning less than \$500,000 may exclude the first \$100,000 of industrial development income from taxation.

5. Payroll Deduction.—All corporations, including those which are eligible for but do not claim the \$100,000 exemption, may deduct an extra amount equal to 5 percent of production payroll costs from taxable industrial development income. This payroll deduction cannot exceed 50 percent of such income.

6. Tollgate Tax.—The new system will provide the following options for dealing with repatriation of

earnings: (a) Paying 10 percent tollgate tax on earnings repatriated at any time; or (b) paying a tollgate tax reduced to 5 percent if the corporation invests 50 percent of any given year's earnings in designated investments (the "2j" financial investments noted above and/or new plant and equipment, local bank saving certificates and construction loans), and then repatriate the remaining 50 percent (or amounts up to 50 percent) in equal amounts over a 5-year period. At the beginning of the sixth year, firms can withdraw the locally invested 50 percent of earnings at the reduced 5 percent tollgate charge.

For the first time, Puerto Rican tax would be imposed upon amounts distributed in liquidation of a subsidiary. The tax would be 4 percent on all repatriated earnings and cannot be taken by the U.S. parent as a tax credit (under U.S. tax laws) against its U.S. corporate net income tax.

7. Export and Service Industries.—Export oriented service firms, (e.g., scientific research, consulting, industrial repair, appliance repair, mail order operations), will receive 10, 15, or 20 years of 50 percent tax exemption from property and corporate taxes depending on their geographical location, providing that (a) the services are supplied outside Puerto Rico, (b) 80 percent of the employees are Puerto Rican residents, and (c) 80 percent of the invoice value is performed in Puerto Rico.

8. Apparel, Leather, and Textile Firms.—A special additional 5-year exemption of 90 percent is to be granted to firms in leather, apparel, and textile industries which have plants with tax exemptions expiring during the next 5 years.

9. Plant Expansions.—Present law generally requires that every exempt expansion be operated as a separate industrial unit without substantial use of common facilities, unless the investment in the original unit is at least \$2.5 million and the investment in expansion is at least \$1.0 million. The proposed law would eliminate the dollar investment conditions and permit the Governor, at his discretion to issue a new exemption to a totally integrated expansion in any case. This would permit the allocation of the firm's profits to the expansion.⁸

10. Conversion to New System.—Exempt manufacturing businesses operating under existing grants may elect to convert to the new industrial incentives program. Those firms converting will continue receiving full exemption from property and license taxes. But they will be subject to a low rate net income tax, with maximum effective rates ranging between 3 percent and 12 percent, depending on the number of years remaining in the original grant. See table 4.

⁸ Angel L. Castro, "Tax Bill and the Manufacturer," *Caribbean Business News*, May 11, 1978.

Table 4.—Maximum Effective Tax Rates Under Proposed Conversion

Years of exemption remaining at conversion	Exemption from Income tax (percentage)	Maximum effective rate on total income (percentage)
1-4	73.3	12.0
4-8	77.7	10.5
8-12	85.3	7.5
12-16	90.0	4.5
16-20	91.1	4.0
More than 20	93.3	3.0

Source: Compiled from data in: Government of Puerto Rico, Industrial Incentive Committee, *Economic Analysis of the Industrial Incentive Program of Puerto Rico*, Administration for Economic Development, Office of Economic Studies (Feb. 1978).

The objective of this section in the amended IIA would appear to be the desire to avert the possible closure of firms reaching the end of their exemptions under the earlier IIA. By extending the time period of the exemption, albeit at a lower exemption level, the Puerto Rican authorities are aware of the need to expand the potential taxable base and the importance of bringing the existing investments within the structure of the new IIA.

Firms with accumulated profits may repatriate those earnings to their U.S. parent at reduced tollgate tax of 4 percent provided that:

- Pre-January 1, 1973, earnings be distributed equally within 2 years, and
- One-half (50 percent) of earnings accumulated from 1973 through 1976 be placed in designated (2j) investments, or in property devoted to industrial development for a period of 5 years. The remaining 50 percent must be distributed in equal annual installments. (The first 50 percent initially invested in 2j can be fully repatriated in the fifth year at 4 percent.)

There is no tax on liquidating dividend distributions, and the tollgate which is paid can be indefinitely carried over as a tax credit against 50 percent of the taxes payable per year on industrial development income. Thus, the tax credit provides a mechanism for companies maintaining Puerto Rican operations to distribute all pre-1977 earnings tax free.

Firms with dividend distributions of current (post-January 1, 1977) earnings to a U.S. or foreign corporate shareholder will be subject to the basic 10-percent tollgate on all such distributions. However, this 10-percent tax can be reduced to 5 percent if at least 50 percent of the industrial development income is invested in property devoted to industrial development (real property and machinery and equipment used by an exempt business) or qualified "2j" financial investments.

Grantees which convert to the new system have a vested right to extend exemptions for a 10-year period. For the first 5 years, the exemption would be

at 50 percent of income, property, and municipal license taxes. For the second 5 years, the exemption varies by geographical zone according to the following schedule:

	Percentage
High Development	35
Intermediate Development	40
Low Industrial Development	45
Vieques and Culebra	50

The applicable tax rate on the taxable portion is the tax rate in effect on the date the Governor signs the grant decree. Thus, under existing statutes, the maximum effective corporate tax rate would range from about 22 percent during the first 5 years to nearly 30 percent during the second 5 years, the rate depending on the development zone. It should be stressed, however, that these are the theoretical maximum effective rates on taxable industrial development receipts. All firms will be able to reduce their taxes as a result of special exemptions, deductions, and/or credits provided elsewhere in the tax statutes.

APPRAISAL OF TAX EXEMPTION PROGRAMS IN PUERTO RICO

Limitations of Commonwealth Tax Policy

The Federal tax exemption allows a firm to establish its productive activities in Puerto Rico exempt from Federal taxation.⁹ An exemption under Puerto

Rican corporate taxation parallels the Federal exemption. Although the Commonwealth exemption plays a role in attracting investors to the island, its importance for attracting firms to Puerto Rico has a cost for the island.

Proponents of tax incentive systems asserts that: (a) jurisdictions failing to provide incentives will lose business to competing areas, and (b) incentives encourage expansion of firms beyond that which would otherwise occur. Certainly, a particular firm with specific marginal investments in question may react more favorably to a tax incentive.¹⁰ However, taxes constitute only one of several business costs, and a fairly sizable tax benefit is required to affect the investment choices of most companies. In this context, it is difficult to accurately assess the effects of Commonwealth tax exemptions in attracting investors to Puerto Rico.

⁹ The 40 percent represents the U.S. Treasury's estimate of what the effective rate of taxation would have been in the absence of section 931 or 936. Data report on *The Possessions Corporation System of Taxation*, Office of Tax Policy, U.S. Treasury Department, June 1978, p. 39.

¹⁰ Thomas Vasquez and Charles W. DeSeve, "State/Local Taxes and Jurisdictional Shifts in Corporate Business Activity: The Complications of Measurement," *National Tax Journal*, September 1977, p. 285-297.

The significance of a tax exemption incentive as a business attraction device is largely determined by what the effective rate would be in the absence of a full or partial exemption. For example, in mainland southern States, the effective corporate income tax rates after Federal taxes are between 2 percent and 3 percent. When that is added to the Federal tax, the total effective rate on business activity is probably about 40 percent.¹¹ Thus, it is not surprising that most research on the role of various U.S. State and local tax concessions concludes that State and local taxes—and therefore reduction in these taxes—play a very minor role in business location and expansion decisions.¹²

However, when focusing on the Puerto Rican tax incentive program, one is then talking about reducing taxes from a total effective tax rate of 40 percent to zero.¹³ Under these circumstances, it is not difficult to conclude, as many studies have, that the Puerto Rican tax exemption is a significant cost reduction factor, in conjunction with the Federal statutes.

The Tax Incentive and Business Firms' Behavior

The combination of the Federal definition regarding what constitutes "qualified possession source investment income" and the Puerto Rican Industrial Incentives Act (and, since 1976, the tollgate tax) places a premium on the section 936 firm's ability to plan its production and investment activities so as to minimize or perhaps eliminate, its tax costs. These tax planning decisions, in turn, influence the firm's economic behavior with respect to its management and financial and capital investment decisions—behavior which significantly affects the Puerto Rican economy.¹⁴

Corporate decisions on investments, on repatriation of subsidiaries' profits,¹⁵ and on intercorporate allocation of costs vary considerably from company

to company. But it is possible to draw some conclusions regarding general corporate tax planning in Puerto Rico.

General Intercorporate Allocation of Costs and Income.—Businesses can maximize profits by utilizing various intracompany transfer price techniques; that is, by allocating the costs of certain goods, services, and intangibles (e.g., trademarks and patents) among subsidiaries. This may be the case with possessions corporations in Puerto Rico which have U.S. parent companies subject to maximum taxes (Federal, State, and local) on 48 percent to 50 percent of profits.

There are various ways to shift profits subject to high mainland taxes to island subsidiaries which pay few or no taxes. However, most of the methods that are possible would be considered not allowable within the scope of Federal tax law. These methods include:

- Providing raw materials and supplies to the subsidiary at relatively low prices;
- Paying high prices for the subsidiary's exports;
- Incurring direct costs (e.g., purchases of supplies, legal expenses) on behalf of the subsidiary, and
- Transferring intangibles to the subsidiary with the subsidiary including the cost of the patents' or trademarks' value in export charges to the parent.

The U.S. Treasury generally requires that intra-company transactions be priced or charged as if they were made on an arms-length basis.¹⁶ The idea is to view the parent and its subsidiaries as separate or independent entities. But because benchmark data to estimate the arms-length price are not readily available, it is often difficult to find independent nonvertically integrated operations which could give comparable pricing data on, for example, specialized equipment sold from a manufacturing subsidiary to another manufacturer or distributor in the multi-corporate chain. Moreover, attempts to estimate the arms-length price ignores the economic reality that multicorporate entities can reduce their costs through the advantages of economies of scale, central management, advertising, reduced transactions costs, quantity discount purchases, and access to capital markets.

In response to problems of these types, the U.S. Treasury Department has issued intrafirm pricing guidelines and has sometimes fallen back on a uni-

¹¹ The Federal estimate of 40 percent is from the Office of Tax Analyses, U.S. Treasury Department, 1978. State corporation income tax rates for jobs in 1976 as provided in U.S. Advisory Commission on Intergovernmental Relations, *Significant Features of Fiscal Federalism*, 1976-77, Report M-110, Vol II (ACIR: Washington, D.C. 1977) table 113.

¹² For a recent detailed review of the literature see Stephen S. Fuller and Joan E. Towles, "Impact of Intraurban Tax Differentials on Business and Residential Location in the Washington Metropolitan Area," A technical paper prepared for the District of Columbia Tax Revision Commission, 1978; and the Report of the Committee on State Income and Business Taxation, *Proceedings of the Seventieth Annual Conference on Taxation*, National Tax Association, Tax Institute of America, 1977.

¹³ Holbrook, "A Study of the Characteristics," p. 63.

¹⁴ See Zohar M. Mihalý, "Puerto Rico: Repatriation of Puerto Rican Earnings," *Tax Management International Journal*, December 1976, pp. 3-21; Barry A. Woods, Puerto Rican 'Toll Tax': A Private Practitioner's View," *Tax Management International Journal*, October 1976, pp. 7-10; Woods and Abrutyn, "How the TRA Changes Tax Climate," and Barry Klingman, "The '76 Act Hits the Tropics: The Improved Investment Climate in Puerto Rico," *The Tax Adviser*, January 1977, pp. 12-17.

¹⁵ A detailed discussion is provided by Mihalý, "Puerto Rico: Repatriation of Puerto Rican Earnings," *Ibid.*, pp. 7-18.

¹⁶ For a detailed discussion of this issue, see Jerome B. Hellerstein, "The Unitary Business Principle and Multicorporate Enterprises: An Examination of the Major Controversies," *The Tax Executive*, July 1975, pp. 313-329; "Multinational Corporations and Income Allocation Under Section 482 of the Internal Revenue Code," *Harvard Law Review*, vol. 89, pp. 1202, 1238.

tary accounting approach. In reality, however, the system is so complex, and its enforcement so expensive, that firms can usually continue to use transfer prices in order to shift profits among the members of the multicorporate whole.

Although the U.S. Treasury and the taxpayer may both lose as a result, there are benefits to Puerto Rico. Since income and cost allocations tend to shift profits to the low tax area, the profits of Puerto Rican based possessions corporations are increased. The Commonwealth can transfer some of these artificially higher profits to its treasury through corporate profits taxation.

A commonwealth profits tax would reduce profit shifting to island firms. Although there is no quantitative evidence available on the size of these profit shifts, the decline in the profit component is not likely to be great for most possessions corporations. This is because the corporate (Federal, State, and local taxes) tax wedge between Puerto Rico and the United States would still be substantial. For example, even if the Commonwealth were to adopt a 20-percent corporate profits tax rate, the average effective tax rate would still be less than half that of the average Federal plus State and local mainland rates. Such a gap should be a sufficient incentive to continue the bulk of the profit shifting—a conclusion that may be warranted in view of evidence that such transfer pricing occurs even among the 50 U.S. State jurisdictions which have much smaller interjurisdictional tax differentials.¹⁷

Behavior of Firms Operating Under Section 931.—Prior to the Tax Reform Act of 1976, the Federal tax law appears to have played a significant role in the firms' tax planning decisions. Failure to follow the section 931 source of income and dividend repatriation rules meant taxation at the full U.S. corporate rates. Even though the Commonwealth had a nominal 15-percent pickup income tax on repatriation of nonliquidating dividends,¹⁸ it was of only minor importance in financial decisions (especially since it qualified for the foreign tax credit).

The domestic U.S. parent organized a subsidiary, generally wholly owned, which would qualify as both a section 931 and a grantee of the Puerto Rican tax exemption. If the subsidiary had losses during its startup or did not meet the 80 percent and 50 percent tests, it would then file a consolidated return with its parent and defer its application for tax exempt status during the startup period. Under the terms of the Industrial Incentives Act, this period could last up to 4 years without resulting in disqualifying the firm from benefits during subsequent years under the act.

The consolidated return tax exemption deferral

served two purposes. First, since a firm's initial years are characterized by startup costs, giving low or negative profits, there is no practical reason to begin exempt status in the early years. Second, these normal startup operating losses of the subsidiary could be used to offset non-Puerto Rican source profits of the parent.

Once the firm becomes profitable, it then would qualify for section 931 and Commonwealth tax exemption status. However, since any repatriated dividends prior to liquidation were subject to U.S. tax, the firm would accumulate its profits and look for financial investment outlets which would qualify as industrial development income.

Four outlets received the bulk of the accumulated profits—U.S. and Puerto Rican municipal bonds, and investments in Guam, Europe, and Canada:

- *Municipals.*—Since municipal bonds are not considered part of gross income for tax purposes, a firm could purchase these and yet not have to consider the interest received when determining the section 931 gross income requirements.
- *Guam Investments.*—Since Guam is a U.S. possession, the return on financial investments in Guam banks could satisfy the section 931 rule that 80 percent or more of the firm's gross income be derived from sources "within a possession."
- *Canadian and European Investments.*—Canadian and European source investment incomes were not included as possessions source income. However, since such income could be exempt from Federal and Puerto Rican income taxation, Europe and Canada were attractive investment areas as long as the income generated did not exceed 20 percent of gross income.

Income generated from Puerto Rican sources would count toward the 80-percent gross income requirement. Due to the limited size of the island's financial market, however, most possessions corporations used one of the above outlets.

Once the period of tax exemption ended, the last step in the tax planning process was often to liquidate the firm, and repatriate accumulated earnings to the parent company on a tax-free basis. This liquidation step was greatly encouraged by the "tax shock" which would occur if a firm were to keep its exempt operations open after the expiration of the exempt period. Profits from the firm's exempt plant would then become subject to a 45-percent maximum corporate net income tax rate.

Firms could minimize the amount of this shock, however, by operating more than one tax exempt

¹⁷ For a discussion, see Hellerstein, "The Unitary Business Principle."

¹⁸ See footnote 7.

plant, and, upon expiration of the exemption in the first plant, transfer, with Commonwealth approval, its operations to another plant which still held exempt status. Other possibilities included negotiating with the Commonwealth for a new exemption by making technical adjustments to the first plant's operations, or running the plant on a taxable basis, but with less profit allocated to it—an outcome which could be accomplished by production adjustments in the firm's interplant operations, or through transfer pricing.

Behavior of Firms Operating Under Section 936.

—In the post-1976 Tax Reform Act period, Puerto Rican tax considerations have taken on greater importance. Although newly defined "qualified possession source investment income" places more restrictions on portfolio investments than under section 931, for most subsidiaries (80 percent or more owned by U.S. shareholders) repatriation of past accumulated earnings as well as current earnings is U.S. tax free. However, the Puerto Rican tollgate tax, in part for accounting reasons, has become an obstacle to the repatriation of accumulated sections 931 and 936 earnings.

With the enactment of the tollgate, possessions corporations were faced with the necessity to set up a tax reserve account for the purpose of paying the tollgate tax on all accumulated earnings. Even if a firm wants to repatriate only a single dollar of accumulated earnings, it is required to book an entire tollgate reserve account for all its prior years' earnings. The result is to lower the earnings per share in the firm's stockholder reports.

One way out of this booking requirement is for the exempt firm to declare that they will wait until liquidation to bring the accumulated earnings home tax free. However, most accountants feel that such a declaration would create a credibility gap between the subsidiary, its accountants, and the parent corporation. The practical result is that possessions corporations are not repatriating these accumulated earnings. Rather, they are searching for investment outlets which will warehouse the accumulated earnings until a final, complete liquidation is carried out, or until firms are successful in their political efforts to have the Commonwealth ease tollgate tax rules. On the other hand, repatriation of current earnings may be taking place in at least small amounts.

One of the features of both the current tax exemption system and the newly proposed system of the Romero Barcelo Administration is the ability of a possessions corporation to reduce the amount of Commonwealth tax by investing in certain kinds of financial obligations—primarily Puerto Rican Government bonds. Indeed, one purpose of the Commonwealth's enactment of the tollgate in 1976 was

specifically directed at providing a barrier to repatriation of accumulated earnings.¹⁹

Arguments for financial investment outlet tax concessions appear to be essentially based on four points:

- That section 936 tax-free repatriations would have generated a large outflow of earnings;
- That by making concessions for certain investments, local interest rates will decline;
- That Puerto Rico's capital short economy needs these funds; and
- That there are insufficient Puerto Rican investment opportunities to absorb an adequate portion of the section 936 funds.

However, both a priori reasoning and available evidence on possession corporation's financial behavior throw some doubt on these assumptions. Contrary arguments can be made to each of the foregoing points:

- Possession corporations were already investing most earnings outside of Puerto Rico;
- Interest rates that the Commonwealth Government must pay on its obligations (the "2j" investments) should decrease slightly, but interest rates in general will not necessarily fall. In fact, one could hypothesize that by being able to offer a relatively lower interest rate on its bonds, some private financial investment which would otherwise be attractive, will be bypassed as the possessions corporation opts for yield and security;
- Concern about being short of capital seems to confuse real investment with portfolio investment. The capital markets between Puerto Rico and the U.S. mainland are well developed. Mainland banks are located on the island, and there are free flows of capital which can increase in response to higher rates of return on investments;
- Puerto Rico's ability to provide investment opportunities is not sufficient to utilize the billions of dollars of accumulated retained earnings.²⁰

¹⁹ Pedro Nicot Santana, "The New Puerto Rican 'Toll Tax': The Government's View," *Tax Management International Journal* October 1976, p. 5.

²⁰ Estimates of the total amount of accumulated retained earnings in mid-1977 by possessions corporations range between \$5 and \$6 billion, with an annual increment rate of more than \$1 billion. According to a recent study done for the U.S. Treasury (Holbrook, "A Study of the Characteristics"), section 936 funds are absorbing a large amount of Puerto Rican securities. To increase the capacity of local investment for such funds, the Commonwealth has established, under the Government Development Bank, a new agency, The Authority For Financing of Industrial, Commercial and Environmental Central Facilities (AFICA), which is set up to help finance the construction of industrial facilities.

To date, most 936 funds have been deposited in Chase Manhattan or Citibank, or invested in U.S. municipal bonds and stocks. Banco Popular and Banco de Ponce, the only local banks with 936 money, have less than one-half a billion of 936 funds together.

Empirical Evidence of Firms' Tax Planning Behavior.—Available empirical evidence regarding the nature of possessions corporations supports the tax planning behavior outlined above. Although some possessions corporations operate on the island without Commonwealth tax exempt status, they are in the nonmanufacturing sectors of trade, merchandise stores, and nonbank financial institutions. Manufacturing possessions corporations are usually tax exempt.²¹

A recent study by Fomento examines the planning behavior of businesses which have received tax exempt status, regardless of whether or not they operated as possessions corporations.²² The total number of firms which have received tax exemption grants under the 1948, 1953, and 1963 Industrial Incentives Acts were compared with current tax rolls. The resulting data show that 683 tax exempt decrees were given to manufacturing firms; only 59 of these firms (9 percent) were operating nonexempt in 1977. The record under the 1953 law is better—219 of 1,148 originally exempt firms (19 percent) are now operating as taxpayers. Of the 2,735 decrees granted under the existing Industrial Incentives Act, only 28 are listed as operating as taxpaying firms.

Possible explanations for these numbers range from the fact that some businesses will inevitably fail, to the end of exemption period tax shock effect, and the fact that by the time the exemption expires, a firm simply no longer finds relative cost advantages in Puerto Rico. In addition, many of the nontaxpaying firms, particularly those operating under the 1963 law, are still in operation in exempt status, most likely due to a renewal of their exemption grant.

Fomento also examined the life cycle behavior of a set of firms which received exemptions in the early and mid-1960's. The data reveal that only one-third of the firms which received grant decrees (443 between 1960 and 1962) were actually established. Eighty-seven (60.8 percent) of the established firms operate at present. Thirty-one of those in operation have extended their period of tax exemption either by moving to a new development zone, consolidating with another firm, manufacturing a new or different product, or benefiting from special textile or clothing industry legislation. Ten of the firms are operating as Commonwealth taxable firms (1975), but only six have reported profits.

Benefits and Costs of Tax Exemption Programs

Exemption programs are beneficial: (a) if they attract investments which would otherwise not have

been made, and (b) if the total generation of local income and spending of these investments causes the tax base to rise more than enough to offset the potential tax loss due to the exemptions.

Robert Dennis and Robert Rafuse adopted a strategy of computing the minimum percentage of real net investment which would have had to occur during the decade of the 1960's as a result of exemption programs so as to generate net additions to the Puerto Rican budget.²³ The higher that percentage, the greater the likelihood that the exemption program had a net negative impact on budget receipts, i.e., the revenue cost due to the exemption would be greater than the increase to total Commonwealth budget revenues contributed by the exempt firms. For example, had the data shown that of the total real investment in Puerto Rico, 90 percent would have to be generated by the exemption just to break even on revenues, then it could be reasonably concluded that the exemption program was a net drain on the treasury.

In order to estimate the actual break-even point, Dennis and Rafuse made several necessary assumptions as to the relationship of various tax revenue sources to net income generated in Puerto Rico and then concluded that only 26 percent of the net investment between 1959-60 and 1969-70 would have to be attributable to the exemption program in order to reach the conclusion that the revenue costs and benefits of the program were equal. Dennis and Rafuse find this to be a modest percentage and conclude that it would be a mistake to scrap the exemption program in favor of some completely different alternative policy.

This conclusion may be warranted. However, it is important that caution be used in interpreting the results. Consider the following arguments:

1. The question asked implies that the choice is between a zero tax and the full rate of Puerto Rican business taxes. It is quite likely there is some optimal effective tax rate greater than zero, i.e., a positive rate which could be levied in order to generate additional revenues and yet which would not become a negative factor in the location decision calculus of most firms.

In background discussions for this study, some manufacturing concerns felt that if the U.S. Government maintained section 936 provisions, then a modest Commonwealth tax could be applied without driving business away from the island. As an attraction device, a maximum current profits tax rate of 20 percent to 25 percent was most frequently mentioned. Fomento economists have concluded (with all

²¹ Holbrook, "A Study of the Characteristics," p. 56.

²² *Economic Analysis of the Industrial Incentive Program of Puerto Rico*. A report prepared by the Administration for Economic Development, Office of Economic Studies, February 1978, chapter 11.

²³ Robert Dennis and Robert W. Rafuse, Jr., *Tax Exemption and Its Alternatives*, a report prepared for the Government Development Bank of Puerto Rico, January 1976, pp. 53-57.

the appropriate caveats regarding measurement problems) that the optimum aggregate tax percentage would be about 18.3 percent.²⁴

The Fomento estimate gives support to the idea that a reasonable incentive is a low tax rate structure. A 20-percent Commonwealth tax rate, for example, would still offer possessions corporations effective total tax rates which are less than half what they would pay on the mainland.

2. By considering tax revenues collected directly and indirectly as benefits and the tax loss due to the exemption as cost as Dennis and Rafuse do, it is possible to measure the impact of the exemption on the receipts side of the Commonwealth budget. However, such an examination is too simple. The calculations do not consider such questions as the net public expenditures on behalf of business firms receiving exemption grants and their possible utilization elsewhere.

The public investment expenditure is significant. One recent estimate of general service and promotional costs of the Puerto Rican Government on

behalf of exempt industry is \$481 million for the next 4 years.²⁵

The tax exemption also reduces the Commonwealth's ability to use its tax policy to encourage industrial integration. Firms which locate in Puerto Rico for tax reasons do so largely because they can magnify their profits to be repatriated to their parent corporations and/or to take advantage of tax avoidance opportunities inherent in their interfirm pricing techniques. With section 936 benefits and its own low rate e.g., 20 percent, of corporate profits taxation, Puerto Rico will continue to attract the high profit industries with mainland suppliers and distributors. Tax benefits will not be sufficient to develop local links, just as they have not been sufficient in the past.

What Puerto Rico can consider, however, is to design its tax policy so that the benefits it now gives to industries in the form of industrial incentives can be directly targeted toward those activities which meet planning objectives of the Commonwealth, such as employment, income, and linkage creation. (See table 5.)

Table 5.—Income and Employment For Section 931 Corporations in Puerto Rico, 1975 and 1976¹

Industry group	Number of firms	Income, 1975	Employment, 1975	Income/employment ratio
Food and kindred products	15 (4.8)	64,402 (6.3)	4,904 (10.0)	13,133
Textile mill products	5 (1.6)	1,198 (1.1)	275 (.6)	4,536
Apparel and other textile products	76 (24.3)	41,170 (4.0)	13,185 (26.8)	3,122
Chemicals and allied products other than drugs	19 (6.1)	60,283 (5.9)	2,451 (5.0)	24,816
Drugs	46 (14.7)	553,314 (53.8)	7,561 (15.4)	73,180
Rubber and miscellaneous plastic products	10 (3.2)	1,058 (1.1)	1,205 (2.5)	878
Leather and leather products	9 (2.9)	6,935 (7.7)	1,905 (2.2)	6,333
Fabricated metal products	16 (3.1)	23,004 (2.2)	1,382 (2.8)	16,645
Electronic and electronic equipment	68 (21.8)	174,455 (17.0)	11,769 (23.9)	14,823
Instruments and related products	14 (4.5)	25,907 (2.4)	1,552 (3.2)	16,171
Miscellaneous manufacturing industries	12 (3.8)	16,353 (1.6)	906 (1.8)	18,050
Miscellaneous	22 (7.1)	60,641 (5.9)	2,867 (5.8)	21,151
Total	312 (100.0)	1,028,450 (100.0)	49,152 (20)	² 20,924

¹ This sample is for 87 percent of the total number of section 931's which accounted for 95 percent of total income in 1975. Percentage composition of column total in parentheses. Details may not add due to rounding.

² Unweighted average income per employee.

Source: Data compiled from Robert Holbrook, *A Study of the Characteristics, Behavior, and Implications of "Possessions Corporation" in Puerto Rico*, a paper prepared for the Office of Tax Analysis, U.S. Treasury Department, 1977, p. 64.

Length of Exemption Period as an Inducement to Investment

The exemption period, particularly in the areas outside San Juan, may be unnecessarily long. Whereas a long-term exemption may be seen as an important locational incentive from the Commonwealth's view, it probably has only a small effect on private firms which tend to be most concerned with increasing financial returns in the short run.

Empirical research lends support to this conclusion. Recently, Robert S. Woodward compared the cost effectiveness of three Puerto Rican industrial incentives designed to encourage growth in the de-

velopment areas outside San Juan.²⁶ In testing the regional tax exemption against Fomento plant construction and direct front-end subsidies, such as cash grants, it was concluded that the exemption (10 years) provided the smallest jobs-per-dollar return. In addition, in his examination of the growth effects of adding an extra 7 years to the tax exemption period, Woodward concluded that the added time was of a "secondary factor in the industry's choice to locate in Puerto Rico."²⁷ However, the increased

²⁵ *Ibid.*

²⁶ Robert S. Woodward, *Industrial Incentives and Regional Economic Growth: The Case of Puerto Rico*, a dissertation presented to the Graduate School of Arts and Sciences, Washington University, St. Louis, Mo., August 1972, p. 141.

²⁷ *Ibid.*, p. 124.

²⁴ *Economic Analysis*, chapter VI.

exemption was found to be of significance in determining the urban vs. rural location within the island.

Competitiveness and Type of Investment

Research on the role of tax levels and tax incentive abatement programs generally supports the view that State and local taxes play a minor role in the business location and expansion decisions. What are important are demographic and other market changes, and the nontax economic cost factors, such as transportation, land, energy, and labor.²⁸ As noted in the discussion above, however, it is difficult to generalize these findings to Puerto Rico where manufacturing firms can be exempted from Federal plus State and local taxes.

The tax holiday era in Puerto Rico has been associated with high investment levels until the recent recession years. Gross fixed domestic investment increased from \$111 million in 1950 to a peak of \$1,913 million in 1975. It amounted to \$1,454 million in 1977. In real terms, gross domestic investment in 1975 was 5.8 times the 1950 level.

Although data are not available on investment by sector, some idea of the amount of increase in the manufacturing sector may be obtained by comparing changes in the amount of private gross domestic investment in machinery and equipment. Such investment amounted to \$23 million in 1950 and to \$505 million in 1977, an increase of 741 percent in real terms. Given that most of this investment was in the manufacturing sector, the percentage increase shown above may be used as an indicator of the rate of increase of investment which has occurred in that

sector. Moreover, since 1950 most manufacturing investment in Puerto Rico has come from mainland sources. The extent and timing of the increases in such investments is suggested by the outflow of income on investment. This item was \$22 million in 1950 as compared with \$9 million in 1942, or in real terms, 65 percent to 70 percent higher in 1950 than in 1942. In contrast, the 1960 level in real terms was about 300 percent higher than the 1950 level, the 1970 level about 260 percent higher than the 1960 level, and the 1977 level about 175 percent higher than the 1970 level.

These rapid increases are to some extent indicative of the impact that the Puerto Rican tax holiday had on the attractiveness of the island for business activity (primarily by U.S. subsidiaries). However, this does not mean that economic factors other than tax incentives schemes did not have a role in the firms' location and expansion decisions.

Examples in Puerto Rico of the importance of "real" (nontax exemption) economic factors in location are readily available. The heavy concentration of investment in labor intensive industries in the 1950's through the mid-1960's is evidence of the influence of relatively low wage rates. The buildup of the island's petrochemical industry can largely be explained by the existence of oil costs which, until the 1973 OPEC price increases, were less than mainland costs.

In short, Puerto Rican profit tax exemptions alone *magnify*, but do not *create* locational incentives.²⁹ The tax exemption only brings industry to the island once it is demonstrated that Puerto Rico can also offer nontax economic competitiveness.

²⁸ Roger J. Vaughn, *The Urban Impact of Federal Policies*, vol. 2, Economic Development, The Rand Corporation, R-2028-KF-RC, June 1977.

²⁹ Lester C. Thurow, "Puerto Rican Industrialization Incentives for the 1970's and 1980's," a paper prepared for the Puerto Rican Planning Board, 1970, p. 3.

Chapter VII.—Industrial Linkage Analysis

BACKGROUND

From the macroeconomic point of view, the effect of an increase in autonomous investments to the economy will be more significant the larger the multiplier. The size of the multiplier, however, is negatively correlated with the amount of "leakages" out of the economic system. This "leakage," among other things, includes the level of imports, i.e., the outflow of financial resources to foreign countries.

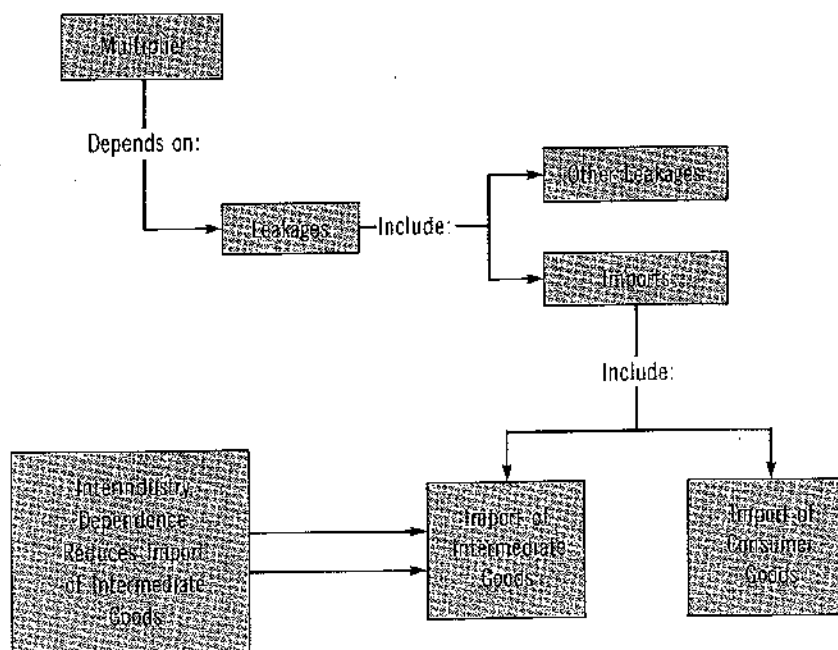
The total imports can be divided into the importation of consumer goods and intermediate goods. Interindustry transactions would reduce the intermediate goods imported. Hence, other things being equal, the multiplier will be larger the lesser the

intermediate good imports and the greater the degree of interdependence (or linkage) between economic sectors within an economy.

Since the interindustry linkage concept was formulated by Hirschman, it has received increasing recognition by development economists. Hirschman, basing his argument on the importance of interindustry linkage, disputed the widely recognized concept of balanced growth which stated that the development process should be promoted such that "every [economic] activity expands perfectly in step with every other."¹ He instead suggests a development strategy to aim at the maximization of "induced" investments

¹ Albert O. Hirschman, *The Strategy of Economic Development*, New Haven: Yale University Press, 1958, p. 63.

Chart 1.
Imports and Multiplier



resulting from the forward and backward linkage effects. "Backward linkage effects" refer to the inducement of attempts—by an economic activity—"to supply through domestic production the inputs needed in that activity"; and "forward linkages effects" refer to the new economic activities which are induced by attempts to utilize output of the original activity.² For practical purposes, the backward linkage effects can be measured by the proportion of an industry's output that represents purchases from other industries, and the forward linkage effects are measured by the industry's total output that does not go to final demand but rather to other industries.³

As it will take time for the linkage effects to penetrate the economy, a policy to maximize employment at any particular period of time may only represent a temporarily optimum action. A well-planned policy must take into account the effects on income and employment generated through the "linkage effects" in the long term.

Another important implication of the linkage concept is that development strategies should also aim at increasing the interindustry dependency to increase the "induced investment effects." Experience shows that developing countries following an industrialization policy commonly begin the development process with the establishment of a few industries to meet domestic demands using mostly inputs imported from abroad. The manufacturing sector's import coefficient is high and there are little linkage effects. As the economy progresses, more industries are being established which increase the demand and supply of domestically produced goods and enhance the transactions among industries. Interindustry linkages improve the process of "vertical integration," and natural import substitution (i.e., reduction of imports) takes place. The rate of vertical integration of industries, with respect to time, varies between countries, mainly because of the various resource endowment and economic structures.

LINKAGE PROSPECTS IN PUERTO RICO

The importance of increasing interindustry linkages is to increase the value added to the Puerto Rican economy. As indicated by Hirschman, the sustainability of growth may be enhanced through greater interindustry linkages among export industries whose markets are diversified geographically. This diversification would reduce the market vulnerability to cyclical downturns in one economy, but not to a worldwide recession which would be detrimental to any economy, open or not. To the

extent that Puerto Rican policies can induce efficient linkages, greater employment and income should be generated for the island. There is evidence to indicate that new industries entering the island in the past 15 years have somewhat increased their local purchases and sales.

An indication of the change in the level of forward linkage can be observed by the ratio of interindustry shipments (sales) to total value of shipments of industries located in Puerto Rico. According to table 1, the "improvement" of forward linkages is ob-

Table 1.—Shipments to Other Industries/Total Shipments, by Major Industry

[In percentages]

SIC Code	Industry	1963	1972	Percentage change 1963-72
20	Food	28.8	25.7	-10.7
21	Tobacco	16.4	5.7	-65.2
22	Textile	24.4	24.7	1.2
23	Apparel	8.6	12.3	43.0
24	Wood products	50.2	63.0	25.5
25	Furniture	35.7	38.9	9.0
26	Paper	59.4	76.8	29.3
27	Printing	9.1	8.6	-5.5
28	Chemicals	10.2	16.2	58.8
29	Petroleum	NA	58.9	
30	Rubber and plastics	20.0	42.4	112.0
31	Leather	9.7	11.9	22.7
32	Stone and glass	27.4	35.6	29.9
33	Primary metals	76.6	40.2	-47.5
34	Fabricated metals	22.9	46.2	101.7
35	Machinery except electrical	18.7	12.8	-31.6
36	Electrical machinery	2.0	4.7	135.0
37	Transportation	NA	38.8	
38	Instruments	2.9	3.3	13.8
39	Miscellaneous manufacturing	11.2	6.6	-41.1
	Overall percentage	23.1	24.7	6.9

Source: U.S. Department of Commerce, Bureau of the Census, *Census of Manufacturers, Puerto Rico*, 1963 and 1972 series. The data are for establishments with 10 or more employees.

served in 12 of 20 major industry groups between 1963 and 1972. The most improvement was experienced by the rubber and plastic products and fabricated metal groups, where the ratios of shipments to other industries to total shipments were both large and increasing at a rapid pace. The next best performing groups were chemicals (59 percent increase), then apparel (43 percent), electrical and electronic equipment and chemical products, although improved significantly, still sold only a small portion of their outputs to local industries.

On the other hand many industries actually reduced their interindustry sales ratio. Most significant were the primary metal industries, miscellaneous manufacturing, tobacco, and nonelectrical machinery industries.

On the average, however, the forward linkage appeared somewhat improved for the manufacturing sector as a whole over the 1963-72 period, as the interindustry sales to total shipments ratio for "all industries" increased slightly from 23.1 percent to 24.7 percent.

² *Ibid.*, p. 100.

³ *Ibid.*, p. 105.

Current data is not sufficient to allow a thorough investigation of the change in the backward linkage trend in the Puerto Rican economy. However, some implications can be drawn by examining the data on imported raw materials and intermediate goods. As the backward linkage can be measured by "the proportion of an industry's output that represents purchases from other industries," the higher the backward linkage, the larger the ratio of domestically produced input to total production, or the smaller the ratio of imported inputs to total production. The latter ratio can be approximated by:

(a) The total import of capital goods, raw material, and other intermediate goods as a percentage of the total industrial production (value of shipments);⁴ and

(b) The ratio of the total import of capital goods, raw material, and other intermediate goods to GDP.

Ratio (a) is relatively more desirable since it concentrates on the measurement of the backward linkage of the industrial sector, while ratio (b) tends to capture the backward linkage of other sectors as well.

Table 2.—Ratios of Inputs Imported

	1963	1972	1973	1974	1975	1976	1977
Capital goods, raw materials, and intermediate goods imported (in millions of dollars)	686.1	1,799.5	1,994.9	2,742.0	3,347.8	3,466.7	3,945.0
Total manufacturing value of shipments (in millions of dollars)	1,480.4	4,143.6	NA	NA	NA	NA	NA
GDP (in millions of dollars)	2,333.6	6,333.5	7,030.4	7,758.6	8,207.7	8,876.0	9,717.0
Ratio (a): Capital goods, raw materials, and intermediate goods imported (in percentages)—value of shipments	46.3	43.4					
Ratio (b) Capital goods, raw materials, and intermediate goods imported (in percentages)—GDP	29.4	28.4	28.4	35.3	40.8	39.1	40.1

Source: Puerto Rico, Planning Board, 1977 *Economic Report to the Governor* (various tables).

Table 2 shows that both indications of backward linkages (ratios (a) and (b)) agree that Puerto Rico became less dependent, in relative terms, on imported inputs from 1963 to 1972.

THE NATURE OF INDUSTRIAL INVESTMENT LINKAGES

The industrial growth of Puerto Rico has been achieved mainly by offisland investments. This was necessary if the well-being of the island's people was to be improved at a rapid rate. It has been shown (elsewhere in this report) that the majority of firms locating in Puerto Rico are U.S. subsidiaries. The widening gap between GNP and GDP indicates that these non-Puerto Rican companies are playing an increasingly significant role in the island's economic structure.

In the production process, most raw material and intermediate goods are shipped to the subsidiary firms by their parent companies, or by U.S. distributors through arrangements made by the parent companies. The outputs produced are shipped directly to the mainland companies for distribution, including redistribution to Puerto Rico. In other words, the general practice of many U.S. corporations is to use Puerto Rico as a production point only. The functions of purchasing raw materials and marketing and distribution of outputs are handled by the parent

corporations. This has been noted by a recent report by the Puerto Rican Planning Board's Committee on the Economic Development Strategy Project: "... in general, Puerto Rico manufacturers imported semifinished products whose production began precisely here."⁵

The main reasons for the lack of transactions conducted between industries located in Puerto Rico are:

- Puerto Rican firms, as a branch of U.S. corporations, must produce outputs which are, in most cases, identical with outputs produced by other branches in the United States.
- To assure the uniformity of output quality, raw materials and intermediate goods should ideally be purchased from preselected sources, which are usually located in the United States.
- The centralization of the distribution function of input and output by the parent firms is sometimes necessary because the Puerto Rican firms lack the knowledge concerning the United

⁴ It is possible that a significant part of the import of capital, raw material, and intermediate goods are for the agricultural sector, and the variation of these agricultural imports would distort the mentioned ratio representing industrial linkage. However, in view of the steady decline in agricultural activities, imported agricultural inputs should have decreased; in such an event, the linkages would be overstated.

⁵ Committee on the Economic Development Strategy Project, "Some Comments on the Industrial Integration Process of Puerto Rico," Puerto Rican Planning Board, San Juan, Puerto Rico, September 1974.

States and world markets. Furthermore, it would maximize the benefit derived from the economies of scale.

Evidence, although scattered, tends to support the above hypothesis that U.S. subsidiaries purchased very little directly from other firms located in Puerto Rico, and that there is very little interdependency between Puerto Rican industries as a whole. A survey of 77 apparel firms conducted by the U.S. Department of Labor, Wage and Hour Division, covering 8,917 employees revealed that:

- out of 77 firms, only 20 had a significant portion of their output sold to local industries or consumers; of which 16 were local firms (not affiliated with a U.S. firm).
- out of the same 77 firms, only 5 purchased a significant portion of input from local sources; of which 3 were local firms.⁶

In short, under the present economic structure, Puerto Rico's U.S. subsidiary firms appear to be reduced to only "production units" with a main function of producing most efficiently in terms of minimizing companywide *production* cost and wastages. The local industries do not emphasize in their operation local purchases of inputs and local distribution and marketing of outputs. They remain dependent on the parent companies who have very little knowledge of the local markets, with respect to the availability of the inputs and (to a lesser extent) the demand for the industries' output. As a result, most of these firms import their raw materials and export nearly all their production. This limits the potential for both backward and forward linkages, and the industrial process in Puerto Rico is not vertically integrated, despite the tremendous increase in industrial output over the past 30 years.

In addition, it is conceivable that the distribution system is still at a low level of development. Discussions with Puerto Rican industrial leaders revealed cases where plant managers (especially local plant managers) found themselves unable to expand because of their lack of marketing and distribution

expertise. The poor distribution system probably also causes the U.S. subsidiaries to depend heavily on their parent companies. On the other hand, their reliance on the parent companies has reduced the demand for marketing and distribution services and not contributed to strengthening of the Puerto Rican distribution system.

CONCLUSIONS AND POLICY IMPLICATIONS

The U.S. corporations, in maximizing their efficiency may not have made sufficient attempts to either purchase inputs or distribute (sell) outputs to local industries and consumers. This problem has been recognized by Hannah,⁷ and by the Committee on the Economic Development Strategy Project,⁸ and by other economists and planners.

It is recognized that Puerto Rico's small market size is a factor limiting the attempt to increase local production of inputs for industrial uses. However, a policy of efficient import substitution in combination with export expansion, an improved distribution system, and a system of tax incentives—to discourage offisland purchase of inputs available locally—could enhance the economic development process on Puerto Rico.

Concerning the improvement of the distribution system, the creation of a trading company has been discussed but not evaluated as a means of improving the distribution and marketing systems. The main functions of this organization are to improve the marketing and distribution of Puerto Rican products for local, U.S., and international markets, and to provide information for existing distribution businesses and sources for industrial procurement. Some other recommendations provided by earlier reports still remain valid and deserve consideration. These include the Government's conduct and publication of periodic surveys of manufacturers' unmet local supply needs and consideration for elimination of excise taxes on items which are predominantly used as inputs in the production process of industries in Puerto Rico.

⁶ U.S. Department of Labor, Employment Standards Administration, Wage and Hour Division, *Men's and Boys' Clothing and Related Products Industry in Puerto Rico*, July 1977.

⁷ Robert Hannah, *et al.*, *Fomento: The Dynamics of Economic Development in Puerto Rico*, (n.p., 1966), pp. 28-29.

⁸ Committee on the Economic Development Strategy Project, *op. cit.*

Chapter VIII.—Import Substitution

INTRODUCTION

Historically, a large portion of commodities consumed in Puerto Rico have been imported. The island purchased \$6.1 billion worth of goods from abroad in FY 1977, about 60 percent of which were shipments from the U.S. mainland. The island's import coefficient (import/GDP) was 63 percent, a ratio considered fairly high among open economies.

Such a large import coefficient implies that a major portion of an increase in Puerto Rican income is spent on imported products and only a small portion is used to purchase goods produced by local establishments and workers. It is conceivable that some reduction in import dependence would be highly desirable providing that it would not impede the productivity and efficiency of Puerto Rico's industries, or severely restrict purchasing options of consumers. "Import substitution policy" has been offered as a solution to reduce the significance of imports and increase employment.

"Import substitution" is usually interpreted as a process taken by many less-developed countries to promote their "infant industries" in the initial stages of industrialization. Sometimes, it is viewed as a "closed" development process which represents an attempt, in response to foreign trade restrictions, to reproduce in an accelerated form the industrialization carried out in the past by more developed countries.¹ The term "import substitution" used in this report should be understood as a simple and literal way to denote the reduction or elimination of certain imports and their replacement by domestic products. The process could take place through induced means of nontariff barriers or subsidies given to industries producing for local consumption.

Past research on Puerto Rico's import substitution tends to emphasize the benefit mechanically derived from an import reduction without sufficient consideration given to the policy instruments used to promote such a policy, and to their consequences. Experiences of less-developed countries using import-substitution policies to promote domestic industries have not always shown good results.

This chapter will examine the possible economic impact of such a policy and provide some recommendations on the types of import-substitution industries that would likely be most beneficial given Puerto Rico's economic structure.

Before proceeding with the analysis, it should be noted that Puerto Rico is within the U.S. customs area and has no authority to impose tariffs or import quotas as in the case of an independent country. However, on various occasions, Puerto Rico has seriously considered requesting the extension of authority to levy separate import duties and other nontariff barriers—as in the case of coffee—to promote import substitution.² At present, Puerto Rico has the power to impose excise taxes and grant tax exemptions and government subsidies to encourage local industries. However, this section does not offer import substitution as an alternative to the present export-led growth strategy, but only as a means of supplementing strategy to increase employment and income to the island's economy.

THEORETICAL CONSIDERATION AND INTERNATIONAL EXPERIENCE

At first sight, import substitution or "replacement of imports by locally produced goods" appears to be not only politically appealing but also economically sound. In fact, many countries, including South Korea, Israel, Argentina, etc., have experienced a notable economic growth subsequent to the adoption of an import substitution industrialization (ISI) policy. However, for a substantial number of other less-developed countries (LDC's) followed ISI, the success was limited to the initial stages of development. Economic recession and high unemployment eventually resulted. Import substitution is, therefore, viewed by many economists as a double-edged sword. Improper methods used in implementing this policy may cause more harm to an economy in the long run. The following section will consider ISI from a theoretical economic perspective and review the experiences of various countries undertaking im-

¹ *Economic Bulletin for Latin America*, vol. IX, No. 1, 1964, United Nations, New York, 1964, p. 3.

² For example, see The Interagency Committee of Puerto Rico, *Economic Development of Puerto Rico—A Development Strategy for the Next Decade*, San Juan, Puerto Rico, Nov. 1975, p. V-16.

port substitution policies. The causes of their success and failure can serve as a guide for the future policy direction taken by Puerto Rico.

Import substitution is conveniently divided into two categories: the substitution of intermediate goods; and the substitution of imported consumer goods by domestic production. The latter path was followed by nearly all LDC's adopting the import substitution policy.

Support for import substitution comes from the LDC's balance of payments problem and an increasing demand for imported consumer goods. ISI proponents suggest that, at first, the country may import semifinished goods, and assemble and convert these almost-finished industrial imports into final products. The successful reduction of imported final consumer goods will ease the country's balance of payments and further push the consumer demand upward. A point will eventually be reached at which the local demand for intermediate components and basic goods is sufficiently high to warrant investment in their production at home. In other words, import substitution which increases the demand for consumer goods will also, after a period of time, generate demand and production in the capital and intermediate goods sector.

The key instruments used to induce the initial switch of demand from import to domestic products and promote import substitution include:

(a) Policy to increase price of imports. This is done by imposing a high tariff on competitive import goods or adopting exchange-rate policies that discriminate against imports;

(b) Policy to restrict imports, through adoption of import quotas;

(c) Policy to lower the prices of domestic goods by financial incentives and subsidies given to local industries which produce import substitution products; and

(d) Legal requirements to replace important components with a locally produced equivalent.

These means to promote import substitution are often criticized as causing the inability of the industrial sector as a whole to maintain a sustained growth, the high prices, the worsening of income inequality, and an inefficient production process geared to historical technology.

Inability to Maintain Sustained Growth

The import substitution process begins with a government policy to increase the price of certain foreign goods sold in the domestic market, and to decrease the price of the same goods produced locally. This is accomplished by an adoption of the

high tariff rate on the import substitution goods and the low or negative tariff on the inputs used in the production process of the new import substitution industries. In addition, the new industries are usually qualified for a range of generous tax exemptions and government subsidies.

Given such favorable treatment, together with the knowledge of the size and structure of the domestic market, the newly established import-substitution industries generally enjoy a profitable operation while facing little or no competition. As import substitution process extends to other commodities (industries) the industrial sector will rapidly become a "lead sector" in economic growth.

However, after the initial period of success—which usually lasts about 10 to 15 years in most countries—the rapidly increasing supply would outgrow the demand; a period of stagnation begins. At this time, the economy is left with the high unemployment and a few relatively high-cost industrial establishments whose operation depends on the imported raw materials, intermediate goods, and whose production is limited to meeting the slowly increased domestic demand. The reasons for this growth bottleneck are: (a) the inherent technical and economic inefficiencies of the protected industries which cannot produce and sell the products at international-competitive prices; and (b) the task of further backward linkage development is difficult or unachievable.

The technical inefficiency (i.e., the failure to minimize costs) arises out of the system of protection and subsidy provided by the government to import substitution industries.

Given the limited knowledge of government planners on the profitability of individual businesses, the system would inevitably include under its umbrella many comparatively disadvantageous industries. Research undertaken by Howard Pack on Israel's import substitution program found that "a disproportionate amount of capital resources were allocated to relatively inefficient branches (industries)."³ Particularly, intensive import substitution was observed in the chemical industry, where both the efficiency and labor absorption rate are low.

Furthermore, the "economies of scales" and "specialization," the keys to efficiency, have been sacrificed in the effort to divert production resources to meet the demand for a wide range of consumer goods. Power and Sicat, in examining the consequences of the Philippines' import substitution policy, have concluded:

The favoring of finishing-stage consumption goods industries at the expense of more basic

³ Howard Pack, *Structural Change and Economic Policy in Israel*, New Haven and London, Yale University Press, 1971, p. 81.

manufactures, together with the bias against exports, has caused resources to be dispersed in many small consumption goods industries, horizontally balanced in relation to consumer demand, rather than concentrated in vertically integrated large-scale industries producing both for the domestic and world markets. Consequently, the potential gains from economies of scale and from learning-by-doing, in the context of more rapid and concentrated growth, have been foregone.⁴

Another cause of the technical inefficiency is that the new industries which are set up behind tariff walls to replace imports would likely suffer from the high production costs and poor management. They are able to perform well only in the task which they are created for—import substitution—and under conditions in which they are created—protection and subsidy. In addition, the small size of domestic markets of many developing countries implies that in most industries the number of firms of economic size is not sufficient to ensure vigorous domestic competition. International competition, the firms' only source of competitive pressure to encourage efficiency and technological progress, is eliminated through protection.

The economic inefficiency (i.e., the misallocation of resources) occurs as a result of the bias against the production of intermediate goods, capital goods, and raw materials (inputs) used by the import substitution industries. The system of protection-subsidy creates a low market price for imported capital equipment and intermediate inputs and destroys any incentive to produce locally. This provides a tendency for import substitution industries to remain heavily dependent on imports. "Import dependent import substitution"⁵ persists, and the Nation's goal to reduce imports is self-defeating. Little, Scitovsky, and Scott's study on seven large less-developed countries⁶ following import substitution policy confirms this hypothesis. They stated: "[Import substitution] tends, paradoxically enough, to increase the economy's dependence on imports. Complete self-sufficiency is probably an unattainable goal; and as the economy becomes more nearly self-sufficient, it also becomes more import dependent, in the sense that the availability of the goods it still has to import becomes more crucial for the smooth functioning of the economy."⁷ However, they did not deny that in the long run the economy's self-sufficiency can be

improved,⁸ especially if the import substitution policy is linked to efforts to expand exports.

The country's increasing dependence on imported inputs implies backward integration of the import-substitution industries is not taking place. Efforts to improve the backward linkage investments by extending the protection and subsidy to input-producing industries are often met with a strong resistance by the initial industries. The reason is that the high profits enjoyed by the initial industrialists depend on their ability to obtain imported inputs at low prices, but the promotion of local production of inputs means that any increase in input prices is expected, as stated by Hirschman:

The greater the difference between the level of protection accorded to import substitution industry and that applying to its imported inputs, the more will the profit margin of the industry depend on preventing domestic production of the inputs. For it is a fair assumption that the backward linkage industry would, once established, be eligible for a level of protection similar to that benefiting the initial import substituting industry.⁹

An example of the inability of the import substitution industries to integrate backward can be seen in Mexico, where the automobile assembly plants existed for decades without any progress being made toward the manufacturing of motors and other assembly parts.¹⁰ The Philippine experience also shows "The early gains from taking over an existing market for consumption goods from excluded foreign suppliers are not easily repeated when the tasks become integrating backward to the production of intermediate and capital goods, and breaking into the export market."¹¹

High Prices, Worsening of Income Distribution, and Unemployment Problems

Import substitution processes may cause a higher cost of living. Import restriction would exert pressure to raise prices of imports; and the prices of domestic substitutes usually also rise to a high level, just below the import prices to preserve a competitive edge. Domestic competition, even when deliberately encouraged, is often insufficient to break the close link between the prices of imports and import substitutes. This is partly because of the small domestic market which prevents competition—as discussed earlier—and partly as a result of the govern-

⁴ *Ibid.*, p. 62.

⁵ Albert O. Hirschman, "The Political Economy of Import-Substituting Industrialization in Latin America," *The Quarterly Journal of Economics*, vol. LXXXII, No. 1, Feb. 1968.

¹⁰ *Ibid.*, p. 19.

¹¹ The Economist Intelligence Unit, *Quarterly Economic Review*, "Philippines-Taiwan Annual Supplement," 1970, p. 5.

⁴ John H. Power and Gerardo P. Sicat, *The Philippines, Industrialization and Trade Policy*, Oxford University Press, New York, 1971, p. 127.

⁵ This term was used by Power and Sicat, *op. cit.*, p. 104.

⁶ Argentina, Brazil, Mexico, India, Pakistan, Taiwan, and the Philippines. These countries together comprise over half of the developing world.

⁷ I. Little, T. Scitovsky, and M. Scott, *Industry and Trade in Some Developing Countries—A Comparative Study*, (London, Oxford University Press, 1970), pp. 59-60.

ment's policy to maintain a high selling price to retain an attractive profit margin in the domestic industrial sector. Little, Scitovsky, and Scott also observe:

To raise manufacturing prices and hence profits is generally considered desirable in order to provide extra rewards that will offset both a supposed lack of entrepreneurial spirit in developing countries and the handicaps of manufacturing in an environment where many supplies, facilities, and skills are still lacking, and the discipline of labor and the reliability of business accounts are at a low level.¹²

Evidence also indicates that countries following import-substitution industrialization generally observe a worsening trend of income distribution. This is a rather obvious result of the government's policy to boost the profits in the manufacturing sector in order to provide an incentive for this sector to compete with imports. The additional income that protection secures for labor and management in the industrial sector results in higher prices, and a loss to those associated with other sectors. This causes a concentration of income in the urban and industrial area. In addition, the inequalities are further worsened by the tendency of import-substitution industrialization to shift income in favor of profits over wages within the manufacturing sector itself.

Another distinguished feature of most economies following import-substitution policy is the high unemployment of unskilled manpower. The rate of labor absorption is usually substantially below the rate of urban population growth. In Latin America, after more than two decades of industrialization, the proportion of labor force employed in manufacturing has actually decreased. The low rate of industrial labor absorption is attributed to the factor price distortions. The investment incentives—to lower capital costs and stimulate industrialization—have depressed the price of capital in relation to labor and encourage labor-saving techniques. At the same time, labor legislations keep the wages high and further encourage capital-intensive techniques of production.

Sicat's study of the Philippine manufacturing,¹³ whose result was confirmed by Williamson,¹⁴ revealed that a 10-percent increase in the relative price of labor would account for a 10-percent decrease in the amount of labor employed per unit of capital.

¹² Little, Scitovsky, and Scott, *op. cit.*, p. 41.

¹³ G. P. Sicat, "Industrial Production Functions in the Philippines," *I.E.D.R. Discussion Paper*, 68-18, May 23, 1968.

¹⁴ J. G. Williamson, "Relative Price Changes, Adjustment Dynamics, and Productivity Growth: The Case of Philippine Manufacturing," S.S.R.I. Workshop Series, University of Wisconsin, 1969.

The high unemployment reflects and intensifies the unequal income distribution problem. The income would become more concentrated in the high capital-intensity sector. High-income groups consume technically more sophisticated goods, which have relatively high direct and indirect import requirements. This would add forces to further the country's dependency on imported goods as a result of import-substitution policies.

The above analysis of undesirable economic impacts of policy following intensive import-substitution strategy does not imply that the strategy should be totally discounted in all developing countries. It leaves open the possibility of using the strategy as a *temporary* means to support the local industries in their infant stages. Chenery found that "almost all countries have gone through a period of favoring industrial production for the domestic market, and it is at least arguable that for many types of manufactured goods this process favors the subsequent development of exports." Countries which quickly switched to export expansion after the initial period of import substitution have generally achieved a sustained growth.

Israel has been able to maintain the high rate of economic growth after the 1950-58 period in which import substitution strategy was intensively used. The post-1958 growth, however, was propelled by the high growth rate of exports, while import substitution continued in the intermediate-goods industries. The government had skillfully channeled all excess capacity in the previous import substitution industries to production for exports. This was accompanied by the government's vigorous efforts to encourage the entry of new firms to increase competition and efficiency. In addition, exports received a favorable exchange rate and the formation of cartels was legalized. The cartelization agreements allowed the higher prices in the domestic market to enable the industries to engage in a strong export drive. Another important feature of Israel's export process included the initiatives—by the government or trade organizations—to establish contacts with foreign purchasers, set quality standards, improve marketing methods, and insure against unusual risks involved in exporting.

As the export demand grew, the domestic demand for intermediate goods also increased. Thus, with some degree of incentives provided, the import substitution process continued in many intermediate-goods industries. The process of vertical integration can also be accelerated by appropriate policy actions. Hirschman observed that the regulations issued by the government of Brazil had caused a rapid enforcement of the backward linkage in the Brazilian automobile industry.¹⁵

¹⁵ Hirschman, *op. cit.*, p. 19.

Conclusion and Policy Implication

The above analysis indicates that overemphasis on import substitution without sufficient attention given to export expansion can lead a developing country to stagnation after a short period of initial success. The primary reason for such a development failure is that the policy instruments used to promote import substitution—tariff and nontariff protection and government subsidies—tend to cause factor price distortions and encourage comparatively disadvantageous industries and foster inefficiencies.

On the other hand, import substitution has been successful in fostering the development of infant industries, and led many less-developed countries to a sustained economic growth. These countries, however, only pursued the import substitution policy in the short, early stage of industrial development, then switched development emphasis to export expansion. Long-run liberal trade policies are viewed as desirable for small developing countries whose domestic market is too small to enhance economies of scale in production.

Puerto Rico, in the short run, may choose to promote the replacement of imported goods by local production without damaging the competitiveness and export potential of local goods, providing that precautions are taken to ensure the preservation of the industries' technological and economic efficiencies. In promoting such a policy, the following points should be kept in mind.

a. Puerto Rico, as a part of the United States, is within the U.S. customs area. It does not have the authority to impose a separate tariff on specific commodities which are either made in the United States or in a foreign country. Excessive protection will not likely be achieved. Because Puerto Rico has a common currency with an enormous U.S. market, the problem of an overvalued exchange rate experienced by independent countries can totally be discounted. The other means of promoting import substitution would be through a system of government subsidies and excise taxes. Even though the special excise tax imposed on nonlocal items is subject to constitutionality challenge, it is possible that Puerto Rico can initiate excise taxes on certain goods having an import-substitution potential and use part of the revenue proceeds to subsidize local industries producing these same commodities.¹⁶

b. A policy instituted by extremely generous subsidies given to import-replacement industries may increase economic inefficiencies and resource misallocations. Similar to the case of other LDC's, inefficiencies will arise out of the "subsidy umbrella"

which would likely include under it a number of comparatively disadvantageous industries. These industries will continually depend on government support; they are not technologically prepared and economically efficient to enter the international market, where transportation cost must be added, government assistance is less effective, the market is unknown, and the competition is more persistent.

c. Another factor that should be given consideration by Puerto Rican authority is that overemphasis in replacing a large number of imported goods will divert the island's resources and reduce the advantage of economies of scale. A program to produce consumer durable goods, such as stoves and refrigerators, to meet the local demand without an export horizon would likely prove to be unsuccessful in view of the limited number of households on the island which would purchase these products, hence only a few items will be produced, resulting in a high per-unit cost of production.

d. Government should identify and give the developmental priority to import substitution industries that have comparative advantages. These industries should have a promising prospect of being able to compete in the local as well as the export markets after the initial period of assistance, and when the domestic market has reached a saturation point. Also, industries that produce for domestic and U.S. or foreign markets simultaneously should be encouraged.

While the Commonwealth under the present common market status is unable to apply independent external tariffs, the investment in intermediate-goods industries linked to local industrial demand must be of sufficient size to be competitive and must be sufficient to overcome any adverse externalities, otherwise local industrial resistance to import substitution would be strong. Under appropriate policy guidance, increasing import substitution can improve the interindustry linkages and increase the multiplier effects.¹⁷

However, it should be noted that vested in the present Puerto Rican economic system is another important factor that may impede the movement to improve the backward linkage investments; i.e., the presence of a large number of U.S. subsidiaries in the island. To assure the uniformity of products produced in Puerto Rico and in other branches in the United States, these subsidiaries must, in most cases, purchase material and intermediate goods from their parent companies. This, plus the lack of confidence in the steady and onschedule supplies of local inputs may create a tendency to "resist" the purchase of locally produced inputs. Government action is needed to discourage this tendency. The action may

¹⁶ This method was suggested by Interagency Committee of Puerto Rico, *op. cit.*, p. 16.

¹⁷ This point is further discussed in section III.

be tied to the initial investment incentive package given to the import-substitution industries, allowing additional tax breaks if they purchase local inputs or extend the operation to produce inputs locally after a certain period of time. In some cases, where it is determined that a Puerto Rican industry can efficiently integrate backwards, but could not do so because of the lack of cooperation on the industrialists' part, strict regulations may be instituted. The resistance to backward linkage investments is undesirable from the point of view of the economy as a whole.¹⁸

PUERTO RICAN IMPORTS AND POTENTIAL IMPORT SUBSTITUTION INDUSTRIES

General

In 1950, Puerto Rico imported \$345 million worth of goods from abroad; by 1977, the imports were \$6,108 million, a 17-fold increase. The island's import coefficient (ratio of imports/GDP was 47.7 percent in 1950; it fluctuated around a slightly increasing trend to reach 49.7 percent in 1973, then sharply rose to 62.9 percent in 1977. The sharp 1977 increase probably reflects some inventory restocking and recovery from the 1975/76 recession. Moreover, the increase in the price of crude petroleum imports was another contributing factor.

An examination of the components and sources of imports shows that the promotion of import substitution for manufactured goods would not result in a significant reduction of the total Puerto Rican imports. Excluding petroleum, imports averaged only 15 percent of all imports in the past 5 years, and this percentage is declining. Among the nonpetro-

¹⁸ Hirschman argues that the resistance to backward integration would no longer exist if the initial import substitution industries themselves would integrate backwards, i.e., to produce their own inputs. The industrialists' ability to do so, however, depends on the process and techniques with which the industrialists are already familiar. The backward linkage would be more easily achieved in say, the "inbred" metal working than in the textile industry whose inputs come in large part from technological strangers, such as the chemical industry [Hirschman, *op. cit.*, p. 19]. In addition, backward integration can be achieved in the case in which high technology is not required. Discussion with producers of bakery products reveals that many of the metal cans and containers are produced by the same factory. This is because it is relatively simple and cost-effective to produce the containers (it requires only one machine), although the technologies are different between the production of bakery products and of metal cans and containers.

leum imports, agricultural commodities, e.g., coffee, fish, beef, and various meat products, constitute a significant part, leaving manufacturing imports as a small portion of the total shipments to Puerto Rico. Furthermore, these manufacturing items either are based on resources which cannot be economically transported to Puerto Rico for processing (e.g., lumber, food products).¹⁹ (See table 1.)

In contrast, U.S. shipments to Puerto Rico have been large and contained many items which can be efficiently produced in Puerto Rico. This section, therefore, concentrates on the import substitution of manufacturing goods originating from the U.S. mainland.²⁰

This section will:

a. Identify major U.S. manufacturing import items, arbitrarily defined as those with an import value in excess of \$20 million in calendar year 1976 (the latest year in which the detailed trade data are available).²¹

b. Discuss the general import substitution potential of each of the industries identified, based on the available information. Industries showing a good potential will be further analyzed in the following section IV.

Major Manufacturing Import Items

The major items shipped to Puerto Rico from the United States totaled nearly \$1 billion in 1976, constituting more than one quarter of all manufacturing and nonmanufacturing shipments to Puerto Rico. These manufactures are categorized into consumer nondurable, consumer durable, and intermediate goods, and are presented in table 2.

The single largest item of consumer nondurable imports appears to be food products (\$113 million). The largest single item imported in the consumer durable goods category is "motor vehicles" which amounted to nearly \$300 million in 1976. Household furniture ranked second with \$61 million; electrical machinery and equipment and motor vehicle tires

¹⁹ See chapter 9.

²⁰ The goal of import substitution of commodity "i" is to reduce the ratio of M_i/C_i —where M = imports, and C = local consumption (by industries or consumers) of the commodity—by reducing M_i .

²¹ These are 4-digit schedule B items. The values shipped are reported in *U.S. Trade with Puerto Rico and U.S. Possessions*, FTC Annual 1976, by the U.S. Department of Commerce, Bureau of the Census.

Table 1.—Puerto Rican Imports From the United States and Foreign Countries

	1950	1960	1970	1972	1973	1974	1975	1976	1977
Import (millions of dollars)	345	915	2,556	3,108	3,496	4,261	4,951	5,432	6,108
Export (millions of dollars)	235	622	1,729	1,797	2,466	3,339	3,138	3,346	4,480
Net Import-Export (millions of dollars)	110	293	827	1,311	1,030	922	1,813	2,086	1,628
GDP (millions of dollars)	724	1,692	5,034	6,334	7,030	7,759	8,208	8,876	9,717
Import/GDP (percentage)	47.7	54.1	50.1	49.1	49.7	54.9	60.3	61.2	62.9
Net Import-Export/GDP (percentage)	15.2	17.3	15.8	20.7	14.6	11.9	22.1	23.6	16.8

Source: Commonwealth of Puerto Rico, Planning Board, 1977 *Economic Report to the Governor* (San Juan).

and tubes are also significant. Most intermediate goods imported were textile products used in the apparel and textile industries, and containers (e.g., glass, metal, paper) used in the production and shipment of Puerto Rican goods for export.

Table 2.—Major Manufacturing Items Shipped to Puerto Rico from the United States (Calendar Year 1976)

	Value (In thousands of dollars)
Consumer nondurable goods:	
Food products:	
1. Manufactured milk products (022.1, 2)	40,611
2. Bakery products (048.4)	22,704
3. Beer, ale, porter, stout (112.3)	49,882
Petrochemicals:	
4. Prepared paints, enamels, lacquers (533.3)	21,022
5. Cosmetics, other toilet preparations (553.0)	39,183
6. Surface active agents, detergents, etc. (554.2)	39,779
Consumer durable goods:	
7. Rubber tires and inner tubes (629.1)	38,186
8. Motor vehicles (732.0, 8)	297,114
9. Heating and cooling machinery and equipment (719.1)	36,737
10. Electric household equipment (725.0)	46,474
11. Furniture (821.0)	60,701
Intermediate goods:	
Textile products:	
12. Yarn and thread of noncellulosic fiber (651.6)	27,531
13. Cotton fabrics, woven (652.1, 2)	97,852
14. Woven fabrics of noncellulosic fiber (653.5)	23,081
15. Knitted or crocheted fabric, no elastic or rubber 653.7)	33,614
16. Miscellaneous made up articles of textile material (656.9)	29,833
Containers:	
17. Paper bags, boxes, containers (642.1)	43,925
18. Containers and closures of glass (665.1)	19,418
19. Metal containers, for transporting goods (692.2)	22,683

Note: Numbers in parentheses () are schedule B codes.

Source: U.S. Bureau of the Census, *U.S. Trade with Puerto Rico and U.S. Possessions*, FT800/Annual 1976 (Washington, D.C.: Government Printing Office), table 1.

Import Substitution Potentials

Based on the general conditions of Puerto Rican industries discussed in the previous chapters, the commodities identified in table 2 are tentatively classified into the following groups:

Group I.—Import substitution is likely feasible because the local industries have already been established and are competitive. Items belonging to this group include bakery products (2) and malt liquors (3).

Group II.—Import substitution is likely feasible because of the strong and growing local demand. Furthermore, the required material inputs are either available locally or can be acquired economically from abroad. Items in this category are concentrated and condensed milk (milk products (1)), and rubber tires and tubes (7).

The expansion of industries in group I and in the establishment of industries in group II would require some government support. A more detailed analysis of these industries will be provided in a later section.

Group III.—Strategy to intensively promote import substitution for items in this group is not likely

effective and/or beneficial to Puerto Rico because of the low potential local demand. The commodities in this category are motor vehicles (8), heating and cooling machinery and equipment (9), and electric household equipment (10). For example, a strategy to promote import substitution by concentrating on the local production of automobiles to replace imported products would likely lead to failure. The automobile's high per unit cost has caused the high value (\$297 million) of motor vehicle imports. However, the replacement of imported automobiles by local products (import substitution) would be a near impossibility due to the small Puerto Rican market,²² the diversified nature of the product, the keen competition, and the degree of automation required in the production process.²³

Although household furniture (11) is also a high value-low quantity sales item—as in the case of household machinery and equipment—the industry is more labor intensive and less automated. Economies of scale may not be an important factor affecting its production growth. At present, the lack of information precludes any conclusion to be reached on the import-substitution potential of this industry; therefore, it is classified in group VI below.

Group IV.—Commodities which do not warrant a high priority in the government effort to promote import substitution because of the poor competitive prospect and/or the low contribution to Puerto Rican income and employment. This group includes all items in the petrochemical category listed in items 4, 5, 6.

The declining competitive situation of the petrochemical industry has been well presented in the Arthur D. Little study,²⁴ and in Appendix B, Petrochemical Industry Profile, of this report. In addition, the analysis in chapter III has found that petrochemicals and petroleum refinery products are among industries characterized by a very high capital intensity, very little labor income, and a level of profit which is not sufficiently high to warrant a high cost of investment. Although the analysis is too aggregate to derive a precise conclusion on the feasibility of the expansion of the above-mentioned products, it is sufficient to deter the classification of these industries to the list of high-priority import-substitution items.

Group V.—This group is represented by commodities in which import substitution can be improved by promoting interindustry linkages,²⁵ but the profit prospect is too uncertain to warrant direct

²² See Section II concerning the economies of scale.

²³ This argument, of course, does not apply to the strategy to produce automobiles by qualified companies for export market. The analysis concentrates on import substitution.

²⁴ Arthur D. Little, Inc., *Competitive Cost Position of the Puerto Rican Petrochemical Industry in 1977*, October 1977.

²⁵ See chapter VII.

and intensive government intervention. Textile mill products (items Nos. 12 thru 16) are included in this group.

The textile industry has experienced a substantial decline since the early 1970's. Employment rapidly and steadily decreased from 8,904 workers in 1970 to 4,277 in 1976. The total Puerto Rican shipments to the United States stood at \$11.6 million in fiscal 1976; two years earlier the number was \$182.6 million. Such a large drop was caused primarily by the drastic decline of the industry's main export components, i.e., yarn, thread, tire cord, and tire cord fabric (schedule P Nos. 65113 and 65115), whose shipment to the United States decreased from \$161 million in calendar year 1974 to less than \$10 million in 1976. This period also witnessed a \$47 million or 30-percent increase in the import of textile mill products, all of which originated from the U.S. mainland.²⁶ Puerto Rico's textile industry was among the hardest hit industries in the 1973-75 recession. Unfortunately, its recovery was hindered by the substantial increase in the industry's minimum wages.²⁷

Despite these problems, the industry's condition is expected to improve and will be of significant importance to Puerto Rico for some time, mainly because of the large potential demand for its products by the local apparel industry. Recent data show that Puerto Rican textile industry made a substantial comeback in 1977 as its sales increased 48 percent from the previous year to reach the level of \$175 million.²⁸ Furthermore, as found in chapter III, textile mill activities contributed substantially to income generating in Puerto Rico because a large percentage of the industry's income is paid to Puerto Rican workers. The social benefits of this industry justify a certain government effort in its promotion, at least through the encouragement of the local purchase of its products.

Most textile mill products are destined to serve as inputs to the apparel industry. As discussed in chapter VII, a large number of apparel firms are U.S. subsidiaries who purchase most inputs from their parent companies. A policy to improve interindustry linkages would effectively increase the demand for local textile products and enhance the substitution of imports.

Group VI.—This group includes furniture (No. 11), and paper, glass, and metal containers used for packaging and shipment of Puerto Rican products (Nos. 17, 18, 19). The demand for these items is growing and it appears that a significant portion has

been met by local industries. The local household-furniture industry reported a value of shipment of \$48 million in 1972 (U.S. census). The value of furniture imports from the United States was \$46 million. U.S. goods have gained a larger market share while the local industry has experienced some decline in the subsequent years. On the other hand, the glass-container industry has been expanding to meet the increasing demand, especially of local industries. Also, many of the industries using glass as well as metal and wood containers for packaging have increased the production of these items for their own needs.

As a whole, import substitution appears to have a good potential in this group. However, the insufficient information has precluded any conclusion to be drawn at this time. Further studies are recommended to determine the import-substitution feasibility of these individual items.

Summary

The above analysis identifies some industries which may be feasible for import substitution, including malt liquor, manufactured milk products, bakery products, and rubber tires and tubes. Further discussion of these industries is provided in section IV. The import substitution of motor vehicles, household machinery, and equipment is not feasible because the local market is too small to warrant their efficient production. Special efforts to promote the substitution of paints, enamels, toilet preparations, and surface active detergents are also not advised at this time due to the uncertainty in the competitive position of Puerto Rico's petrochemical industry. The replacement of textile imports can best be improved by a blanket policy to encourage the purchase of local textile products by apparel plants located in Puerto Rico. The market for local furniture, paper, glass and metal containers, will grow as Puerto Rico's population and industrial activities grow. However, further studies are needed to determine the economic feasibility of the import-substitution program for these materials.

ANALYSIS OF SELECTED IMPORT SUBSTITUTION INDUSTRIES

Beer

The Puerto Rican beer industry holds a promising prospect for import substitution for the following reasons:

(a) The local beer industry is already well established. Its operation is efficient and the prices of local beers being sold in the market are lower than

²⁶ Commonwealth of Puerto Rico, Economic Development Administration, *The Textile Mill Products Industry in Puerto Rico*, February 1977.

²⁷ See chapter IV.

²⁸ Commonwealth of Puerto Rico, Planning Board, unpublished data from the Commonwealth's Income and Product Accounts, 1977.

those of imported beers, either from the United States or foreign countries.

(b) The quality (taste) of local beer is considered highly competitive to imported beers.

(c) Local breweries can expand their present production level without a significant cost increase in terms of capital investment. Seven years ago, the Puerto Rican beer industry produced twice the amount it does today.

(d) The demand for beer by Puerto Ricans is expected to rise. Per capita beer consumption has increased consistently from 7.9 gallons per year in 1960 to 13 gallons in 1970 and 14.3 gallons in 1977. This level is, however, still substantially below the U.S. per capita consumption of 22 gallons per year.

(e) Although the imported beers have been gaining in the percentage of the local market share, the competition between local and imported beer is so intense that small governmental efforts to promote local brewers can tilt the balance in favor of local products.

Less than two decades ago, in 1960, the local breweries supplied 95 percent of 18 million gallons of beer consumed in Puerto Rico. In the 1960-70 period, Puerto Rico's beer consumption nearly doubled, but most of the market gain was captured by the United States and foreign beers, causing a substantial decline in the market share of Puerto Rican beers. As a result, in 1970, the supply of Puerto Rican beer was reduced to 70 percent of the market. The 1970-75 period witnessed a dramatic 50-percent decline in the absolute amount of local beer produced and sold, despite the continuous increase in the local demand (see table 3). Puerto Rico's beer export to the United States, which was never significant, stood at 21,000 gallons at a value of \$50,000 in 1975.

In fiscal year 1977, the Puerto Rican beer production was 12 million gallons, sharing only one quarter of the local market. The other three quarters were

taken primarily by the U.S. mainland brewers, including Schaefer (the leading company), Miller, Schlitz, Budweiser, Heineken, and El Tigre.

The tendency for large U.S. brewers to increase the domination of the market is not uncommon. The United States once had more than 700 independent breweries; today's number is only 48. There were 42 breweries in Philadelphia two decades ago; only one is left today. The small brewers have been hard hit by the increasing costs of grain, metal and glass for packaging, and especially the huge advertising budgets of the larger companies. The shift of public demand toward products of large companies in many cases was simply due to the "images" they have created through intensive promotion programs.²⁹

The general consensus among local business authorities is that this is precisely the reason for the rapid deterioration of the competitive positions of Puerto Rican beers. The local beer industry now faces a situation where it must expand to regain the economies of scale in production or will be driven out of business. The smaller market share would reduce the industry's budget and preclude it from conducting expensive (and effective) advertising campaigns, or developing periodical market studies to anticipate any changes in consumer tastes.

Development Strategies.—In reviewing the local beer industry, any one or combination of the following three measures can be adopted:

(a) Increasing the excise tax on all beers sold locally and using part or all of the revenue proceeds to assist the local brewers in their promotion efforts. In fact, this measure was adopted in 1972. Nearly half of the \$8 million collected from the new excise tax on beer was used to support local brewers in marketing, advertising, quality control, and employee training programs through Fomento. The incentive program was abolished in 1976.^{30 31}

(b) Requiring a mandatory deposit on beer containers sold locally. All "no deposit-no return" bottles and metal cans are banned. This measure has two important effects.

• **Import substitution effect.** The new regulation will cause an increase in the handling cost for the producers and/or distributors of the imported as well as locally produced beer. While it is possible that this increased cost would be covered by the savings in material cost for local brewers (as a result

²⁹ See, *The Washington Post*, "Local Distributor Helping Strohs to Compete," September 26, 1978, p. E-1.

³⁰ *Caribbean Business*, "We Want Our Market Back," Nov. 10, 1977, p. 1.

³¹ At the final writing of this report (May 1978), the Administration has proposed a bill which would increase the local excise tax on beer by 55 cents a gallon (or 5 to 6 cents per can or bottle at retail prices). The tax, however, would only apply to brewers producing 31 million gallons or more annually. Thus the island beers would not be affected by the new tax increase. This bill, however, is subject to constitutionality challenge. (*San Juan Star*, May 27, 1978).

Table 3.—Beer Production, Import, and Consumption

[Thousand wine gallons]

Year	Local production	Import (United States and foreign)	Consumption ¹	Percentage share of local production
1960	17,614	864	18,478	95.3
1965	23,609	2,760	26,369	89.5
1970	24,755	10,541	35,296	70.1
1971	15,651	21,980	37,631	41.4
1972	18,793	22,534	41,327	45.5
1973	21,517	20,360	41,877	51.4
1974	11,984	25,679	37,663	31.8
1975	12,776	25,847	38,623	33.1
1976	15,775	25,437	41,212	38.3
1977	12,233	34,563	46,796	26.1

¹ Consumption = Local Production + Import; Export is negligible.

Source: Junta de Planificación de Puerto Rico, *Informe Económico al Gobernador* 1975 and 1977 series.

of using the returned containers), this is not the case for the importers. The long distance to their home breweries means a substantial increase in the transportation cost and a reduction in their competitive edge. The importers may of course choose to sell the returned containers to a local recycling plant (at low price). The savings on material, however, is unrealized and the benefit of the new regulation remains with the local brewers.

• **Environmental effect.** The disposal of aluminum cans and glass bottles has been a major environmental concern for years. In early 1977, two States, Oregon and Vermont, adopted provisions for mandatory deposit requirements on beverage containers. Several counties, including Fairfax County of the Washington, D.C., metropolitan area, have issued similar regulations for soft drink containers. Other States (e.g., Maine, Massachusetts, Colorado, and Michigan) are considering the adoption of such regulations.³² These regulations, if adopted, would safeguard the beauty of Puerto Rico and continue to provide a favorable atmosphere for the growth of tourism.

(c) Encouraging and assisting the local beer industry to expand to the U.S. mainland market. The large sales volume would increase the economies of scale and reduce the industry's per unit cost of production and distribution, which in turn would help the Puerto Rican beer industry to be in a better competitive position in the local market. This strategy is consistent with optimum long-term development goal of fostering import substitution and export expansion simultaneously.³³

As stated above, the U.S. beer market is highly competitive. Most of the smaller brewers have dropped out in the past decades, giving way to a few large national brewers. On the other hand, the U.S. beer consumption has been increasing steadily.³⁴ Foreign beers have taken advantage of this trend and captured a record gain in the past years.³⁵ Many small regional brewers have also successfully competed in the U.S. markets.³⁶ There is a reasonably good prospect for Puerto Rico to export beers to the United States for the following reasons:

With innovative advertisement and promotional procedures a substantial volume of Puerto Rico's beer can be sold to Puerto Ricans living in the U.S. mainland. The 1970 population census shows nearly 1.4 million Puerto Ricans—equivalent to one-half

of the island's population—living in the United States, 58 percent of whom were island born. Out of the total, over 1 million live in the New York-New Jersey area and 80,000 in Chicago. This concentration provides a very favorable condition for the promotional efforts.

The promotion mechanism for rum is well established in the U.S. mainland by Fomento. The cost of adding the beer promotion campaign to the current rum advertisement program would not likely be substantial.

A substantial financial return to the government's contribution to the industry's advertisement campaign expenses is almost guaranteed by the expected increase in the refund of U.S. excise taxes. Current law provides that excise taxes collected from Puerto Rican products sold in the United States be returned to the Commonwealth's treasury. There is an excise tax of \$9 per barrel of beer sold in the United States.³⁷ If Puerto Rico can capture only one-thousandth of the U.S. market, it would net 170,000 barrels in sales per year, and the excise tax return to Puerto Rico would be more than \$1.5 million (minus U.S. Government's expenses).³⁸ Alternatively, if the one million Puerto Ricans living in the New York-New Jersey area use 25 percent of the amount of money that was spent on U.S. and foreign beer to purchase Puerto Rican beer, 180,000 barrels will be sold and the Puerto Rican treasury would net about \$1.6 million in excise tax returns.³⁹

These are probably conservative figures. As the product gains consumer familiarity, and continuous marketing studies help to modify the beer formula, if necessary, to better suit the U.S. consumer's taste, and to enable more effective advertising campaigns, the sales of Puerto Rican beers can increase manifold.

Conclusion.—The above discussion attempts to show that the market condition appears favorable for the import substitution and export expansion of the Puerto Rican beer industry. Among the three measures to promote the industry, the first measure—i.e., the increase in excise taxes—appears inferior to the latter measures. The increased tax would cause an increase in the price of beer that will be passed on, in whole or in part, to local consumers. Furthermore, this measure of "protection" constitutes an "inward looking" policy which does not encourage efficiency.⁴⁰

Finally, it should be kept in mind that the purpose of this analysis is to provide an example of many industries in Puerto Rico in which the import sub-

³² U.S. Department of Commerce, *U.S. Industrial Outlook 1977* (Washington, D.C.: U.S. Government Printing Office), January 1977.

³³ See section on Policy Implication.

³⁴ Per capita consumption for the 21-years-and-over age group rose from 33.1 gallons in 1974 to 34.2 gallons in 1975.

³⁵ The sales of imported malt liquor rose from \$70 million in 1974 to \$176 million in 1976.

³⁶ For example, see "Local Distribution Helping Stroh's to compete," *Washington Post*, March 25, 1978.

³⁷ A \$7 per barrel tax rate applies to the first 60,000 barrels of beer of a brewer who produces not more than 2 million barrels of beer per calendar year.

³⁸ See chapter VI.

³⁹ Based on the U.S. average of 22 gallons per year.

⁴⁰ See section on Theoretical Consideration and International experience.

stitution strategy can be promoted in conjunction with export expansion, i.e., the short-term self-sufficiency and long-term industrial-expansion goals are pursued simultaneously. The analysis does not contain sufficient information to serve as a feasibility study, nor does it so intend. Additional investigation must be conducted on the U.S. market demand as well as the economic impact of the measures used to promote such a strategy.

Manufactured Milk Products

Puerto Rican import of milk products from the United States consists mainly of evaporated milk, condensed milk, cream, and nonfat dry milk. (Schedule B 022.1 and 022.2, SIC code 2033.) The value of shipments fluctuated around the average of \$32 million per year from 1970 to 1975, then rose sharply to \$40 million in 1976.⁴¹

At present, the milk-processing industry is virtually nonexistent in Puerto Rico. A program to successfully manufacture milk products locally will not only decrease the outflow of the dollars but also help stimulate the development of Puerto Rico's agricultural sector, through the newly created demand for whole milk. The following sections will briefly discuss the availability of materials and other factors affecting the development of such a program.

Materials.—A survey of the production characteristics of the U.S. condensed and evaporated milk industry shows that nearly all the materials required for the production of milk products, except for containers and supplies, are whole milk and milk derivatives. Specifically, 45 percent of the total costs of material consumed is from whole milk, 23 percent from milk products, and the remaining 31 percent of the cost is from the purchase of containers, supplies, and other materials. See table 4.

Puerto Rico's whole-milk production has been in-

⁴¹ Calendar years. Source: U.S. Department of Commerce, *U.S. Trade with Puerto Rico and U.S. Possessions*, op. cit.

Table 4.—Production Characteristics of the U.S. Condensed and Evaporated Milk Industry, 1972

	Value (millions of dollars)	Percentage
Material consumed:	1,026.1	100.0
Whole milk	462.5	45.1
Fluid skim milk	31.6	3.1
Cream	26.1	2.5
Butter	(²)	—
Condensed and evaporated milk	57.3	5.6
Dried milk	102.1	10.0
Natural cheese	2.8	—
Ice cream, sherbet, and ice milk	(²)	—
Sugar	16.4	1.6
Other materials, containers, supplies	319.1	31.1
Value of shipment	1,667.8	

(²) Withheld to avoid disclosing figures for individual companies.

Source: U.S. Department of Commerce, Bureau of the Census, *1972 Census of Manufactures, Volume II, Industry Statistics, SIC-2023*.

creasing rapidly as a result of intensive government efforts to develop the island's agricultural activities. In 1977, milk was the number one sector in agriculture, producing \$146 million and employing some 20,000 people in direct and indirect jobs.⁴² The development process, however, was nearly stalled by a low demand for milk by local sources, causing an excess production of 30 million gallons in 1977. The excess was purchased by the Commonwealth Government at a below-cost price, resulting in a \$4.7 million loss to local dairy farmers. Nevertheless, the government's net cost of subsidizing the milk industry amounted to \$1 million per annum.

Attempts to sell Puerto Rican milk to the Army and federally funded school lunch programs have failed due to the relatively low quality of local milk. The Department of Agriculture is now forced to implement means to decrease the production. Whether the Department is successful or not, the local milk industry in particular, and the agricultural sector in general, will suffer some irreversible damages. Conversely, if the demand for local products can be increased through the establishment of a sound milk-processing industry, the local dairy farms will continue to be a growing source of income and employment for Puerto Rico in the years to come.

Economies of Scale.—Generally, a firm which produces a relatively larger quantity of output would experience a lower per-unit cost and, as a result, can better compete in the open market. The firm's quantity produced, however, is limited by the size of the market. An initial investigation of the Puerto Rican consumption (potential demand) and the economic size of milk-processing plants in the United States shows that the economies of scale do not appear to be a significant constraint to the establishment of a milk-processing industry in Puerto Rico. The 1972 U.S. Census shows that the firms rating third most efficient in plant size (measured in terms of value added per dollar of payroll) were those employing between five and nine workers. These firms produced an average of \$503,125 per year. See table 5. Such an output is equivalent to less than 2 percent of the current Puerto Rican purchase of manufactured milk products from the U.S. mainland.⁴³

The group which employed 20 to 49 workers has the largest number of establishments, producing \$4.67 million each on the average. This amount is 17.5 percent of the current local purchase of the products.

⁴² Interview with Puerto Rican Secretary of Agriculture in "Agricultural Plan A Success for First Year," *Caribbean Business*, March 16, 1978.

⁴³ The current (1977) purchase of condensed and evaporated milk is \$39,756,000. Deflation of this amount based on the dairy product's price increase of 49 percent from 1972-77, would bring it down to \$26,681,879 in 1972 prices; \$500,000 is 1.87 percent of this deflated amount. The inflation rate of dairy products is obtained from the U.S. Department of Commerce, Bureau of Economic Analysis, *Business Statistics* series.

Table 5.—Condensed and Evaporated Milk, Production Statistics by Employment Size of Establishment, United States, 1972

Number of employees	Number of establishments	Value of shipment per establishment	Value added per employee
1-4	37	\$140,540	\$3.33
5-9	32	503,125	3.83
10-19	51	1,364,706	3.35
20-49	89	4,699,663	3.39
50-99	49	8,585,714	3.00
100-249	20	26,390,000	5.61
250-500	5	106,400,000	6.19

Source: U.S. Department of Commerce, Bureau of the Census, 1972 *Census of Manufactures, Volume II, Industry Statistics*, SIC 2023, p. 20, B-12.

Thus, if the technology being used in the Puerto Rican manufactured-milk production is compatible to that of the United States, a 20-percent share of the local market would be sufficient for an establishment of a plant employing 20 to 49 workers, or several plants employing 5 to 9 workers.

In summary, this section has briefly examined the characteristics of the milk-processing industry and the benefits of establishing such an industry in Puerto Rico (to substitute for imports and stimulate agriculture). The findings justify further study to provide a detailed examination of the production requirements, determine the marketing and distribution strategies, and develop a plan to provide necessary incentives to attract and promote initial investments.

Bakery Products

General.—The two major categories of bakery products are: (1) "perishable" products, such as bread, buns, cakes, doughnuts, pastries, etc., and (2)

"dry" bakery products, including biscuits, crackers, cookies, and similar items. These two categories are classified under SIC codes 2051 and 2052, respectively.

The U.S. shipments of all bakery products to Puerto Rico were reported at a high level of \$22.7 million in calendar year 1976.⁴⁴ Foreign imports are estimated to add approximately 15 percent to this total.⁴⁵ The local bakery products market, while historically controlled by Puerto Rican manufacturers, has become a large and increasing source of income for offisland producers.

This section will examine Puerto Rico's bakery products industries, and suggest policy options to improve the competitive conditions of local production and encourage import substitution in this market.

Puerto Rico's Bakery Products Industry and Market.—The bakery product industry of Puerto Rico has steadily declined in the past two decades, contrary to the rapid growth of the island's manufacturing sector as a whole.

In 1958, there were 270 establishments producing bakery products in Puerto Rico. By 1972, only 98 were reported in operation. While outputs experienced a rapid growth prior to 1972, employment in the industry as a group reported no growth from 1958 to 1963, and substantially decreased thereafter. See table 6.

Puerto Rico's bakery products industries have also experienced a declining competitive position against foreign imports. In a 7-year span, 1968 to 1975, foreign imports increased tenfold. As a percentage of U.S. shipments, foreign imports rose from 3.5

Table 6.—Bakery Products Industries of Puerto Rico

	All bakery products				Perishable products				Dry products			
	1958	1963	1967	1972	1958	1963	1967	1972	1958	1963	1967	1972
Number of establishments	270	223	202	98	263	212	189	86	7	11	13	12
Employment	2,483	2,483	2,053	1,923	2,157	1,950	1,936	1,354	326	533	567	569
Value of shipments (thousands of dollars)	18,348	25,547	32,727	34,478	43,946	18,384	23,779	23,483	4,402	7,163	8,948	10,635

Source: U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures, 1972*. (Washington, D.C.: Government Printing Office, 1974).

Table 7.—Shipments of Bakery Products from United States to Puerto Rico

[In thousands of dollars]

1958	\$2,523	1973	\$11,121
1963	3,519	1974	13,181
1967	6,228	1975	16,551
1971	7,532	1976	22,703
1972	9,625		

Source: U.S. Bureau of the Census, *U.S. Trade with Puerto Rico and U.S. Possessions*, Ft 800/Annual, various years, (Washington, D.C.: Government Printing Office).

percent to 16.3 percent in the period. In 1975, imports from the Netherlands ranked the highest with \$938,470, followed by Colombia (\$408,842) and Dominican Republic (\$350,418). See table 8.

⁴⁴ U.S. Department of Commerce, Bureau of the Census, *U.S. Trade with Puerto Rico and U.S. Possessions*, FT 800/Annual 1976, (Washington, D.C.: Government Printing Office).

⁴⁵ Based on the Puerto Rican Planning Board, *External Trade Statistics*, which reported in fiscal 1975, imports of bakery products from foreign countries amounted to \$2.493 million, or 14 percent of \$15.289 million imported from the United States.

Table 8.—Import of Bakery Products from Foreign Countries, 1968 and 1975

(In thousands of dollars)

	1968	1975	Percentage increase
Argentina	(¹)	\$1,330	(²)
Belgium and Luxembourg	\$14,747	147,109	897.5
Brazil	(¹)	102,235	(²)
Canada	8,617	27,955	224.4
Colombia	(¹)	408,842	(²)
Denmark	38,431	203,655	430.0
Dominican Republic	840	350,418	(²)
France	6,477	12,849	98.3
Hong Kong	(¹)	24,535	(²)
Italy	(¹)	1,813	(²)
Netherlands	46,056	938,470	1,937.6
Spain	5,344	13,786	158.0
Trinidad and Tobago	3,717	6,585	77.2
United Kingdom	102,285	203,979	99.4
Venezuela	(¹)	49,700	(²)
Finland	3,217	(¹)	-100.0
West Germany	922	(¹)	-100.0
Yugoslavia	774	(¹)	-100.0
Total	231,197	2,493,261	978.4

¹ Negligible.

² Very large, undefined.

Source: Puerto Rico, Planning Board, *External Trade Statistics*, 1968, 1975 (fiscal years).

The reasons for such a decline in employment, and a slow growth in output are mixed. They range from the insufficient attention offered the industry by the government, the local producers' lack of knowledge in modern marketing techniques, the stiff competition of U.S. and foreign imports, and the increase in wage rates which this labor-intensive industry will only slowly absorb through efficiencies in its other factor costs or productivity increases.

The primary emphasis of the government's "Operation Bootstrap" was to encourage the production of commodities for export markets. Most export industries, such as apparel, leather products, chemicals, etc., received government assistance, tax exemptions, and other financial and facilities supports. Bakery industries, on the other hand, oriented their products to meet local demands, and historically received relatively little attention from the government. Moreover, these industries are largely owned and managed by Puerto Ricans. They are not U.S. subsidiaries, and have neither sufficient knowledge nor facilities to expand to the highly competitive export markets.

On the other hand, competition from abroad has increased substantially. U.S. mainland producers, because of their large advertising budgets, have asserted influence to shift local consumer preference to mainland products. High capital investments also enable these producers to increase labor productivity which helps absorb the extra transportation cost to Puerto Rico. As a result, U.S. producers have consistently gained larger shares of the island's market, and increased the levels of U.S. shipments from \$2.5 million in 1958 to nearly \$10 million in 1972. In the following 4-year period, the rate of increase accel-

erated, causing the absolute level of bakery goods and shipments to more than double, reaching the record level of \$22.7 million in 1976. See table 7.

The gain in foreign imports of bakery products shown in table 8 can be largely attributed to the U.S. Government's liberal trade policies and increasing Puerto Rican labor costs. For example, the average wage rate in Colombia is \$0.46 per hour and in Argentina is about \$0.66. The minimum wage of \$2.65 per hour is required to be paid to workers in Puerto Rico's bakery-products plants. In addition, under local laws, the companies are required to pay each worker 15 days of vacation leave per year, 10 days of sick leave, workmen's compensation, medical insurance, and 2 percent of annual salary payable to all employees as a Christmas bonus.⁴⁶

Import Substitution Prospects and Policy.⁴⁷—

Prospects.—The large difference in labor costs described above would make it tremendously difficult for the island to "substitute" for foreign imports. As an initial effort, import substitution policy should concentrate on regaining the local market share from U.S. producers. However, the productivity of the Puerto Rican bakery products industry was considerably lower than that of its U.S. counterpart. In 1972, value added per Puerto Rican worker was \$8,438, an amount equivalent to 44 percent of the average U.S. worker's productivity (\$19,357); however, Puerto Rico's low average wage rate (by U.S. standards) increased the island's value added per dollar of payroll to 88 percent of the mainland's. With the majority of Puerto Rican workers receiving pay at the minimum statutory level, the gap between the U.S. industry's value added per dollar of payroll and that of Puerto Rico is expected to widen, hence the island's competitive position worsened.

⁴⁶ Institute of International Law and Economic Development, *Economic Effects of Federal Programs and Policies in Puerto Rico*, A Report Prepared for the U.S. Department of Commerce, Economic Development Administration, June 1978, vol. III, ch. IV.

⁴⁷ Except as otherwise specified, information in this section was obtained through discussions with Puerto Rican bakery-goods producers.

Table 9.—Bakery Product Industry in the United States and Puerto Rico (1972)

	Puerto Rico	United States	P.R./U.S. ratio (percentage)
Value added (in thousands of dollars)	16,226	4,548,900	
Employees (number)	1,923	235,500	
Payroll (in thousands of dollars)	8,249	2,037,500	
Value added/employee (in dollars)	8,438	19,316	44
Value added/payroll (in dollars)	1.97	2.23	88

Sources: U.S. Bureau of the Census, *Census of Manufactures, 1972, Volume II—Industry Statistics*, (Washington, D.C.: Government Printing Office).

U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures, 1972*, (Washington, D.C.: Government Printing Office).

and tubes imported from the United States was \$6.5 million in 1958. It doubled in the 1958-67 decade and tripled in the following decade. By 1976, the total value of these products shipments stood at nearly \$40 million. Imports from foreign countries added approximately 10 percent to this total.⁵⁰

Table 11 shows the breakdown of the tires and

tubes products shipped from the United States by items in FY's 1968 and 1975. Passenger car and cycle tires accounted for 65 percent of the total value of shipments in 1975. Together with truck and bus tires, they accounted for \$25 million, 85 percent of the total U.S. shipments of tires, tubes, and products to Puerto Rico.

Table 11.—Shipments of Tires, Tubes, and Products From United States to Puerto Rico, FY's 1968 and 1975

Schedule B	Description	Value		Percentage increase
		FY 1968	FY 1975	
6291010	Passenger car and cycle tires, pneumatic	\$8,254,327	\$18,745,138	127.1
6291020	Truck and bus tires, pneumatic	3,113,632	5,467,057	75.6
6291030	Off-the-highway tires, pneumatic	711,911	1,070,999	50.4
6291040	Aircraft tires, pneumatic	127,515	56,009	-56.1
6291050	Tractor implement tires, pneumatic	418,267	1,092,391	161.2
6291060	Other vehicle pneumatic tires	29,848	72,353	142.4
6291070	Solid cushion vehicle tires	153,317	89,795	-43.3
6291080	Inner tubes for vehicles	711,404	1,069,099	50.3
6291090	Tire flaps	31,848	14,638	-54.0
6210220	Tire sundries and repair material	240,589	96,480	-60.0
6210230	Tread rubber, camelback	889,391	842,240	-5.3
Total		14,687,149	28,616,250	94.8

Source: Puerto Rico, Planning Board, *External Trade Statistics*, 1968, 1975.

Puerto Rico's imports of tires, tubes, and products from foreign countries were also dominated by items for automobiles and trucks, i.e., 55.6 percent were passenger car tires and 38.1 percent were tires for trucks and buses.

Table 12.—Imports of Tires, Tubes, and Products From Foreign Countries, FY 1975

Item	Value		Per- centage increase
	1968	1975	
Passenger car tires	\$388,187	\$2,788,994	618
Truck and bus tires	318,735	1,910,636	499
Others	640,508	313,937	-55
Total	1,397,430	5,013,937	259

Source: Puerto Rico Planning Board, *External Trade Statistics*, 1968, 1975.

Tables 11 and 12 above show that, in addition to the large volume, the combined offisland purchase of automobile and truck tires (from United States and foreign countries) increased at rapid rates. Therefore, initial efforts to promote the import substitution of tires, tubes, and products would likely provide a high return if concentrated on these items.

The establishment of a strong automobile tire industry in Puerto Rico has been of interest to the Commonwealth Government for many years. In a letter to the Federal Maritime Commission, in 1968, listing several goods which are essential to the industrialization program of Puerto Rico, the EDA included processed natural or synthetic rubber and carbon black. These two materials are essential for

the production of automobile tires. The letter stated:

"It is estimated that this project alone (automotive tires) will generate some 2,500 direct jobs."⁵¹

However, 4 years later, in 1972, when the last economic census was conducted, the industry recorded only a few dozen people employed in the entire tires and inner tubes industry group with the total output of less than \$300,000.

Further efforts to promote the expansion of the tires and tubes industry in Puerto Rico should consider the following factors:

a. There has been and will be an increasing demand for and market share of radial tires. In 1970, the radial passenger car tires represented only 2 percent of output in the United States. In 1976, the output share was 40 percent. The U.S. Department of Commerce has predicted that radial tires will continue to gain in market share, but at a reduced rate in the future.⁵²

b. The industry is very energy-sensitive. The higher cost of energy causes both a decrease in the demand for automotive tires and an increase in the cost of supplying the product.

On the demand side, the higher gasoline prices would cause consumers to purchase lower weight automobiles and fewer automobiles, reducing the quantity of tires demanded. On the supply side, the higher energy cost increases the costs of petrochemical products used as principal inputs in the produc-

⁵¹ Federal Maritime Commission, *Puerto Rican-Virgin Islands Trade Study*, 1970 p., 198.

⁵² U.S. Department of Commerce, *U.S. Industrial Outlook 1977*, (Washington, D.C., U.S. Government Printing Office, 1977), p. 160.

⁵⁰ Based on the data from Puerto Rican Planning Board, *External Trade Statistics*, 1975.

tion of tires and tubes (including synthetic rubber, tire cord, carbon black, etc.). See table 13.

Table 13.—Material Consumed by U.S. Tire and Tubes Industry, 1972

	Value (millions of dollars)	Percentage of total
Natural rubber	186.7	8.6
Synthetic rubber	651.5	30.0
Rubber processing chemicals	99.8	4.6
Carbon black	148.8	6.9
Tire cord and tire fabric	641.3	29.6
All other material, containers, and supplies ..	441.4	20.3
Total	2,169.5	100.0

Source: U.S. Bureau of the Census, *Census of Manufactures, 1972, Volume II—Industry Statistics* (Washington, D.C.: Government Printing Office).

c. The increasing use of rubber. The expansion of the market for radial tires, which require twice as much natural rubber as conventional tires, will decrease the energy sensitivity of the industry and increase its demand for rubber. To cope with the possible future shortage of natural rubber, Goodyear Tire & Rubber Co. has begun an expansion program to increase its natural rubber acreage by more than 40 percent by 1990. Firestone Tire & Rubber Co. also plans to expand its worldwide acreage by 25 percent and also tries to replace older trees with better yielding trees.⁵³ Smaller tire companies who are without sufficient knowledge of the future market may encounter a material (rubber) shortage in the future.

⁵³ Paul Van Shembrouck, "Rubber Bounces Back," in *Christian Science Monitor*, reprinted by *Pacific Daily News*, Guam, March 28, 1978.

d. Economies of scale is an important factor. According to the company financial reports, the five largest tire manufacturing and distribution firms, with sales of \$11 billion, had net profits amounting to 5 percent of sales in 1976. Five smaller companies, which had total sales of \$3 million, reported the net profit/sales ratio of only 1.5 percent. The U.S. Department of Commerce concluded that "it is very difficult for the smaller companies to expand or modernize facilities when returns on sales and investment are insufficient."⁵⁴

Conclusion and Policy Implications.—The specific characteristics of the rubber tires and tubes industry outlined above indicate that the island's production of these products should best be undertaken by large and well established U.S. or international companies. These companies will likely emphasize the production for export markets, but the objective of meeting the island's demand for tires and tubes by industries located in Puerto Rico will also be at least partly fulfilled. The promotion of international firms is likely more successful since their expansion in the U.S. tires and tubes market has shifted from increasing sales to increasing sales and investment in recent years. A foreign-owned plant has recently been opened in South Carolina and another one has been renovated in Colorado.⁵⁵ Puerto Rico, with the tax-incentive package, low average wage, and without significant labor-union problems,⁵⁶ can be an attractive place for U.S. as well as international tire companies.

⁵⁴ *U.S. Industrial Outlook, 1977, op cit.* p. 160.

⁵⁵ *Ibid.*

⁵⁶ The 1976 strike of 60,000 U.S. workers reduced the company earnings substantially. The newly approved contract, which is valid until 1979, is estimated to result in about 36 percent increase in the total labor costs for the 1976-79 period. *Ibid.*, p. 159.

Chapter IX.—U.S. Foreign Trade Policy and Puerto Rican Industry

INTRODUCTION

Except for coffee and sugar, the Commonwealth of Puerto Rico has been treated as an integral part of the United States insofar as foreign-trade policy is concerned. A different Puerto Rican coffee tariff dates from the early years of this century and the Sugar Act of 1940 established a quota for Puerto Rican sugar exports to the mainland. Otherwise, Puerto Rico is part of the U.S. customs territory. Unlike the Virgin Islands, U.S. tariffs and other foreign trade restrictions apply to goods of foreign origin imported into Puerto Rico, while all exchanges of goods between Puerto Rico and other parts of the U.S. customs territory are free from any such barriers.

U.S. foreign trade policy affects the development of Puerto Rican industry in a variety of ways:

(1) A reduction in U.S. import barriers may reduce the cost of consumer goods imported into Puerto Rico. It may also reduce the cost of raw materials, finished products, and capital equipment with comparable effects on production, competitive costs, and the attractiveness of new investment.

(2) A reduction in U.S. import barriers on products produced in Puerto Rico for the mainland market would increase competitive pressures on Puerto Rican producers, reduce the prices that could be charged for such production, diminish its profitability, and discourage new investment.

(3) A reduction in U.S. import barriers on goods produced in Puerto Rico for the Puerto Rican market would have effects on Puerto Rican producers of those goods similar to a tariff reduction on the products it markets on the mainland.

(4) A reduction on foreign trade barriers to goods that are or could be produced competitively in Puerto Rico would open new markets for Puerto Rican producers and attract investment in expanding existing production or introducing new industries.

(5) Increases in U.S. or foreign barriers would have the opposite effect of the types of reductions indicated in (1) to (3) above.

(6) Changes in the exchange rate of the dollar

have effects comparable to a change in trade barriers. An increase of the value of the dollar vis-a-vis another currency has the same competitive effect as a reduction in U.S. trade barriers or an increase in the barriers of countries using the other currency. The effect on Puerto Rico depends on whether a country provides goods that are actually or potentially competitive with Puerto Rican production for the domestic mainland or other foreign markets, or whether such a country is an important source of supply for Puerto Rican consumer demand.

Puerto Rico is a tiny component of the U.S. economy, with a GNP equivalent to less than one-half of one percent of the U.S. total. Yet U.S. actions affecting its overall foreign trade position apply to Puerto Rico and their impact may be magnified or minimized as a result of Puerto Rico's special economic characteristics—its location and insular character, its climatic conditions, relatively dense population, and the much less developed status of its economy. To evaluate the impact of U.S. foreign trade policy in Puerto Rico, one must look at products that are particularly important to the island, whether as a producer or an importer. One must also look at the markets that the Puerto Rican economy is particularly equipped to serve.

Foreign exchange policy is inherently an indiscriminate instrument, ill-suited to differentiating among the various geographic and economic sectors of the society, let alone the output of specific island industries. On the other hand, foreign trade policy *per se* is discriminating, by its very nature. Foreign trade barriers are erected or dismantled, raised or reduced as a result of multilateral and bilateral negotiations or unilateral actions in which specific products are very much at issue.

International trade negotiations occur in a climate of reciprocal concessions. The participating countries make concessions to each other within a framework intended to achieve a balance of advantages to existing producers within each country, as well as an overall benefit to all participating countries through greater specialization and better allocation of re-

sources to products of greater comparative advantage. Even where unilateral concessions are offered, as in the case of the Generalized System of Preferences (GSP) to developing countries, they are defended as a means of increasing the developed countries' ability to increase exports to developing countries.

It is thus important to go beyond an analysis of the effect of past and recent U.S. foreign trade policy behavior on Puerto Rican industry. One must also examine how Puerto Rico was treated in determining the balance of reciprocal concessions on the U.S. economy as a whole. Did Puerto Rico have an opportunity to register its special interests in each negotiation prior to the formulation of a U.S. negotiating position? Were those special interests given reasonable consideration and accorded an appropriate priority in U.S. bargaining and in the final agreements?

This chapter attempts to analyze the subject matter of the foregoing remarks. U.S. foreign trade policy has a long history and many facets. Seven rounds of multilateral trade negotiations have taken place since 1947 (including the current Tokyo round), as well as innumerable bilateral trade negotiations. There have also been a number of international commodity agreements in which the United States has participated, including two that are of importance to Puerto Rico as a producer—sugar and coffee. Unilateral U.S. actions with respect to its foreign trade have also had effects of varying importance on the Puerto Rican economy. Significant examples are the oil-quota system that existed between 1959 and 1974, the system of differentiated petroleum price controls and entitlements that followed, quotas on imports of shoes, the new steel reference price system, etc. The analysis that follows is illustrative, rather than exhaustive. It is confined to the last rounds of international trade negotiations, the system of generalized preferences for less developed countries, the recent bilateral negotiations with Japan, and U.S. exchange-rate policies in the 1970's. The analysis that follows illustrates some of the problems that arose and the way that they have been handled. It provides a basis for an examination of policy options for improved consideration of Puerto Rican interests in future U.S. foreign trade policy.

TREND IN PUERTO RICAN MARKET SHARES

The impact of U.S. foreign trade policy on Puerto Rican industry is masked by the effects of other factors. The growth of Puerto Rican industry stems from a variety of internal and external policies and developments, the sum total of which has undoubtedly been more influential than U.S. foreign trade policy

per se. Puerto Rican investment, productivity, wage policy, and tax incentives have been significant. Of equal, but perhaps less recognized importance, has been the overall rate and structure of economic growth on the mainland. Nor should the significance of developmental patterns in the rest of the world be neglected.

An expanding economy creates a market environment in which sales from all sources may increase readily. Moreover, structural changes occur as economies expand over a period of years. The volume of both imports and exports tend to increase at least as rapidly as overall output levels and the composition of foreign trade flows tends to change. The importation of some items may increase at a very rapid rate, while other imports may actually decline—even without changes in trade barriers. So it has been in the case of Puerto Rico and its mainland and foreign markets.¹

Puerto Rico's Share of the U.S. Import Market

Between 1960 and 1976, U.S. GNP increased 3.4 times current prices while final sales of goods tripled. During the same period, imports from Puerto Rico rose 5.6 times, indicating that the island's share of the total U.S. market for goods increased significantly.

Puerto Rico's shipments to the U.S. declined *relative* to U.S. imports from foreign countries. The increased cost of imported petroleum accounts for much of the growth of imports relative to total final sales of goods in the United States. On the other hand, imports of petroleum products from Puerto Rico had, over this period, also become an important part of its shipments to the mainland, accounting for 12 percent of the total in FY 1977. With severe recession in the United States, total exports to the mainland declined in FY's 1975 and 1976. With resumed growth on the mainland, shipments rose by 37 percent in current dollars and 29 percent in constant dollars in 1977, over the previous year.

Such aggregations are less significant than changes in their composition, because the Puerto Rican economy is so small relative to that of the mainland. Its exports were equal to less than half of one percent of final sales of goods on the U.S. market in 1976 and 2.7 percent of U.S. imports of goods (3.2 percent of U.S. imports of goods other than petroleum).

The years since 1960 have witnessed significant economic change in Puerto Rico, a high rate of economic growth and the establishment of a substantial industrial base.

¹ Unless other sources are indicated, data in section I of this study are derived from tables recently prepared by the Department of Commerce.

This growth has been particularly evident in the structure of Puerto Rican sales to the mainland. In 1950, sugar, needlework, and tobacco accounted for 85 percent of Puerto Rican shipments to the mainland, with sugar accounting for three-fifths. By the mid-1960's, sugar and tobacco together accounted for only a fourth, while apparel, textiles, and footwear constituted an additional third of Puerto Rican shipments to the mainland. By 1976, all of these traditional goods together accounted for only one-fifth of the island's shipments. Chemicals, petroleum products, pharmaceuticals, cosmetics, electrical equipment, and scientific instruments represented a full half of Puerto Rican sales to the mainland in that year. As shown in table 1, these

Table 1.—Rate of Growth in the Value of Puerto Rican Shipments to the Mainland (FY's 1971-77)

	Average annual percentage growth
Pharmaceuticals	112.7
Chemical materials and products, n.e.c.	84.0
Cosmetics	72.9
Organic chemicals, n.e.c.	62.5
Alcohols, n.e.c.	48.8
Fuel oils	46.0
Mineral tars and crude chemicals	36.6
Plastics	36.1
Electrical machinery, n.e.c.	33.5
Scientific instruments	29.8
Machinery except electrical	21.7
Medicinal and pharmaceutical preparations, n.e.c.	21.4
Tuna fish, canned	20.0
Gasoline, n.e.c.	15.8
Electrical apparatus for circuits, n.e.c.	15.1
Rum	14.8
Telecommunications equipment, n.e.c.	14.0
Watches and clocks	11.8
Brassieres	4.8
Cigars	1.0

Note: Twenty leading products by value of shipments in 1977. Five digit commodity descriptions.

Above items accounted for two-thirds of Puerto Rican shipments to the mainland in 1977.

are the products that have shown the highest growth rate in Puerto Rican shipments to the mainland in the 1970's.

The decline in the share of traditional products reflected the changed structure of the Puerto Rican economy more than the failure of traditional products to find a market in the United States. Rising incomes and wages diminished Puerto Rico's ability to market needlework and sugar competitively. Moreover, the very rapid growth of imports in the U.S. market tended to diminish Puerto Rico's share of the total market, though without much of a decline in the value or in the volume of such shipments. As its industry developed, Puerto Rico appears to have moved toward higher value added products, where it appears that lower wages relative to those prevalent on the mainland gave it a competitive advantage. Expansion in the U.S. market for imported textiles, apparel, and footwear tended to be preempted by still lower wage competitors.

Puerto Rico has been able to compete most effectively in the mainland market in products supplied primarily by mainland, rather than foreign producers.

The data in table 2 demonstrate the extent to which Puerto Rico has maintained its share of the U.S. market relative to mainland producers. It has not succeeded in matching the growth of foreign imports in sectors where such imports have competed most successfully with U.S. production.

Table 2.—Puerto Rican Share of U.S. Market (1965 and 1976)

	Percent- age of all Puerto Rican shipments to main- land	Value of Puerto Rican shipments (millions of dollars)	Percent- age of U.S. imports— Puerto Rican and foreign	Percentage of U.S. mainland product or industry shipments
Petroleum products:				
1965	6.6	62.3	7.1	0.3
1976	11.8	382.3	7.1	0.7
Pharmaceuticals:				
1965	2.6	24.5	30.5	0.6
1976	10.1	328.6	34.8	2.9
Organic chemicals:				
1965	3.0	27.5	14.7	
1976	14.9	577.0	37.9	27.9
Apparel:				
1965	24.5	230.1	30.1	1.3
1976	11.4	370.2	9.3	1.0
Electrical machinery:				
1965	6.9	65.2	9.3	0.2
1976	7.7	250.4	3.2	0.5
Canned tuna:				
1965	6.0	56.7	73.5	24.3
1976	7.9	256.2	71.8	30.0
Shoes:				
1965	4.3	40.1	20.0	1.5
1976	2.0	66.0	3.7	1.9
Textiles:				
1965	3.4	31.6	3.9	0.2
1976	0.9	24.4	1.4	0.1
Rum:				
1965	1.5	13.9	14.4	10.1
1976	1.7	53.5	14.2	10.3
Totals:				
1965	58.8	579.4		
1976	68.4	2,308.6		

¹ All alcoholic beverages.

The strongest growth in U.S. imports (apart from crude petroleum, steel, and automobiles which are not produced in Puerto Rico) over the past decade has occurred in the case of apparel, shoes, and electrical equipment. Puerto Rico's share of total mainland imported shipments has fallen drastically in the case of each of these industries. Yet, relative to shipments by mainland manufacturers, Puerto Rico has increased its sales in the case of both electrical machinery and shoes, and suffered only a modest decline in the case of apparel. However, the absolute value of shipments increased by at least 60 percent in each of these industries between 1965 and 1976. In the case of shoes, the increase in the value of

shipments barely kept pace with the rise in U.S. wholesale footwear prices; in the case of apparel, price increases were somewhat less than the increased value of Puerto Rican shipments and in the case of electrical machinery very significantly less.

As for drugs and pharmaceuticals, the United States accounts for about one-fourth of world exports. The expansion of production in Puerto Rico by subsidiaries of virtually all the major U.S. producers has helped them to produce competitively. The same appears to be true in the case of organic chemicals, where the United States again is a substantial net exporter. For both pharmaceuticals and organic chemicals (as well as canned tuna), Puerto Rico has a major share of the U.S. import market. Its relation to U.S. mainland producers' shipments is modest in the case of drugs and pharmaceuticals, but is substantial for the other two categories. In the case of the electrical-machinery industry, electrical transmission and distribution equipment, radio and television equipment, and electronic components have experienced substantial expansion by mainland firms in Puerto Rico to help them remain competitive with foreign producers. Shipments of electrical equipment from Puerto Rico to the mainland more than doubled between 1975 and 1977, while shipments of both chemicals and drugs together increased by more than 50 percent.

Foreign Share of the Puerto Rican Market

Puerto Rico appears to produce only about half of its food requirements and is not rich in raw materials.² Imports from all sources were equal to 63 percent of gross domestic product in FY 1977, up from 51 percent in FY 1970. The rise in petroleum prices combined with the importance of crude petroleum imports to the Puerto Rican economy explain the increased percentage.

The same factor—crude petroleum imports—explains a sharp decline in the share of Puerto Rican imports obtained from the mainland. In the mid-1950's, the mainland's share exceeded 90 percent. As petroleum refining expanded on the island, the mainland share dropped to about 80 percent in the 1960's, and then to about 75 percent prior to the OPEC price increase in 1973. Subsequently, the mainland share of the Puerto Rican market has been reduced to about three-fifths.

Excluding petroleum, the U.S. share of Puerto Rican imports has been fairly constant at about 85 percent of the total (see table 3). Imports from foreign sources, excluding petroleum, declined abso-

Table 3.—Foreign Share of Puerto Rican Imports

Fiscal years	Foreign imports (millions of dollars)		Foreign share of Puerto Rican imports	
	Total	Excluding petroleum	Total	Excluding petroleum
1971	648	380	24	15
1972	809	477	27	17
1973	929	535	27	17
1974	1,533	515	37	16
1975	1,867	453	39	13
1976	2,013	500	38	13

Source: Puerto Rico, Planning Board, *External Trade Statistics* (various years).

lutely after the petroleum price rise depressed the Puerto Rican economy. They began to increase again in FY 1976 but had still not reached their 1973 peak and were still less in volume (correcting for price increases between 1973 and 1976). The figures undoubtedly understate the total sale of foreign products on the Puerto Rican market. Some goods are imported onto the mainland in bulk and then marketed in Puerto Rico in the smaller quantities required there, sometimes with little or no further processing.

Nevertheless, the bulk of Puerto Rican imports comes from the mainland. Puerto Rico imports a wide variety of products in small quantities. The top 20 five-digit items account for only a third of total imports from the mainland. Passenger cars, the largest single item, accounted for only 5 percent of total shipments. A full third of the market was supplied by automobiles from foreign countries in 1976, substantially more than the foreign share of the U.S. market. Rice, poultry, beef, and pork accounted for another 7 percent of imports from the mainland, all products for which the U.S. is a competitive supplier to the world. Since Puerto Rico's production of organic chemicals is limited to those derived from petroleum, it must import substantial quantities of coal and natural gas derivatives. Again, the United States is a very competitive supplier.

Apart from automobiles and petroleum, most of Puerto Rico's imports from foreign countries consists of foodstuffs and metals and metal products. Fish, beef and various meat products, coffee, iron and steel, footwear, and lumber, account for most of the value of imported products.

With a relatively small market, and speedy and efficient shipping services from the mainland, Puerto Rico's tendency to look to mainland suppliers for the myriad consumer goods and intermediate industrial products that it needs should not be surprising. Apart from petroleum, its principal sources of foreign imports are Japan and the Dominican Republic. In 1976, they accounted for 30 percent of Puerto Rico's imports by liner and tramp steamer. The rest came from a wide variety of countries in Western

² Analysis of the National Accounts (measured in nominal terms) for the years from 1970 thru 1977 indicates that food imports represent between 45 percent and 53 percent of food consumption. This implies that between 47 percent and 55 percent of food consumed on the island is produced locally. However, the data in the National Accounts may be weak—particularly the consumption estimates.

Europe, Canada, South Africa, and Australia, as well as Central and South America—Brazil, Panama, Trinidad, the Honduras, Costa Rica, etc. Puerto Rico has trade connections with this variety of overseas suppliers, though shipping services are neither as regular nor reliable as with the mainland. It imports from them when they can provide supplies on a competitive and timely basis.

Puerto Rican Exports to Markets Other Than the U.S. Mainland

Direct exports from Puerto Rico to foreign markets (excluding the Virgin Islands) have increased at a significant pace, rising from \$17.5 million in 1960 to \$459 million in FY 1977.³ In 1960, such exports played a minor role in the Puerto Rican economy, equivalent to barely 1 percent of the gross domestic product. However, by FY 1977, they had expanded to a respectable 4.7 percent of gross domestic product. (For the United States as a whole, 1976 exports were equivalent to 6.8 percent of GNP.)

Because exports to the mainland were eight times as large as exports to other markets in FY 1977, the latter tend to be overshadowed. Nevertheless, exports to foreign markets have grown persistently at a more rapid rate than other indices of both the U.S. and the Puerto Rican economy. Table 4 illustrates the growth of such exports in current dollars, as a percentage of all U.S. exports, as a percentage of all exports from Puerto Rico, and as a percentage of the Commonwealth gross product. Between 1960 and 1976, exports to foreign countries grew more than four times as fast as U.S. exports as a whole, four times as fast as all Puerto Rican shipments off-island and 4½ times as fast as Puerto Rican gross domestic output.

More than half of Puerto Rico's direct foreign exports in FY 1977 were shipped to Central and

³ Puerto Rico Planning Board, *External Trade Statistics*.

Table 4.—Trend of Puerto Rican Direct Exports to Nonmainland Destinations

	1960	1965	1970	1975	1976
1. Index of current value	100	179	674	2,040	2,354
Indices of value of Puerto Rican direct exports to nonmainland destinations in proportion to:					
2. All U.S. exports	100	122	322	391	423
3. All Puerto Rican exports	100	112	238	398	431
4. The Puerto Rican gross domestic product	100	108	227	418	452
Base:					
5. Puerto Rico direct exports (millions of dollars) ..	17.5	31.3	118.0	357.0	412.1

South American countries, while somewhat less than half went to developed countries. See table 5. Exports to developed countries consist primarily of chemical and pharmaceutical products, while exports to Central and South America are much more varied, involving electrical and nonelectrical machinery and equipment, intermediate and consumer goods.

Table 5.—Principal Puerto Rican Export Markets—FY's 1977 and 1971 Growth Rates

Developed countries		
Country	Percentage of FY 1977 total exports	FY 1971-77 average annual growth
Netherlands	13.4	22.5
Belgium-Luxembourg	5.3	29.7
France	5.2	65.4
Spain	3.2	67.2
Italy	3.2	43.4
Japan	2.7	43.7
West Germany	2.2	34.2
United Kingdom	1.8	11.6
Switzerland	1.2	67.9
Australia	1.0	109.6
Total above countries	39.2	
Central and South America		
Dominican Republic	12.2	16.9
Venezuela	10.6	29.6
Netherland Antilles	5.5	26.9
Brazil	4.1	59.4
Windward and Leeward	3.8	26.0
Haiti	3.7	20.9
Trinidad-Tobago	3.2	25.6
Mexico	2.2	93.3
Colombia	2.0	67.1
French West Indies	1.6	24.3
Jamaica	1.4	NA
Total above countries	50.3	

Trade with the developed countries has grown at a faster rate than trade with Central and South America in the 1970's. In FY 1971, Puerto Rican exports to developed countries accounted for only about one-fourth of Puerto Rico's exports. Economic growth has proceeded at a more rapid pace in such markets as Venezuela, Brazil, Mexico, and the Dominican Republic than in the United Kingdom and Canada, which were important markets for Puerto Rico earlier in the decade. The Dominican Republic was Puerto Rico's largest export market in 1971, accounting for 17 percent of total shipments. While its share of Puerto Rico's exports has declined, the Dominican Republic did buy 2½ times as much from Puerto Rico in 1977, as in 1971.

To some extent, the growth of trade with hemisphere neighbors is apt to be self-reinforcing, since trade growth depends on the availability of regular and reliable transportation. Apart from the Dominican Republic, most dry cargo shipped from Puerto Rico to Western Hemisphere foreign markets is carried by trampers rather than regularly scheduled

liner service. Exports to the Dominican Republic were about evenly divided between liners and trampers in 1976. As volume increases, better shipping services should become available and that availability should facilitate trade growth.

Even at the 1976 level, direct exports from Puerto Rico represented little more than one-third of one percent of all U.S. exports. However, such a percentage undoubtedly underestimates Puerto Rico's contribution to U.S. export trade. For a variety of reasons, U.S. manufacturers tend to emphasize production rather than marketing in the operation and management of their Puerto Rican subsidiaries. As a result, an indeterminate proportion of Puerto Rican manufacturing output is exported to mainland locations of the parent company, whence they are incorporated in export shipments as well as in sales to the domestic market. In some cases, Puerto Rican production is packaged on the mainland prior to final sale to foreign and domestic buyers. In other cases, shipments from Puerto Rico receive further processing on the mainland before sale or are incorporated as components of other products. Exports of mainland products from Puerto Rico to Caribbean markets appear to account for very little of Puerto Rican exports.

The bulk of the increase in Puerto Rican exports to foreign countries consists of chemical products, which have become a major Puerto Rican industry in the 1970's. These exports to foreign countries rose from \$61 million in FY 1970, to \$262 million in FY 1977. Thus, about two-thirds of \$333 million increase in the value of Puerto Rican foreign shipments between FY's 1971 and 1977 consisted of such exports.

Most of the increase was in petrochemicals, although the export of pharmaceutical products has also risen significantly, reaching a total of \$89 million in FY 1977. The principal market for petrochemical exports was the Netherlands, though Belgium and Japan also account for a significant proportion of export sales. The large European countries (United Kingdom, France, West Germany) and those Latin American countries (Brazil, Argentina, Mexico) with processing facilities for petrochemicals also imported from Puerto Rico. Pharmaceuticals were sold widely in Europe, Central and South America, South Africa, and Australia.

Puerto Rican exports to Caribbean countries range from food preparations, yarns, clothing, and cigars to a wide variety of electrical equipment—household appliances and electric lighting and wiring equipment, electronic components, electrical transmission and distribution equipment. Included are fruit juices, insecticides, paint, aluminum doors and windows, plastic and paper products, scientific and medical instruments, perfumes, antibiotics, and rum. The range

of products is likely to grow with economic growth in both Puerto Rico and its Caribbean neighbors. Moreover, the nature of the market and the products sold will change over time, as some Puerto Rican products are displaced by local production or imports from lower cost sources.

THE IMPACT OF U.S. FOREIGN TRADE POLICY ON PUERTO RICAN COMPETITIVENESS

Puerto Rican Input Into the U.S. Foreign Trade Decisionmaking Process

As a very small segment of the U.S. customs territory, it would not be surprising if Puerto Rican interests sometimes appeared to be overlooked in the formulation and execution of U.S. foreign trade policy. Indeed that policy itself reflects ever-changing compromises between the economic and political interests of the country as a whole and the special concerns of particular sectors—State or regional, individual industries, labor, and agriculture, etc.

In the multilateral negotiations at the GATT, Puerto Rico has been represented by spokesmen who have supplied advice to the U.S. negotiating team in every one of the rounds since 1947. Prior to the actual negotiations, hearings have been held at which the government of the Commonwealth has offered very detailed presentations. Additional information and positions have been elicited and provided as a result of questions and discussion during the hearings. In its Report on the Trade Act of 1974, the Finance Committee of the United States Senate specifically directed that products be excluded from duty-free preference under the GSP if such preferences would be detrimental to the economy of Puerto Rico.

For the current Tokyo round, the Commonwealth's presentation was made before the International Trade Commission and the Special Trade Representative on May 5-6, 1975, and supplemented by a presentation to the Trade Policy Staff Committee on July 30, 1975. The hearings and presentations covered tariff concessions that might be offered by the United States whether in return for reciprocal concessions or as part of the Generalized System of Preferences available to developing countries. Also included were concessions by other countries that Puerto Rico desired the United States to obtain in the negotiations and foreign non-tariff trade barriers that Puerto Rico would like to see lowered or removed.

In addition, hearings were held before the International Trade Commission in the case of industries that can claim serious injury as a result of tariff

concessions. Regular additions to, and deletions from, the GSP list have been made about every 6 months, based on such hearings. Puerto Rico's interests at such hearings are reflected both in the presentations by the government of the Commonwealth and by particular industries and firms that consider their interests may be affected by the negotiations or proposed actions. Because so much of Puerto Rican industry consists of subsidiaries of mainland firms, presentations on their behalf may be of considerable significance to Puerto Rico.

To pursue these and other trade matters on a continuing basis, the Commonwealth maintains an experienced trade policy expert on its Washington staff. Trade matters of interest to Puerto Rico also arise in bilateral negotiations to which the United States is a party, in international commodity agreements to which the United States has adhered, or in which the United States is considering participation, and in unilateral actions or multilateral arrangements concerning specific industries. It is in these categories of U.S. foreign trade policy behavior that it may be more difficult to assure due consideration for Puerto Rico's views and interests. That is most likely to occur in the case of Puerto Rican industries whose interests are not represented or paralleled by large mainland companies.

U.S. Petroleum Policy

It would be difficult to exaggerate the impact of U.S. petroleum policy over the past 20 years on the economy of Puerto Rico. The main features of the policy—and the changes that have occurred since 1973—were clearly adopted with a view to their impact on mainland production of crude oil and, more recently, on mainland consumption of petroleum products. Just as clearly, the effects on Puerto Rico have been a fallout from the thrust of the general policy, but they have, nonetheless, been very large.

In 1959, the United States established a Mandatory Oil Import Program by Presidential determination and proclamation. The program regulated import restriction through quota levels and allocated permitted imports among domestic claimants. The mainland quota was reduced by the amount of product shipments from Puerto Rico. Puerto Rico's quota was based on its internal requirements plus limited product shipments to the mainland. In December 1965, several companies received additional import allocations and permission to ship finished products to the mainland for the purpose of creating employment in Puerto Rico.⁴ The Puerto Rico program was intended to help create employment in

refining and petrochemicals and in satellite industries to be built around the core facilities for refining and petrochemical production. A similar program was established for the Virgin Islands in 1967. Puerto Rico imported crude from Venezuela at world prices (\$2.00 to \$2.50 per barrel) and could export refinery products to the mainland where refineries were paying \$3.00 to \$3.50 per barrel for domestic crude. As an additional result, Puerto Rican petrochemical producers had a 30-percent to 45-percent advantage in their feedstock prices relative to mainland facilities. As a result, petroleum refining and petrochemicals production flourished in Puerto Rico and shipments of both products and petrochemicals expanded steadily both to the mainland and to foreign countries. Puerto Rico also used the cheap imported petroleum to produce and sell power and petroleum products on the island at lower prices than were prevalent on the mainland.

The quadrupling of foreign crude petroleum prices by OPEC eliminated these advantages and had an adverse effect on Puerto Rico. In 1973, the United States imposed fees on increases in imports above the previous level, and in 1975, assessed fees on imported naphtha (petrochemical feedstock) aggregating about 60 cents per barrel. It subsequently adopted an entitlements program designed to equalize the cost of crude to domestic refiners, whether obtained from domestic or foreign sources. The entitlements program was extended to the Puerto Rican refineries after some delay, but it still gives domestic crude a 21-cent-a-barrel advantage over foreign crude and Puerto Rican refiners are *disadvantaged* since they use only foreign crude. In mid-1976, entitlements were provided on naphtha feedstock imports for use in Puerto Rico's petrochemical plants. (See review of Federal regulatory programs in part III of the interagency study.)

The Mandatory Oil Import Program spurred economic development in Puerto Rico for an extended period. The post-1973 change was the result of OPEC policy over which the United States had no control, so that the disappearance of Puerto Rico's competitive advantage was not a direct result of U.S. policy.

The Impact of Tariff Reductions

Six rounds of reciprocal tariff reductions have been completed since the end of World War II under GATT auspices, in the course of which the tariffs imposed by the United States and other industrialized countries on manufactures have been substantially reduced. Another round—the Tokyo round—is now being negotiated. The tariff protection which significantly contributed to the growth of industries in Puerto Rico for export to the mainland

⁴ See Cabinet Task Force on Oil Import Control, *The Oil Import Question* (GPO, Washington) 1970.

has diminished. On the other hand, reductions have opened foreign markets to Puerto Rican products, whether by direct export or reexport after packaging and/or further processing on the mainland. Moreover, U.S. tariff reduction has worked to reduce the cost of consumer products on the island, as well as the cost of intermediate products and capital equipment. The Generalized System of Preferences for imports from developing countries, established by Executive Order at the end of 1975, may still further reduce Puerto Rico's international competitive advantage on the U.S. mainland market.

However, it is far from clear the extent to which U.S. tariff reduction has influenced Puerto Rico's competitiveness on the mainland market. Much attention has been directed to foreign competition in the case of apparel, textiles, footwear, and electrical equipment. Much of the change in the shares of these Puerto Rican exports is attributable to a more rapid growth of other Puerto Rican exports and to the growth of foreign imports at the expense of mainland rather than Puerto Rican producers. Puerto Rican exports of manufactures to the mainland, even excluding chemicals and petroleum products, have expanded significantly, though the 1975-76 U.S. recession did result in a severe setback.

The growth of foreign imports appears to be due more to industrial expansion and increased foreign marketing by certain Latin American, Mediterranean, and Asian countries than to tariff reductions. Employment in the Puerto Rican apparel and footwear industries has declined over the past decade as wages rose and the apparel industry on the island shifted toward higher value-added items. However, the value of Puerto Rican shipments of apparel has grown moderately even after allowing for price increases, despite large increases in U.S. imports from foreign countries. To be sure, Puerto Rico has been at a wage rate disadvantage with respect to many foreign suppliers.⁵

1. *Generalized System of Preferences.*—Pressures from much more disadvantaged mainland producers combined with the position of the Commonwealth to produce the exclusion of certain import-sensitive products from GSP—most textiles and apparel, footwear, watches, some glass, some steel, and some electronic products. Certain products of particular importance to Puerto Rico are also omitted from the list—canned tuna, rum, filler tobacco, and cigars. Indeed, the excluded list covers much of the value of Puerto Rican shipments to the mainland apart from petroleum, petrochemicals, and pharmaceuticals. Production and export of the latter items by developing countries would not yet appear to be threatening.

⁵ See Robert R. Nathan Associates, *Report on the Minimum Wage Issue*, 1973.

Puerto Rico is further protected from developing country exports by certain additional exclusions. GSP is not available on imports of certain items from specified countries that (a) accounted for 50 percent of total U.S. imports of the specified article in the preceding year, or (b) supplied imports valued at \$25 million or more in the preceding year. Nor is GSP extended to members of OPEC, including Venezuela and Ecuador in the Western Hemisphere. *The modest significance of GSP to Puerto Rico is further indicated by a 37-percent increase over the preceding year in the value of Puerto Rican exports to the United States in FY 1977, the first full Puerto Rican fiscal year in which the system was in effect.*

The Commonwealth's official presentation with respect to GSP heavily emphasized the desirability of excluding a list of electrical transmission and distribution equipment items, together with fresh pineapple, ornamental plants, carbon electrodes, plastics and industrial polymers, leather products, and petrochemicals. It also sought the removal of copper products from the list and the addition of a 5-percent duty at a later date when Puerto Rican copper production is expected to enter the market.

In addition to GSP exclusions, Puerto Rico is further protected in the case of textiles, apparel, and footwear by the existence of "voluntary" agreements under which major low-wage exporting countries have agreed to limit the rate of growth in their shipments to the United States.

2. *Reciprocal Tariff Concessions.*—Understandably, Puerto Rico would also like all items whose current omission from the GSP list is beneficial to its producers to be excluded as well from tariff concessions in the course of the Tokyo round negotiations. At the same time, it would like to see added to the GSP list, and/or subjected to tariff reductions on a reciprocal basis, certain items that it imports from foreign countries or might import at lower cost than its import from the United States, e.g., oleomargarine, edam and gouda cheeses, corn oil, and cottonseed oil. Also, understandably, Puerto Rico would prefer that reciprocal tariff concessions by the United States be confined to goods primarily produced on the mainland, while obtaining tariff concessions and reduced nontariff barriers on products that might be exported in larger quantity from Puerto Rico.

The less developed nature of the Puerto Rican economy and its recent economic difficulties provide a strong case for such a U.S. negotiating position. Puerto Rico has so large a reservoir of unemployed and underemployed workers that it can ill afford to trade employment opportunities in its less competitive industries for increased employment in future high-growth industries. It needs to retain as

much employment in less competitive occupations as it can for as long as it can.

Moreover, expanding foreign markets for its competitive industries remain a priority concern. Such expansion is most likely to occur as a result of (a) economic growth and rising demand in foreign countries, and (b) reduced tariff and nontariff barriers to Puerto Rican products. Increased export opportunities are one of the most important stimulants of economic growth. The data previously presented in table 4 bear strong testimony to the significance of expanding foreign markets to Puerto Rico over the past decade and to the importance of maintaining and fortifying the pace of that increase.

An examination of Puerto Rico's concerns at the time of the Kennedy round suggests the difficulty of identifying the product areas in which expanding foreign markets may be significant. Its presentation to the U.S. Special Representative for Trade Negotiation in 1965 emphasized (a) exempting from negotiated tariff reductions items imported into Puerto Rico in competition with its own producers, and (b) raising existing U.S. tariff levels to compensate the Commonwealth for any diminution in its preferential access to the mainland market as a result of concessions.

While seeking foreign concessions on Puerto Rican exports, the major product emphasis was rum. Puerto Rico also requested foreign concessions on antibiotics, petroleum products, and ethylene glycol which proved to have significant export potential. However, it also sought concessions on footwear, fertilizers, glass beverage bottles, green coffee, industrial molasses, and wheat flour—all products in which it could hardly have become a significant competitor in foreign markets under the conditions actually prevalent over the ensuing decade. In the 1965 negotiations, the Commonwealth concluded that "[e]ven under the best of circumstances, the prospect for increasing Puerto Rican exports significantly to Europe or Latin America is not encouraging."

The 1975 presentation is much more positive about the potential value of foreign concessions, undoubtedly reflecting both Puerto Rico's success in expanding its exports to foreign countries over the intervening decade and its substantial progress in industrialization. Foreign concessions are suggested on such items as business machines, metal doors and windows, carbon electrodes, and electrical lighting and wiring equipment, as well as pharmaceuticals, petrochemicals, plastic products, radio and TV accessories, and medical and surgical instruments.

The major thrust of the 1965 presentation was to protect from further U.S. tariff concessions existing Puerto Rican producers of beef; cigar filler tobacco; women's undergarments, nightwear, and

sweaters; leather billfolds, wallets, and gloves; baseballs and gloves; rubber footwear; and fresh pineapple. The industries considered to be less vulnerable to large U.S. tariff reductions included tobacco manufacturers and leather footwear. In fact, all of the foregoing industries proved to be vulnerable, though U.S. tariff reductions appear to have been a less important factor than increases in Puerto Rican wages and the expansion of production and foreign marketing by other developing countries.

Electrical equipment, petroleum refining, and the then tiny production of pharmaceuticals and industrial chemicals were correctly judged in 1965 to be less vulnerable to tariff reductions. As shown in table 1 above, these industries experienced very high rates of growth in their shipments to the United States during the 1970's, as did perfumery and cosmetics, artificial plastic products, and scientific, medical, and optical instruments. Of this group, only a tiny plastic flower and foliage industry was singled out in the 1965 presentation for attention in the tariff negotiations and it was judged to be very vulnerable. Tuna canned in oil was also considered to be vulnerable, no tariff concessions were made during the Kennedy round, and shipments to the United States have grown significantly.

The 1975 presentation again seeks more protection for Puerto Rican beef producers through a quota on Puerto Rican imports or a large tariff increase. Foreign imports increased after 1965 but Puerto Rican production in 1973-74 was more than twice that 10 years previously. Protection is also sought for other agricultural products primarily sold on the domestic market—taniers, pigeon peas, fresh pumpkins, sweet potatoes, plantains, cassava, and bananas.

Perhaps of greater significance is the request for protection for commodities important in Puerto Rican exports to the United States—tuna, ornamental plants, citrons, pineapple, rum, cigars and tobacco products, textiles and apparel, petrochemicals, electrical and electronic products, and leather footwear and other leather products. Only in the case of pharmaceuticals is a request for protection absent.

Petrochemicals represent a relatively new area of production and significant growth of shipments to the mainland, though further increases could be threatened by tariff reductions. Rum has also been an area of significant expansion that could be threatened by lower wage Caribbean competitors.

The emphasis on protection for tobacco shifted from cigar filler in 1965 to the production of tobacco products in 1975. While tobacco products have maintained or increased their share of the U.S. market, this *relative* comparison only represents a

statistically larger share of a shrinking U.S. market, rather than an absolute gain in sales.

Neither the tariff nor the nontariff barriers protecting the U.S. apparel market have prevented a decline in Puerto Rican market shares. However, Puerto Rican apparel production has succeeded in maintaining the volume of total apparel shipments to the United States. Foreign competition continues to be acute and Puerto Rico feels the need for protection even more than during the Kennedy round.

The electrical and electronic products industry is one of the more flourishing sectors, as new plants continue to be established. Exports both to the United States and to foreign countries, particularly in the Caribbean, have grown vigorously. The industry has been highly competitive and U.S. manufacturers would prefer to maintain tariff protection in the domestic market while seeking foreign concessions. Puerto Rico's principal foreign competitors are developed countries and Puerto Rico does have a labor cost advantage.

Neither GSP nor U.S. tariff reductions in the Kennedy round appear to have damaged Puerto Rico's economic progress. Some requests for continued protection were honored, but the increase in Puerto Rican shipments nonetheless was not particularly vigorous in some cases. The difficulties experienced by certain of its industries in exporting to the mainland appear to be attributable to factors other than reduced U.S. trade barriers. Moreover, the general reduction in foreign barriers after the Kennedy round was accompanied by a faster growth in the Commonwealth's exports than its authorities had believed possible. Most of that growth involved products that could not be readily identified as having a significant Puerto Rican export potential.

The aftermath of GSP and the Tokyo round could well have comparable surprises for Puerto Rico. The record of the past decade suggests that if world trade in general is less restricted and economic growth is widespread, production facilities on Puerto Rico may be better placed than those on the mainland to make the most of the opportunities.

THE IMPACT OF FOREIGN EXCHANGE POLICY ON PUERTO RICAN COMPETITIVENESS

Until 1971, foreign exchange policy had relatively little impact on Puerto Rican competitiveness. The value of the dollar was pegged to the fixed price for gold and the United States maintained an open window to foreign central banks interested in buying or selling gold for dollars at the fixed price. With few exceptions (Canada was most important for Puerto Rico), other countries also maintained fixed rates

for the exchange of their currencies into dollars. The dollar rates were changed from time to time, but primarily in response to the so-called "structural disequilibria." Essentially, that meant that domestic inflation had priced their goods out of foreign markets and the devaluations restored their previous competitiveness. A few countries revalued in terms of the dollar, again with the primary result of correcting lower rates of inflation in the prices of their goods.

By the 1970's, capital movements had come to play a very large role in determining the international position of the dollar, probably more than changes in U.S. prices relative to those of its competitors. Large quantities of surplus dollars became available on the international market, first as a result of the Vietnam inflation and later in response to OPEC increases in crude petroleum prices. Capital movements were increasingly freed of restrictions by the United States and other major countries and the dollar came under heavy pressure. When the United States closed its gold window at the end of 1971, the era of fixed exchange rates came to an end. Subsequently, the exchange rate of the dollar floated, largely in response to foreign accumulations of dollar assets and to capital movements, though relative price-level changes continue to have their effect.

When exchange rate alterations are not closely correlated with changes in domestic price levels, the net effect is to change the competitiveness of the countries concerned in international markets. A reduction in the exchange rate of the dollar that is not matched by relatively higher dollar prices has the same effect on the competitiveness of foreign goods on the U.S. market as a corresponding increase in U.S. tariff rates. Since Puerto Rico is an integral part of the dollar area, the impact of changes in the foreign exchange value of the dollar on its competitiveness with foreign producers, whether on the U.S. or foreign markets, is identical with the effect on the mainland economy.

On the whole, other Caribbean and Latin American countries have chosen to peg their exchange rates to the dollar despite its floating character, largely in order to eliminate any competitive impact on their economies. *Forty percent* of Puerto Rico's foreign exports in 1977 went to such countries—the Dominican Republic, Venezuela, Netherlands Antilles, the Windward and Leeward Islands, Haiti, Trinidad-Tobago, and Jamaica. Puerto Rico increased its foreign exports at a much faster rate in the 1970's to countries that have let their currencies float against the dollar—Brazil, Mexico, and Colombia. Their domestic price levels have multiplied three to four times in the 1970's, but their currencies have floated down relative to the dollar by less

than the increase in their internal price levels. Puerto Rico has thus become more competitive in their markets and has been successful in increasing its exports.

All of the European countries absorb small, but growing amounts of Puerto Rican products. Perhaps of greater importance is that they compete with some Puerto Rican products in virtually all of the Commonwealth's export markets, including the United States. The striking increase in Puerto Rico's pharmaceutical exports is undoubtedly linked to the improved competitive position of the dollar with respect to the Swiss franc and the deutsche mark.

The future course of floating rates is unpredictable, but there is no present reason to expect a lasting increase in the value of the dollar relative to most European currencies or to the Japanese yen. Assuming that cost inflation in Puerto Rico itself can be held in check, it should be able to expand industrially and export more competitively with these countries than was the case in the 1960's and early 1970's.

POLICY OPTIONS

In both its 1965 and 1975 presentations to the U.S. Special Trade Representative, the Commonwealth has sought differentiated tariffs or quotas for Puerto Rico to protect its domestic market for its own producers. In the case of some commodities, it would prefer lower tariffs or duty-free tariffs than the mainland goods that provide its consumers with lower cost imports or its producers with lower cost raw materials or semimanufactures. Such differentiation has legal precedent in the form of the difference coffee tariff. Constitutional authority for a separate tariff system does exist, if Congress should so legislate.⁶ There would, however, be problems under the GATT. Any net increase in the level of

trade barriers vis-a-vis another GATT contracting party would have to be compensated, presumably by concessions on products of primary interest to mainland producers.

Given the current stage of Puerto Rican economic development and the probability that its growth rate will continue to exceed that of the mainland, its interests lie heavily in opening foreign markets to its products. Particular attention in U.S. trade policy might be directed toward reducing restrictions currently imposed by Caribbean and Latin American countries on products that Puerto Rico can supply competitively. Puerto Rican export interests could also receive higher priority in bilateral negotiations. *Protection of preferential access to the U.S. market may be of less importance to the Commonwealth in the long run, as proved to be the case in the aftermath of the Kennedy round. Puerto Rico might well seek to attract new investment, both United States and foreign, to compete with products that can be produced efficiently in relatively small-scale facilities in competition with developed countries whose dollar costs have been inflated by recent exchange rate changes.*

Nevertheless, the absence of petroleum and petroleum products at cheaper prices than were available on the mainland has created a severe structural adjustment problem for the Puerto Rican economy. A more rapid closing of the gap between world and domestic prices would improve Puerto Rico's competitiveness with mainland producers. However, the accompanying loss of entitlements would reduce Puerto Rico's competitiveness in petrochemicals vis-a-vis foreign producers and could further increase the cost of petroleum products and power on the island.

Some further consideration of special subsidies to ease the petroleum price adjustment process may be justified, though it could be difficult to legislate such subsidies given competing mainland claims on the Federal budget.

⁶ Arnold H. Leibowitz, "The Applicability of Federal Law to the Commonwealth of Puerto Rico," 56 *Geo. L. J.* 219, 260-268 (1967).

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Chapter X.—Analysis of the Impact of Federal Assistance Programs

Only a handful of Federal assistance programs have funds for activities directly related to industrial operations, although many programs have important indirect effects. Federal regulatory programs, on the other hand, tend to have their greatest impact on the industrial sector. In purely economic terms, the costs of conforming to Federal regulations seem to exceed the direct benefits available from Federal assistance programs.

The indirect effects of Federal assistance programs may be more positive, however, especially in providing infrastructure for industrial firms and markets for industrial products. In assessing the impact of Federal assistance to the Puerto Rican industrial sector, both the direct and indirect effects need to be considered.

FEDERAL ASSISTANCE PROGRAMS AFFECTING THE INDUSTRIAL SECTOR

Since only a small amount of governmental assistance in the U.S. private enterprise economy is channeled into industrial activities, the direct effects of industry-oriented programs are less important than are the indirect effects of the broad array of Federal programs.

Programs With Direct Effects

Federal assistance programs available to the Puerto Rican industrial sector are listed in table 1. This list was compiled from all programs included under the "Business and Commerce" category of the functional index of the U.S. Office of Management and Budget.¹ Excluded were programs: (1) funding only public sector activities; (2) providing insurance; and (3) not having separate identifiable

funding, or entries in national summaries of the Federal Information Exchange System of the Community Services Administration for FY 1977.² Except for these exclusions, all programs which contained some financial or technical assistance available for Puerto Rico's industrial sector are included (e.g., excludes Indian programs, and geographically designated programs for which Puerto Rico is ineligible).

Since some Federal Government programs useful to the industrial sector do not fall under the OMB domestic assistance program definition, and because some programs under that definition do not have separate identifiable funding, the table 1 list is not an exhaustive one. On the other hand, program funds in that table are only *available* to the industrial sector. In reality, a sizable portion of those funds are spent on businesses or activities which are not in the industrial sector. There is no way to obtain a breakdown of the specific uses of each program. Also, in any given year, some of the listed programs may not provide any assistance to industrial firms.

Even if all of the funds noted in table 1 were used to assist the industrial sector, the amounts would still be small, and consist overwhelmingly of loans and loan guarantees rather than grants. Furthermore, Puerto Rico appears to receive less than the national average. At least for 1977, Puerto Rico's per capita receipts from these programs are lower than those for the Nation as a whole. The Commonwealth might be able to increase its slice of this small pie by more actively seeking funds from particular programs. However, a major funding source—regional development program assistance—is not available to Puerto Rico.

Regional development programs are authorized under Title V of the Public Works and Economic Development Act of 1965, as amended.³ The eight

¹ Office of Management and Budget, *1977 Catalog of Federal Domestic Assistance* (Washington, D.C.: Government Printing Office, May 1977), pp. FI-1 to FI-3.

² Community Services Administration, *Geographical Distribution of Federal Funds in Territories and Other Areas Administered by the U.S.* (Springfield, Va.: National Technical Information Service, PB-278 252, March 1978), pp. 11-15a.

³ Public Law 89-136; 42 U.S.C. 3121 *et seq.*

Table 1.—Federal Assistance Available to Puerto Rican Industrial Sector

[In thousands of dollars]

Programs	1970	1971	1972	1973	1974	1975	1976	1977	
								Puerto Rico	United States
Department of Agriculture:									
Business and industrial loans					1150	13,000	16,763	18,691	1349,987
Industrial development grants						473	404	340	9,997
Department of Commerce:									
Business assistance, services, and information				63	77	79	91	101	10,149
Economic development—grants and loans for public works and development facilities ^a	7,512	7,551	462	1,401	3,109	3,070	3,731		169,645
Economic development—business development assistance	12,344	15,606	14,051	1409			12,770	1434	145,401
Economic development—technical assistance	399	177	240	156	728	211	85	170	13,138
Economic development—special economic development and adjustment assistance							3,185		76,500
Grants to States for supplementary and basic funding of Titles I, II, and IV activities						482	713	699	34,775
Minority business enterprise—coordination, management, and technical assistance				167		145	294	111	57,743
Community Services Administration:									
Community economic development	840				500				46,088
Small Business Administration:									
Displaced business loans									115,681
Economic injury disaster loans									152,547
Economic opportunity loans for small businesses	12,779	13,998	17,224	15,678	16,858	16,143	15,607	10,733	104,107
Physical disaster loans	1121	18,628	1,408	1,200		18,115	139,174		1270,468
Product disaster loans									1,736
Small business investment companies		1100				1500			105,036
Small business loans	16,422	18,304	15,961	11,108	115,292	17,798	14,644	127,853	2,488,206
State and local development company loans				1453	1,574	1158	1581	1931	148,414
Occupational safety and health loans									15,687
Emergency energy shortage economic injury loans									15,174
Water pollution control loans									16,024
Air pollution control loans									
Total loans (direct, insured/guaranteed)	111,666	136,636	118,644	118,848	123,874	125,714	180,039	158,642	13,498,468
Total grants and technical assistance	8,751	7,728	702	1,787	4,414	4,460	8,503	1,421	418,035

^a Loans or loan guarantees.

^b Outlays in Puerto Rico have consisted entirely of grants.

Source: Community Services Administration, *Federal Outlays in Territories and Other Areas Administered by the United States for*

FY's 1970 to 1976: *Community Services Administration, Geographical Distribution of Federal Funds in Territories and Other Areas Administered by the United States* (Springfield, Va.: National Technical Information Service, March 1978.)

Title V regions encompass all or parts of 34 States,⁴ and had total program costs in 1977 of \$59.9 million.⁵ In addition, there are Appalachian Regional Development Programs authorized under the Appalachian Regional Development Act, for which 1977 outlays amounted to \$248 million.⁶ Some funds for these nine regional programs are useful for industrial development; all of the funds are designated for economic development purposes.

In March 1976, Puerto Rico and the Virgin Islands requested that they be designated under Title V as the Antillean Economic Development Region, "... with the same type of authority and financial support as that conferred to other Title V Regional Commissions."⁷ Approval of that request would open up a major new source of developmental assistance for the island's industrial sector. With-

out Title V money, Federal funds for that sector will probably continue to constitute only a small fraction of total Federal assistance—a fraction with a very limited impact.

Program With Indirect Effects

The small funding amounts noted in table 1 are not representative of the total Federal fund flows into the Commonwealth. The bulk of Federal disbursements to Puerto Rico are presented in table 2. If net Federal loan inflows (table 3) are added to grants, transfer payments, agency operating expenses, and returned excise taxes and customs duties,⁸ Federal funds come close to supplying a third of the island's GNP. Amounts of this magnitude have substantial indirect effects on the industrial sector.

⁸ Excise taxes on Puerto Rican tobacco products and alcoholic beverages sold in the United States, and customs duties collected on foreign goods imported into Puerto Rico are, with some exceptions and deductions, returned to the Commonwealth Government to be used at its discretion. For more detailed information on all types of Federal disbursements on the island, see: Institute of International Law and Economic Development, *Economic Effects of Federal Program Policies in Puerto Rico*, report submitted to the U.S. Department of Commerce under EDA grant No. OER-592-77-36 (Washington, D.C.: June 1978), chapter 1.

⁴ The regions are designated as follows: Coastal Plains, New England, Ozarks, Upper Great Lakes, Old West, Pacific Northwest, South West Border, and Four Corners (Arizona, Colorado, New Mexico, and Utah).

⁵ U.S. Budget for Fiscal Year 1979, Appendix, pp. 232-233.

⁶ Ibid., p. 77.

⁷ The Commonwealth of Puerto Rico and the Territory of the U.S. Virgin Islands, Joint Report, *Reauthorized Findings Precedent to Designation of Puerto Rico and the Virgin Islands as the Antillean Economic Development Region*... (March 11, 1976), p. i.

Table 2.—Disbursements of Federal Government in Puerto Rico (Fiscal Years)

Type of expenditure	1970	1971	1972	1973	1974	1975	1976	1977
Millions of dollars								
Transfer payments	303.2	377.6	432.7	543.9	635.7	1,167.1	1,692.5	1,835.0
Grants to government sector	256.5	314.7	413.3	491.6	500.0	650.0	822.7	844.9
Net operating expenses of Federal agencies in Puerto Rico	160.8	175.4	160.0	175.7	181.4	187.7	226.2	230.5
Return excise taxes	79.6	90.0	102.5	108.1	95.0	114.6	138.1	143.4
Customs duties	39.0	35.3	44.9	42.7	32.0	32.0	45.0	54.4
Gross total disbursements	839.1	993.0	1,153.4	1,362.0	1,444.1	2,152.0	2,924.5	3,108.2
Less: Payments to Federal Government	231.1	269.9	301.7	356.3	427.2	591.2	686.5	727.6
Net total disbursements	608.0	723.1	851.7	1,005.7	1,016.9	1,560.8	2,238.0	2,380.6
Percentage								
Net Federal disbursements as a percentage of Puerto Rican GNP	13	14	15	16	15	22	30	30

Source: Puerto Rico Planning Board, 1976 *Informe Económico al Gobernador*, pp. 120-132, A-14-A-16, A-26; Unpublished 1977 *Informe Económico*, pp. A-20-A-22, A-28.

Table 3.—Loans to Puerto Rico by Federal Credit Agencies (Fiscal Years)

[in millions of dollars]

Loans	1950	1960	1970	1971	1972	1973	1974	1975	1976	1977
Long-term loans:										
Farmer's Home Administration	2.6	2.4	12.9	16.4	10.6	34.8	32.6	50.8	43.8	75.6
Small Business Administration	—	2.3	9.5	21.4	19.5	8.1	29.0	25.4	48.4	35.0
Federal National Mortgage Association ¹	8.0	22.4	—	—	—	—	—	—	—	—
Government National Mortgage Association	—	—	2.2	2.1	18.1	27.2	11.5	67.6	72.2	71.1
Federal Land Bank of Baltimore	1.8	4.4	3.7	4.6	5.6	9.3	16.5	8.8	12.2	16.6
Others ²	1.6	7.2	14.4	10.0	6.6	20.1	5.5	7.5	6.7	7.6
Total, new long-term loans	14.0	38.7	42.7	54.6	59.4	99.5	95.0	160.0	183.3	205.9
Short-term loans:										
Federal Intermediate Credit Bank of Baltimore	17.4	23.9	30.1	30.2	26.1	23.5	8.1	6.7	9.9	7.9
Baltimore Bank for Cooperatives	2.9	16.4	7.7	4.9	7.2	8.1	8.4	5.8	3.6	5.0
Commodity Credit Corporation	—	7	2.8	1.5	2.1	1.8	2.7	.8	(³)	—
Total new short-term loans	20.3	41.0	40.6	36.6	35.4	33.4	19.3	13.3	13.5	12.9
Net inflow (outflow) of loans:										
Long-term loans less repayments	6.4	27.2	27.1	30.1	29.8	66.9	19.2	89.2	74.1	85.4
Short-term loans less repayments	(2.9)	3.9	2.0	2.5	(4.0)	(7.9)	(3.8)	(1.9)	5.5	(.8)
Total, net inflow of loans	3.4	31.1	29.1	32.6	25.8	(59.0)	15.4	87.3	79.6	84.6

¹ On September 30, 1968, the Federal Mortgage Association became a private corporation and the Government National Mortgage Association was organized.

² Economic Development Administration; Department of Housing and Urban Development loans in addition to those of the Government National Mortgage Association; Veterans Administration; Department of Health, Education, and Welfare; Baltimore Bank for Cooperatives, and the Reconstruction Finance Corporation.

³ Less than \$0.5 million.

NOTE.—Figures in parentheses indicate repayments exceed new lending.

Source: Puerto Rico, *Balance of Payments, 1942-61*, pp. 57-60; Puerto Rico, *Balance of Payments, 1975*, pp. 49-52; Unpublished 1977, tables 19 and 20.

A key effect is to generally increase Puerto Rican incomes, thereby increasing the potential market for industrial-sector products. Although less than 40 percent of the Commonwealth's industrial output is purchased locally,⁹ many of these purchases are directly or indirectly financed by Federal funds. It is impossible to place a dollar figure on the Federal role in providing an expanded market for industrial-

⁹ The less than 40-percent estimate is a very rough one. According to the 1972 Economic Census of Outlying Areas, Puerto Rico: *Census of Manufactures*, 41.2 percent of the manufacturing sector's 1972 output was purchased locally. With the proportional increase since 1972 in pharmaceutical and chemical production, most of which is exported, even a 40-percent local consumption figure is probably too high for 1978.

sector production, but since about half of the 1970-77 increase in Puerto Rican incomes can be traced to increasing Federal disbursements on the island, the purchasing power of Puerto Ricans is greatly augmented by Federal funds.

A second area in which Federal assistance affects the industrial sector is in financing infrastructure projects. Transportation, communications, power, and other facilities used by the industrial sector have received support under a number of Federal programs. A few of these programs are noted in table 1. A more inclusive list is presented in table 4. The larger funding figures in the latter table demonstrate

Table 4.—Federal Financing of Capital Improvements in Puerto Rico

[in thousands of dollars]

Programs	1970	1971	1972	1973	1974	1975	1976	1977
BUSINESS DEVELOPMENT								
Department of Agriculture:								
Emergency disaster loans	14	1226	119	18,054	13,176	111,137	1927	156
Farm operating loans	11,196	1859	1746	1700	11,317	11,078	11,451	13,855
Economic opportunity farm operating loans	78	34						
Business and industrial loans					150	13,000	116,763	118,691
Industrial development grants						473	404	9,997
Department of Commerce:								
Economic development—business development assistance	12,344	15,606	14,051	1409			12,770	1434
Economic development—special economic development and adjustment assistance							3,185	
Small Business Administration:								
Economic opportunity loans for small businesses	12,779	13,998	17,224	15,678	16,858	16,143	15,607	110,733
Small business investment companies		1100				1500	1500	
Small business loans	16,422	18,304	15,961	11,108	15,292	17,798	14,644	127,853
State and local development company loans				1453	11,574	1158	1581	1931
ECONOMIC INFRASTRUCTURE								
Department of Agriculture:								
Rural electrification loans					12,834		19,402	120,540
Rural telephone loans							125,000	
Department of Commerce:								
Economic development—grants and loans for public works and development facilities ²	7,512	7,551	462	1,401	3,109	3,070	3,731	
Grants to States for supplementary and basic funding of Titles I, II, and IV activities						482	713	699
Department of Transportation:								
Highway research, planning, and construction	13,572	7,125	8,240	11,947	15,172	25,719	22,129	34,048
Urban mass transportation capital improvement grants	345	199	469		641	738	51,337	6,958
Grants-in-aid for airports	743	4,816	421	600	252	1,482		
Airports facilities and equipment	105	47	147	29				
RESOURCE CONSERVATION AND DEVELOPMENT								
Department of Agriculture:								
Emergency conservation measures		179	214				571	450
Agricultural conservation program	793	743				865	472	526
Soil and water loans	167	135	141	16	16	15	132	163
Water system development grants	199	103	348					
Water system loans	1511		1366					
Soil survey	144	151	165	160	161	155	154	149
Total grants and services	23,491	20,948	10,466	14,137	19,335	32,984	82,696	52,827
Total direct loans and loan guarantees	113,323	119,128	118,408	126,408	141,207	129,819	177,677	183,156

¹ Loans or loan guarantees.

² Consisted entirely of grants in Puerto Rico.

Source: Community Services Administration, *Federal Outlays in Territories and Other Areas Administered by the United States*.

that infrastructure and related resource conservation and development activities useful to industrial firms receive more Federal aid than do actual industrial operations.

Federal assistance in the educational area provides a third source of indirect support for the industrial sector. Although employees receive most of their training on the job, the basic educational backgrounds they bring to these jobs are an important determinant of their trainability and productivity. As noted in table 5, Federal financing of general education exceeds the combined total available for Puerto Rico's industrial sector and for general capital improvements.

In addition to supporting general educational activities, the Federal Government also finances special training programs and related services. See table 6. In 1975 and 1976, funding for such pro-

grams was greater than that provided for general educational activities. These training programs are basically designed for the unemployed, and the placement rates in Puerto Rico's labor-surplus economy have been disappointing. But some Federal training program graduates have been employed in the industrial sector, and a closer matching of training and required job skills might substantially improve on that performance.

In summary, although the industrial sector is indirectly affected by Federal assistance in additional areas, the principal indirect Federal contributions to that sector consist of the following:

- market expansion,
- infrastructure and general economic development, and
- education and training.

Table 5.—Federal Programs for General Education in Puerto Rico¹ (Fiscal Years)

[In thousands of dollars]

Education Programs	1970	1971	1972	1973	1974	1975	1976
HIGHER EDUCATION, GENERAL							
Student financial assistance and related programs:							
Cuban education—student loans		\$145	\$147	\$99	\$77	\$17	
Supplemental education opportunity grants	1,348	2,119	1,386	2,436	2,936	4,083	3,832
Higher education act insured loans	292	2180	2388	2868	23,078	21,676	22,503
Higher education work study	743	2,365	2,028	3,448	4,894	5,679	6,981
National direct student loans	\$1,052	\$1,066	\$1,890	\$4,133	\$2,310	\$2,896	\$2,971
Special services for disadvantaged students	277	125	64	205	625	658	88
Talent search		64	157	225	110	110	29
Upward bound		150	160	355	341	386	100
Basic educational opportunity grant programs					14,179	12,765	55,472
Higher education—veterans' cost of instructions program (VA)				206	210		
Grants to States for student incentives							360
Veterans educational assistance (VA)	8,242	13,589	16,562	27,964	35,090	45,292	54,962
Dependents educational assistance (VA)	923	1,453	1,915	2,671	3,073	4,822	5,352
Subtotal—Loans	\$1,144	\$1,391	\$2,425	\$5,100	\$5,465	\$4,589	\$5,474
Subtotal—Grants	11,533	19,863	22,272	37,510	61,458	73,795	127,176
Assistance to institutions:							
College library resources	74	198	285	110	89		
Higher education—land grant colleges and universities	256	229	229	225	218	218	218
Higher education—strengthening developing institutions	552	575	678	700	1,255	1,315	1,185
Higher education academic facilities construction—interest subsidization	861	272	286	485			305
Higher education academic facilities—public community colleges and technical institutes			151			472	
Higher education personnel development—institutes, short-term training, and special projects	123			165			
Teacher corps—operations and training	52	254	766	82	809		404
University community service—grants to States	62	81	80	30	123	10	98
Higher education—cooperative education			20	95	158	110	108
Higher education instructional equipment		60	107		121		86
Subtotal	1,980	1,669	2,602	1,892	2,773	2,125	2,404
Total—higher education:							
Loans	\$1,144	\$1,391	\$2,425	\$5,100	\$5,465	\$4,589	\$5,474
Grants	13,513	21,532	24,874	39,402	64,231	75,920	129,580
ELEMENTARY AND SECONDARY EDUCATION							
General programs:							
Educationally deprived children—local educational agencies					\$27,367	\$36,873	
Educationally deprived children—migrants					516	676	
Educationally deprived children—state administration			272	289	315	291	388
Preschool, elementary, and secondary personnel development—grants to States		625					
Personnel development programs		248					
State grants—education professional development	418	250	110				
School assistance in federally affected areas—maintenance and operation	7,071	404	616	489	467	363	1,139
School library resources, textbooks, and other instructional materials		1,635	1,842	1,847	1,828	1,440	695
Strengthening instruction through equipment and minor remodeling	422	671	605	19	417	279	132
Strengthening State departments of education—grants to States	265	265	321	327	345	553	314
Libraries and learning resources	846	1,635	1,842				1,113
Educational personnel development—urban/rural school development						182	160
Subtotal	9,022	5,733	5,608	2,971	3,372	3,624	41,490
Special programs and innovative projects:							
Bilingual education		105	88	85	406	556	4459
Educational classroom personnel training—bilingual education				420			
Educationally deprived children—handicapped			359	524	571	571	571
Educationally deprived children in State-administered institutions serving neglected or delinquent children			329	491	654	654	654
Follow through		897	6	543	622	90	743
Handicapped early childhood assistance					60	129	
Handicapped preschool and school programs	569		652	652	728	546	1,063
Handicapped personnel preparation	199		239	393	394	250	700
Preschool, elementary, and secondary education—special programs and projects					439		
Supplementary education centers and services, guidance, counseling, and testing	2,584	3,069	2,712	2,706	2,706	1,525	994
Special programs for children with specific learning disabilities			125			128	
Emergency school aid act—educational television				428	1,500	986	4731
Emergency school aid act—special programs					35	101	
Right to read—elimination of illiteracy							1,401
Educational innovation and support							
Child development—Head Start (HEW Office of Human Development)	7,779	6,710	5,095	4,958		15,852	15,659
Subtotal	11,131	10,781	9,605	11,173	8,115	21,388	22,975
Total—elementary and secondary education	20,153	16,514	15,213	14,144	11,487	25,012	64,975

Table 5.—Federal Programs for General Education in Puerto Rico¹ (Fiscal Years)—Con.

[In thousands of dollars]

Education Programs	1970	1971	1972	1973	1974	1975	1976
VOCATIONAL EDUCATION⁵							
Basic grants to States	6,136	—	6,942	6,489	6,724	6,716	6,631
Consumer and homemaking	278	395	463	433	505	565	643
Cooperative education	381	252	531	397	536	536	536
Research	—	332	326	152	270	259	4259
Special needs	—	—	362	338	326	314	314
State advisory councils	—	37	44	42	59	65	63
Work study	—	92	98	90	114	136	136
Innovation	177	268	495	—	497	497	4440
Personnel—State systems program	—	15	30	65	162	—	4182
Vocational and adult education—research (special projects)	—	—	444	—	—	—	—
Total—vocational educational	6,972	1,391	9,735	8,006	9,193	9,088	9,206
OTHER PROGRAMS							
Cooperative extension services (Agriculture Department)	3,070	3,550	3,812	3,937	4,012	4,209	4,499
Adult education—grants to States	648	6,671	787	984	821	1,037	—
Construction of public libraries	77	123	132	24	—	228	—
Educational broadcasting facilities	—	—	—	—	395	—	—
Library services—grants for public libraries	523	484	674	456	—	—	692
Total—other programs	4,318	10,828	5,405	5,401	5,228	5,474	5,191
Grand total—all education programs:							
Loans	21,144	21,391	22,425	25,100	25,465	24,589	25,474
Grants	44,956	50,265	55,227	66,953	90,139	115,494	208,952

¹ These general education activities exclude programs which are primarily for medical education. Also excluded are programs from which Puerto Rico did not receive over \$200,000 in total payments over the years noted. Unless otherwise indicated, programs are those of the Office of Education of HEW.

² Loans and loan guarantees.

³ Figures supplied by the U.S. Office of Education. For 1975, no amount was listed in the *Federal Outlay Book*. For 1976, cited figure agrees with amount listed in Region II 1978 *Budget Book*; *Federal Outlay Book* erroneously printed \$368,873,000 for 1976.

⁴ See source.

⁵ Official titles of all programs in this section begin with the term, vocational education (e.g., Vocational Education—Basic Grants to States).

Source: Community Services Administration, *Federal Outlays in Territories and Other Areas Administered by the United States* (annual publication), unless noted by (1). When the validity of the *Federal Outlays Figures* for 1976 were in doubt, data were used from the Federal Regional Council—Region II, *Budget Book 1978*. When such an exception is made, (4) indicates that the figure is from the *Budget Book 1978*.

Table 6.—Federal Programs for Employment Training and Related Services

[In thousands of dollars]

Programs	1970	1971	1972	1973	1974	1975	1976	1977
Comprehensive employment and training programs	—	—	—	—	38,471	90,324	113,446	158,799
Economic opportunities program	26	1,271	—	—	—	—	—	—
Manpower training and employment service	—	1,494	7,500	—	—	—	—	—
Job corps	736	864	1,054	2,332	11,400	1,393	1,543	1,654
Job opportunities in private business sector	1,288	6,359	3,086	1,604	—	—	—	—
MDTA—institutional training	3,951	4,834	3,383	3,347	2,552	—	—	—
Migrant and seasonal farm workers	—	—	—	250	290	250	2,997	2,258
National on-the-job training	764	4	161	149	—	—	—	—
New careers	797	—	—	—	—	—	—	—
Neighborhood youth corps	6,575	11,577	14,443	14,419	—	—	—	—
Work incentive program	2,970	555	1,283	2,732	6,123	11,934	12,900	1,099
Work incentive program—child care—employment related services	128	25	583	—	1,152	1,250	1,153	1,196
Youth employment and training programs	—	—	—	—	—	—	—	528
Total	17,235	26,983	31,493	24,833	49,988	95,151	122,039	165,534

¹ Unless otherwise indicated all amounts except with (1) are from the Community Services Administration, *Federal Outlays*. (1) denotes figures from the Labor Department's Draft Interagency Study Report,

or from the Federal Regional Council—Region II *Budget Book*, FY 1978.

Modification in the use and selection of Federal assistance programs could produce more beneficial results, but the effects of programs in the above areas are generally positive.

Options for Improving Direct and Indirect Assistance to the Industrial Sector

In discussing options for improvements, the market expansion and education-training areas can be treated separately. Direct Federal assistance to the

industrial sector, however, is usefully combined with the infrastructure and general economic-development category. This combined treatment reflects the tendency for most industrial-sector assistance to come from programs designed for general economic development covering more than a single sector.

Expanding the Market for Puerto Rican Industrial Products.—The market expansion effect of Federal expenditures is basically tied to the total magnitude of funding which raises Puerto Rican incomes. In

lieu of major funding increases, the only significant Federally related market expansion would result from increased purchases from the Federal Government itself. A recent directive to the General Services Administration (GSA) to double the amount of contracts to minority businessmen and entrepreneurs operating in labor-distressed areas enhances the possibilities for such purchases. In 1977, less than \$2 million worth of GSA contracts were awarded on the island, with \$1.5 million going to a single company.¹⁰ Considerable dividends could result from greater efforts by the Puerto Ricans to take advantage of Federal Government purchasing from (1) ethnic minority businessmen, (2) small businessmen, and (3) areas with high unemployment.¹¹

In the export-expansion programs conducted by the Department of Commerce, the Department's regional office in San Juan actively pursues local firms' participation in the development of new markets for Puerto Rican goods. However, little direct funding is involved in promoting industrial development of these products.

Improving Basic Education and Training Programs.—As Puerto Rican industries become more technologically advanced, they increasingly require higher worker skill levels. Improved Federal training programs could assist in providing these skills. However, since on-the-job training is the dominant method used to acquire useful work skills, trainability is the most critical factor. Trainability rests so heavily on the possession of solid, basic educational backgrounds that improvements in the island's educational system can play a major role in assisting the industrial sector.

Although education is the largest single item in the Commonwealth's budget, the budgetary base is relatively small, and per student expenditures are correspondingly low.¹² The Puerto Rican Government has been unable to supply the "... buildings, equipment, materials, books, teachers, and other personnel necessary to maintain an adequate educational system."¹³

The Federal Government provides considerable educational assistance, but Federal aid could be improved in numerous ways. The chief difficulties relate to the distribution of Federal funds: (1) only a

little over two-fifths of the funds are directed to general elementary and secondary education, where Puerto Rico's needs are the greatest; (2) over 40 percent of these elementary and secondary funds have been for special programs and innovative projects rather than for basic education; and (3) over 95 percent of Federal funding on higher education is used for financial aid to students studying any subject matter, while only a few million dollars a year support the universities attended by Federally aided students.

Better tailoring of Federal programs would rest upon specific priorities established by Puerto Ricans. However, the options for improving Federal educational aid include the following:

- *To improve basic education*, given the existing selection of Federal programs, the most feasible action would probably be to grant State-like treatment to Puerto Rico in the educationally deprived children programs (Title I of the Elementary and Secondary Education Act of 1965). By dropping or at least modifying the special formula for funding this program in Puerto Rico, increased assistance would be available for the island's more fundamental elementary and secondary education needs.
- *To upgrade school facilities*, in light of the current lack of HEW programs for this purpose, greater coordination with other Federal agencies would be useful. More construction projects and public-service employment could be targeted on schools (e.g., under the Labor Department's Comprehensive Employment and Training Act, through the Commerce Department's economic development administrative public works projects, and with the Department of Housing and Urban Development community development block grant program).
- *To promote technical education*, some gains could result from supplemental funding of secondary level vocational education, and from combined assistance efforts by HEW, DOL, the Puerto Rican Departments of Education and Labor, and Puerto Rican businesses. A similar approach could profitably be used also to foster more technical education on the higher education level. Aid to 2-year technically oriented colleges might be especially valuable.

Federal training programs cannot fully compensate for poor basic educational backgrounds, but there are also options for improvements in assistance area. Some options include greater:

- Support of on-the-job training programs in private companies.

¹⁰ "Millions in Federal Bids Go Begging in Puerto Rico for Lack of Response," *Caribbean Business*, 1 June 1978, p. 4.

¹¹ Federal programs which could be of particular assistance are: GSA's Business Services (Counseling on Doing Business with the Federal Government), and SBA's Procurement Assistance to Small Businesses. For descriptions of 103 major programs, see: Institute of International Law and Economic Development, *Description and Analysis of Key Federal Programs Applicable to Puerto Rico*, Report submitted to U.S. Department of Commerce under EDA grant No. OER-592-77-36, June 1978.

¹² The Commonwealth Government is the only source of public school funding in Puerto Rico's centralized education system.

¹³ *Agenda for Socio-Economic Study of Puerto Rico*, p. 47.

- Emphasis on the linkage between formal training and specific industrial employment needs.

Both of these options relate to the poor placement record of Federal training program graduates, and the contrasting deficiency of highly skilled workers needed by the industrial sector.¹⁴ This supply-demand imbalance partially reflects the Federal emphasis on training the unemployed, who often lack the basic educational backgrounds needed of them to fully profit from special training programs. The imbalance also partially corresponds to the incongruence between skills taught and skills needed.

The preemployment training program recently developed (but subsequently discontinued) by the Puerto Rican Board of Education and Fomento represented an appropriate type of preparation which should be emphasized. This program trained workers specifically for new factories opening on the island, rather than for possibly nonexistent jobs.

Promoting Industrial and General Development.

—Even in general economic and business-development programs, funds are not exclusively used for economic ends. The Commerce Department's economic development objectives share the spotlight with its concern for the unemployed and for the welfare of areas with lagging economic growth. Similarly, the Small Business Administration emphasizes assistance to minority-group members, low-income individuals, and business persons unable to obtain commercial credit. These and other economic programs incorporate some of the social priorities that dominate most other Federal assistance. The potential impact of the relatively small number of industrial and economic development programs available is thus further reduced by the restricted clientele and multiple purposes of many of these programs. In relative terms, there simply is not a great amount of Federal assistance for aiding the

industrial sector, or financing infrastructure projects and related economic activities that have indirect but beneficial effects on the industrial sector.

Nevertheless, from the programs which are available, better selection and use could significantly increase the resulting economic development. The key consideration would be to concentrate on obtaining technical assistance and project funding that promote long-term development. Federal "economic development" funds can also be used to finance projects which have unemployment reducing effects, but in both the Federal Government and the Commonwealth Government, this use has often tended to overshadow the developmental functions of Federal assistance. Options for improvements in this regard include:

- An increased Commonwealth emphasis on selecting industrial and economic development assistance, for which they currently receive a disproportionately small share.
- A greater Federal and Commonwealth emphasis on using individual programs for economic rather than primarily social purposes.

A third option, which would perhaps have an even more beneficial effect, is to:

- Provide Puerto Rico with regional development program assistance under Title V of the Public Works and Economic Development Act of 1965.

These special funds would substantially augment those presently available for developmental activities. The current developmental financing, however, along with the education-training assistance and market expansion effects of Federal disbursements do have a generally positive impact. The same cannot be said with regard to the costs to the industrial sector created by a number of Federal regulating programs.

¹⁴ Federal financing of on-the-job training can also act as a hiring incentive, and as a subsidy to businesses.

Chapter XI.—Comparative Analysis of Puerto Rican Economic and Industrial Development Administrations

INTRODUCTION

The dramatic change in the structure of Puerto Rico's economy, from a primarily agricultural to an advanced industrial society, is commonly attributed to the island Government's intensive efforts to promote the growth of manufacturing beginning in the 1940's. The most far-reaching effects within the organization of the industrialization program include:

- The creation of the Puerto Rican Industrial Development Company in 1942 (PRIDCO);
- The establishment of the Puerto Rico Planning and Zoning Board in 1942;
- The creation of the Government Development Bank in 1942 (GDB);
- The creation of the Economic Development Administration in 1950 (EDA); and
- The passage of several tax incentive acts.

This chapter examines the roles played by the local government's economic development programs and agencies. The scope, however, is limited to the investigation of the functions, objectives, programs, and accomplishments of PRIDCO and EDA. These two agencies are commonly referred to as Fomento, the development administration most directly involved in the promotion of industries in Puerto Rico. This chapter also analyses the investment incentives provided to industries by Fomento, and compares these incentives to those offered by the governments of other regions.

THE FUNCTION AND ACCOMPLISHMENTS OF FOMENTO

Functions of PRIDCO and EDA

Established by a Puerto Rican legislative act on May 11, 1962, PRIDCO was charged with the re-

sponsibility of developing the resources of Puerto Rico and allocating them for proper uses in various economic activities and research efforts to promote the island's economic growth. In addition, the act authorized the company "to own, establish, and operate new enterprises for the purpose of exploiting and distributing products manufactured from raw materials available on the island."¹ This original act was later amended to authorize the company to engage in various enterprises which consume imported materials as well.² In addition, PRIDCO was authorized to make loans to any person for the purpose of developing industrial, mining, commercial, or agricultural activities.

With the initiation of "Operation Bootstrap," in 1948 and the creation of the EDA in 1950, the role which PRIDCO plays in Puerto Rico's economic development has changed. However, this role still remains highly significant. The basic functions of PRIDCO presently include:

- The provision of physical facilities to industry, principally land and buildings; and
- The administration of special incentive programs designed to start up new firms through cash grants.

The Puerto Rican Economic Development Administration (EDA) was created in 1950, 8 years after the birth of PRIDCO.³

In addition to the reassignment of the industrial research functions of PRIDCO to EDA, the 1950 act also identified EDA as an official department within the island government. "Its [EDA's] administrator was vested with powers as PRIDCO's 'board of directors.' PRIDCO, thus, fell under the umbrella of EDA."⁴ Together, these two agencies are

¹ Thomas Hibben and Rafael Pico, *Industrial Development of Puerto Rico and the Virgin Islands of the United States*, Report of the United States Section Caribbean Commission, 1948, p. 30.

² *Ibid.*

³ Government Development Bank for Puerto Rico, *Puerto Rico Business Review*, vol. 3, No. 5, May 1978, p. 4.

⁴ *Ibid.*

referred to as Fomento (a Spanish word for development).

The EDA's activities are numerous. They range from conducting research studies to determining the government policies on industrial promotions, to assisting individual businesses in loan applications, and in the acquisition of property and facilities. EDA activities include:

- The provision of up-to-date information to businessmen on relevant Puerto Rican economic factors such as labor, materials, transportation, taxes, etc.
- Through PRIDCO, assistance in the selection of plant sites or leasing of modern factory buildings at low rentals. In addition, new factories and facilities may be built to particular production specifications.
- Assistance to businessmen in arranging necessary loans from private and/or government institutions.
- Assistance in setting up and operating the training programs necessary to ensure industry of qualified skilled workers, clerical and administrative personnel.
- The provision of engineering assistance, marketing surveys, and other applied research necessary to strengthen industrial operations in Puerto Rico.⁵

From the list of activities above, it is clear that EDA and PRIDCO's programs are highly complementary. PRIDCO serves as a financial arm for EDA. Therefore, it is very difficult to separate the economic impacts (direct and indirect) of PRIDCO's programs from those of EDA. In the following sections, only programs completed before 1950 will be credited to PRIDCO; other programs are referred to, in general, as Fomento's.

Activities and Accomplishments of Fomento

Early Accomplishments of PRIDCO.—In 1942, the Puerto Rican legislature created PRIDCO, allowed it to inherit a cement plant from the depression-born Puerto Rico Rehabilitation Administration, and appropriated \$500,000 to the company to "develop the resources of Puerto Rico." The economy at this time was characterized by a large agricultural sector, very few industrial activities, a generally unskilled labor force, and a lack of local raw materials. There was an uncertainty concerning whether development efforts should be concentrated on agriculture, industrial, or commercial sectors.

⁵The Chase Manhattan Bank, N.A., *Industry in Puerto Rico*, July 1967, p. 10.

In 1943, PRIDCO organized and developed the Puerto Rican Glass (ceramics) Corporation. This development was followed by the Puerto Rico Pulp and Paper Corporation in 1944, and the Puerto Rico Shoe and Leather Corporation in 1945. PRIDCO, however, was not successful in most of its original projects. PRIDCO's ceramics and shoe factories did not prosper primarily because no thought had been given to arranging for contacts through continental distributors to reach the U.S. market. In fact, except for an inherited cement plant, all publicly owned corporations were incurring losses. As a result, strong local pressure developed to force PRIDCO out of competition with private enterprise. Nevertheless, PRIDCO was in an excellent financial situation because of the increasing amount of funds acquired from the excise tax remittances on rum. In the 1941-46 period, the company's investment amounted to \$20 million.⁶ As a whole, however, PRIDCO's activities were not very satisfactory in the 1942-50 period. Available data show that in June 1948, PRIDCO's subsidiaries employed only 992 workers (see table 1). During the initial period (1943-47), a growing number of private companies received assistance from PRIDCO.

Table 1.—Employment, Payroll, and Gross Sales of Puerto Rican Industrial Development Company Subsidiaries, June 1948

Subsidiaries	Workers	Annual payroll	Gross sales
Puerto Rico Cement Corporation	156	\$267,738	\$3,200,000
Puerto Rico Glass Corporation	176	205,525	2,400,000
Puerto Rico Pulp and Paper Corporation	173	151,489	1,000,000
Puerto Rico Clay Products Corporation	205	201,556	800,000
Puerto Rico Shoe and Leather Corporation	282	167,318	1,000,000
Total	992	993,626	8,400,000

Source: Thomas Hibben and Rafael Pico, *Industrial Development of Puerto Rico and the Virgin Islands of the United States*, Report of the U.S. Section Caribbean Commission, 1948, Appendix, table IV.

Accomplishments of Fomento (PRIDCO and EDA).—a. *Measures of Accomplishments:* Since the creation of the tax incentive program and the establishment of Fomento, the industrial sector has grown at a very rapid rate. A recent publication reports:

[Between 1950 and 1977] manufacturing employment increased from 9 percent to 19 percent of the work force, while manufacturing net income moved from 14 percent to 43 percent of total net income. Net income, in turn, had increased to over 10 times the 1950 level.⁷

⁶*Ibid.*

⁷Government Development Bank for Puerto Rico, *op. cit.*, p. 6.

However, industrial growth is not a good measure of Fomento accomplishments. The tremendous growth cited above is obviously not entirely attributed to the industrial incentives made available to investors and the work of Fomento alone. Other reasons for such a rapid growth may be the low wages in Puerto Rico, the availability of labor resources, Federal tax incentives, and the improving transportation and communication linkages with the U.S. mainland.

Another measure of Fomento program accomplishments can be approximated by computing the change of the ratio (percentage) of Fomento promoted plants, to the total number of plants (both promoted and nonpromoted) in Puerto Rico over a period of time. The ratios of employment and outputs are also computed in the same fashion to assess the effectiveness of Fomento programs.⁸

This approach, although superior to the first, suffers the same major drawback; it tends to overestimate the effectiveness of Fomento programs. The main reason is an expanding firm may switch from "independent" to "Fomento promoted" not necessarily because it needs the promotion efforts of Fomento to stay in business, but only to receive benefits from the tax-incentive packages. In such a case, the statistics would show one additional "Fomento promoted" firm and one less "non-Fomento" firm.

The drawback above may also apply for new firms entering the Puerto Rican market as well. In this case, a firm may choose to be "Fomento promoted" even though it is capable of being "independent."

It is unknown whether these types of firms are numerous in Puerto Rico today. On the other hand, Puerto Rican business leaders and government officials generally agree that without Fomento programs, many industries would never have located in Puerto Rico. In the absence of other evidence, or of a more reliable measure, the ratio of income and employment from Fomento-assisted or promoted plants to those of total Puerto Rico plants can be used as an indicator of the development of Fomento programs in the past decades.

b. Income and Employment Created by Fomento Plants.—Table 2 indicates that generally Fomento has accomplished its objective "to promote industry" during the 1950-77 period. In 1950, Fomento plants generated \$3.1 million of "net income originated in manufacturing." In percentage terms, they contributed 3.5 percent of \$88.7 million of the total manufacturing income. This percentage

Table 2.—Net Income Originated From Manufacturing, Total and Fomento Promoted Plants, Fiscal Years

[In millions of dollars]

Item	1950	1960	1970	1975	1977
Total	88.7	288.8	957.6	1,940.9	2,844.9
Food	41.6	66.7	161.3	274.5	307.0
Tobacco	5.0	10.4	36.4	49.4	55.1
Textiles	1.1	13.9	41.1	48.8	42.3
Apparel	17.4	50.7	172.0	204.9	261.8
Furniture and wood	4.1	8.8	26.2	26.1	25.4
Printing and publishing	3.2	11.2	22.6	37.5	37.0
Chemical	5.5	9.8	109.3	559.5	1,036.2
Stone, clay, glass	4.8	18.8	49.1	71.9	72.7
Machinery and metal	2.7	54.7	191.5	478.2	779.6
Others	3.4	43.7	148.0	190.0	227.8
From all Fomento plants	3.1	155.4	782.3	1,684.5	2,602.9
Food	D	4.4	65.0	126.3	175.6
Tobacco	—	6.2	33.3	46.4	53.1
Textiles	.4	12.7	40.8	48.7	41.2
Apparel	.4	37.1	163.5	197.8	253.9
Furniture and wood	D	1.5	17.3	14.7	14.3
Printing and publishing	D	.7	7.1	16.0	12.9
Chemical	D	4.0	107.9	554.7	1,032.2
Stone, clay, glass	1.6	6.7	30.9	44.9	48.1
Machinery and metal	D	43.2	177.6	455.8	756.8
Others	.6	39.0	138.9	179.2	214.8

Ratio of Fomento plants' income to total (percentages)

All Fomento plants	3.5	53.8	81.7	86.8	91.5
Food	—	6.6	40.3	46.0	57.2
Tobacco	—	59.6	91.5	93.9	96.4
Textiles	36.4	91.4	99.3	99.8	97.4
Apparel	5.4	73.2	95.1	96.5	97.0
Furniture and wood	—	17.0	66.0	56.3	56.3
Printing and publishing	—	6.3	31.4	42.7	34.9
Chemical	—	40.8	98.7	99.1	99.6
Stone, clay, glass	33.3	35.6	62.9	62.4	66.2
Machinery and metal	—	79.0	92.7	95.3	97.1
Others	17.6	89.2	93.9	94.3	94.3

D—Data unavailable.

Source: Junta De Planificacion de Puerto Rico, 1977 *Informe Economico al Gobernador*.

increased consistently to 53.8 percent in 1960, 81.7 percent in 1970, and 86.8 percent in 1975. By 1977, \$2.6 billion was contributed by Fomento plants, causing the ratio of Fomento-promoted to total manufacturing income to increase to 91.5 percent.

A close examination of the ratio of income from Fomento plants to total plants by industry (last part of table 2) indicates that Fomento has increased its influence in all industries except for furniture and wood products (in the 1970-75 period), textile mill, and printing and publishing (in the 1975-77 period).

Available data on the profitability of EDA promoted manufacturing plants which filed income tax returns in the 1950's indicate that Fomento was also fairly successful in the first decade of its operation. The total profits generated by EDA plants rose from \$4.3 million in 1951 to \$35.7 million in 1958. The ratio of total loss (unprofitable) to total profit of all

⁸For example, "income produced by Fomento promoted or assisted plants rose from 3 percent of total manufacturing income in 1950 to 91 percent in 1977."

EDA plants shows a fluctuating but declining value in the period. See table 3.

Table 3.—Profitability of Fomento Promoted Plants Which Filed Income Tax Returns, FY's 1951–58

Fiscal year	Firms reporting	Loss (In thousands of dollars)	Profit (In thousands of dollars)	Net profit (In thousands of dollars)	Loss/profit (Percentage)
1951	56	757	5,035	4,278	15.0
1952	88	1,013	9,035	8,022	11.2
1953	136	1,270	19,650	18,380	6.5
1954	180	1,933	24,365	22,432	7.9
1955	217	1,907	26,389	24,482	7.2
1956	280	1,648	34,522	32,874	4.8
1957	350	3,128	44,865	41,737	7.0
1958	1417	6,391	42,065	35,674	15.2

¹ There were 504 Fomento plants in existence as of December 31, 1958.

Source: Commonwealth of Puerto Rico, Economic Development Administration, *Annual Statistical Report of EDA Manufacturing Plants 1958–59* Ed., table 15, Section II.D.

Employment in Fomento-assisted plants also increased significantly, compared to that of the manufacturing sector as a whole. As a result, Fomento's share of employment rose from a negligible level in 1950 to 56 percent in 1960, and 80 percent in 1975. See table 4.

Table 4.—Employment by Fomento Plants and All Manufacturing Plants in Puerto Rico

Year	Total (In thousands)	Fomento promoted (In thousands)	Fomento/total (Percentage)
1960	82.1	46.0	56.0
1965	111.3	74.7	67.1
1970	136.7	105.5	77.2
1975	136.6	110.0	80.5

Source: Commonwealth of Puerto Rico, Department of Labor, Bureau of Labor Statistics, *Census of Manufacturing Industries of Puerto Rico*, October series.

c. *Other Considerations.*—This subsection briefly reviews additional economic factors associated with Fomento plants, and with Puerto Rican industries influenced by Fomento. Problem areas which might receive more attention in Fomento's programs for economic development are suggested.⁹

(i) *Interindustrial linkage improvements:* Increased efforts by Fomento to improve the linkage among industries in Puerto Rico would be beneficial. The weak links between industries are partially attributable to the lack of Puerto Rican resources and the island's reliance on offisland trades. Another reason is the presence of a large number of subsidiaries of U.S. corporations on the island ("enclave industries"). An earlier study reported:

* It should be noted that the subjects are extremely complicated which may require independent research to study the problems. The suggestions are therefore only preliminary.

... many of the new manufacturing companies, although expanding rapidly, were having little economic impact on each other or on other sectors of the economy. The typical new factory was almost completely integrated into the U.S. economy and actually created or satisfied more industrial demands in the United States than in Puerto Rico.¹⁰

Increased effort by Fomento should be considered to improve the linkage between industries in order to maximize the benefits of industrial expansion in Puerto Rico.¹¹

(ii) *Market Distribution Mechanism.*—A number of small local industrialists have expressed desire to expand their local and external markets. Industrialists in this effort meet with persistent and effective competition offered by offisland producers.

Currently, most of Fomento's efforts have been in the area of financial assistance. Additional technical assistance and resources focused on marketing, advertisement, and distribution problems would benefit local industries in their effort to expand operations. This type of support program, if effectively implemented, may help prevent the closure of many small Puerto Rican locally owned firms employing a large number of Puerto Rican workers. The improvement in the market-distribution mechanisms may also improve the interindustry linkages discussed above. See chapter VII.

(iii) *Cost/Benefit Consideration of Assistance Projects.*—In the past, all firms who met specific requirements established by Fomento were eligible for 100-percent tax exemption. Presently, however, a study published by EDA in February 1978 has reevaluated the cost/benefit ratio of industrial tax-exemption programs. The study results indicate that in the future, more attention will be given to the cost/benefit aspect of tax-exemption applications. It is suggested that capital-intensive projects which: (a) require substantial Fomento investment and efforts; (b) create only a few jobs per dollar of government investment; and (c) yield little other benefits to the island, be carefully considered before full assistance is granted.¹²

(iv) *Assistance Given to Locally Owned Industries:* Table 5 shows that local plants promoted by Fomento added 10,565 jobs during the 1965–74 period, one-third the increase in Fomento promoted offisland plants' employment of 32,565. However, in percentage terms, the increase was 137 percent for local plants and only 46 percent for nonlocal plants.

¹⁰ Chase Manhattan Bank, N.A. *op. cit.*, p. 11.

¹¹ See chapter VII for further discussion.

¹² An example of such a project is the establishment of assembly plants for transportation equipment, which require highly advanced technology and high-cost capital equipment.

**Table 5.—Employment in Manufacturing—
October 1965–74**

	1965	1974	Increase or decrease	
			Number	Percentage
Locally owned:				
Fomento promoted	7,685	18,250	10,565	137
Other	32,330	26,716	-5,614	
Total	40,015	44,966	4,951	
Foreign and continental owned:				
Fomento promoted	70,685	103,250	32,565	46
Other	1,253	1,341	88	
Total	71,938	104,591	32,653	
Total manufacturing	111,953	149,557	37,604	

Source: Salvador Lugo and Luisa M. Cabarrout de Elias, *Trend and Problems of the Local Puerto Rican-Owned Manufacturing*, October 1975, table I.

In terms of financial assistance, except for fiscal years 1965 and 1967, 50 percent or more of PRIDCO's loan and investment disbursements were given to local firms every year. See table 6. This percentage is significant considering the fact that only one-third of the island's manufacturing sector (represented by employment) was locally owned.

Table 6.—Loans and Investments Disbursed and Special Incentives Approved by the Puerto Rican Industrial Development Company to Manufacturing Firms, FY's 1965–74

Year	Total amount	Percentage local
1965	\$5,256,559	45
1965–66	4,182,665	59
1966–67	7,165,280	22
1967–68	9,059,588	28
1968–69	7,152,912	53
1969–70	4,319,334	50
1970–71	6,249,443	54
1971–72	12,671,793	63
1972–73	13,050,115	70
1973–74	7,946,307	50

Source: Salvador Lugo and Luisa M. Cabarrout de Elias, *Trend and Problems of the Local Puerto Rican-Owned Manufacturing Industries*, October 1975.

Increasing assistance to local manufacturers, while providing sufficient incentives to attract permanent, long-term offisland investments, would be beneficial for island residents and consistent with the Commonwealth's objectives of promoting a stable manufacturing sector.

(v) *Improvement of Data Collection and Research Efforts.*—The task of conducting research to determine the feasibility studies of industrial development projects, and to incorporate the industrial promotion and economic research functions rest with EDA. On the other hand, the Planning Board has the responsibility of formulating the economic development program for Puerto Rico in its entirety. Because industry is the largest private sector,

the Planning Board is also associated with industrial development planning in Puerto Rico. Better coordination of research efforts by the EDA and the Planning Board would significantly benefit Puerto Rican industries.

Coordination might be first emphasized in the area of *data collection*. Discrepancies between data from various Puerto Rican sources are commonly cited. Annual publication of the Statistical Abstract by the Planning Board (which was discontinued in 1974) should assist businesses and administrators considerably in their research tasks, particularly if such a data package were accepted as "official" by all planning agencies.

In addition, reevaluation of EDA-promoted plants should be made periodically to determine the difference between the number of jobs expected to be created, reported by the firm when the tax exemption application is filled out, and the actual number of jobs created. Fomento should also make all attempts to obtain financial information of EDA-promoted firms in order to determine the profitability of industrial categories. This type of information would help the agency improve success of future assistance projects.

Incentive Programs of Selected Countries

This section reviews the investment incentives offered by some 20 countries to attract foreign investment and to promote local business. The experiences of these countries can serve as a guide to Puerto Rico in revising and upgrading its incentive program.¹³ The countries surveyed include (in alphabetical order): Argentina, Australia, Belgium, Brazil, Canada, Egypt, India, Iran, Ireland, Israel, Ivory Coast, South Korea, Mexico, Netherlands, Peru, Philippines, Portugal, Spain, Taiwan, and the United Kingdom.

1. *Types of Incentives.*—All 20 countries have some type of incentives to attract investment and/or industries. The incentives are generally designed to promote particular "priority industries" or to develop economically backward subnational regions. Most programs focus on export-oriented industries. Specifically, the incentives can be categorized into tax incentives, financial incentives, and trade-related incentives.

a. Tax Incentives

i. *Tax Holidays and Income Tax Provisions.*—Egypt, Israel, Ivory Coast, Korea, Taiwan provide basic 5-year tax holidays for approved industries in

¹³ The scope of this chapter does not allow a detailed review of all programs. It only highlights the main features of selected programs. Additional information on specific individual countries may be obtained from the respective embassy, consulate, or economic development agencies.

certain locations. In Iran, industries which export Iranian products are given such tax holidays, Argentina, Brazil, Mexico provide full exemptions in some cases. Ireland also uses full exemption: also, all export profits have a tax-free status. The indefinite exemptions offered by Ireland on export profits must end in 1990 in accordance with European Economic Community (EEC) agreements.

Whereas accelerated depreciation only defers tax payments, allowances or grants may permit deductions in excess of the cost of depreciable assets to be taken in the early years, thereby reducing income-tax liabilities. Accelerated depreciation is most commonly used, with the accelerated rate frequently double the usual rate. This type of tax incentive is being used by *most* of the countries reviewed including Argentina, Ireland, Mexico, the Netherlands, Peru, Spain, and the United Kingdom.

Some countries provide for generous carryover of losses or for carryover of unused income deductions. Two such countries are the Philippines and the Netherlands. Some countries also provide special tax incentives for reinvested earnings; e.g., Brazil and Peru. In several instances transfer and establishment taxes are exempted or reduced: Israel, Spain. A few countries offer virtually a complete system of tax exemption for highly desired enterprises; most notably Ireland and Israel.

ii. *Financial Incentives.*—The most common financial incentives are the various forms of grants, loans, and loan guarantees. Open access to the domestic financial market and domestic credit facilities also may be considered an incentive since many nations have standing restrictions on the use of local funds. For example, Ireland provides grants toward infrastructure and investment, costs of fixed assets, modernization and reequipment costs, expense of R. & D., and worker and managerial training.

The United Kingdom provides grants of 20-22 percent for new or modernized plants in expansion areas, 15-20 percent of costs for new investments in key industrial sectors, and up to 80 percent of the removal costs for companies relocating in development areas.

Loans on favorable terms are reported as common incentives, and overall may be more important than direct grants.

iii. *Trade-Related Incentives.*—These include exemption or reduction of import duties and related charges, and the imposition of controls or duties to protect industries against imports. (Also, less frequently used are reductions or exemptions of export duties and/or taxes). The specific incentives are:

- *Import Duties:* The exemption or reduction of import duties and related charges (include in

some cases domestic sales taxes) on machinery and equipment is a very common incentive.

- *Import Protection:* Import protection against competition from external industries is usually confined to "infant industries" and is provided only for a limited period. The actual mechanism may be through tariff measures, import restrictions or, in rare cases, the actual banning of imports. This type of protection is commonly used in developing countries including Argentina, Brazil, Korea, and Peru.

- *Export Subsidies:* Many countries provide subsidies for exports which may serve as incentives for export-oriented firms. This type of subsidy is often a complementary instrument of "import protection" measures above.

iv. *Other Incentives:*

- *Assistance in Worker Training and Other Aspects of Labor:* The United Kingdom provides help in training and retraining workers, free of cost in its "assisted areas" and at low cost elsewhere.
- *Subsidies or other financial aid for housing workers.*
- *Subsidies to workers for moving expenses when enterprises are relocated.*
- *Incentives Related to R. & D.:* For example, Israel provides grants for up to 80 percent of R. & D. costs and Belgium provides interest-free loans up to the same percentage.
- *Transportation and Utility Subsidies:* These are among incentives used less frequently. United Kingdom does not subsidize freight rates, but it provides grants for up to 50 percent of the total cost of certain rail-freight facilities for firms relocating in "assisted" areas.
- *Industrial Estates:* These have been established in many countries as a means of providing facilities for manufacturing enterprises.
- *Free-Trade Zones:* These are available in most of the countries and are used extensively by a few countries to attract export industries.

2. *Qualification Requirements.*—The requirements are designed to ensure that incoming investments serve particular objectives of the Nation. Investors must meet these requirements to qualify for investment incentives or even to invest.

Briefly, for the developing countries the more important qualifying factors relate to the size and nature of the investment, the importance of the industry to the national economy in terms of develop-

ment, the amount of employment created, and either the foreign exchange earnings or foreign exchange savings. For the industrialized countries the qualifying factors for incentives primarily relate to the assistance provided backward or depressed areas and job creation and other factors.

The following sections summarize the qualifying requirements of the countries surveyed and compare them with the current requirements of Puerto Rico specified in the 1978 incentive legislation:

i. *Requirement Relating to Size.*—Some countries set lower limits on the size of investment that can qualify for incentives. Others graduate the incentives provided according to the size (value) of the investment, the number of jobs created, or some other similar measure. Portugal requires the creation of at least 250 jobs as one criterion for investments. Brazil considers the number of jobs to be created in its case-by-case approval of incentives. There is no clearly established provision on the size of investment requirement in Puerto Rico.

ii. *Requirement Relating to Specific Industries.*—Most of the developing countries limit their major benefits to certain priority industries that they are seeking to stimulate. In Puerto Rico, there have been official "priority industries," but they have shifted over time to reflect new policy perceptions. For example, in the mid-1960's the emphasis moved from generally labor-intensive toward more capital-intensive enterprises. This shift appeared to result from a Puerto Rican view that competitive export industries were necessary for long-term growth of the island's economy. In the new incentive legislation, extra benefits are provided for the apparel and leather industry to protect the industry from "low-priced foreign competition."

iii. *Requirement Regarding Location.*—Major factor for many of the incentive programs is that of geographical location in areas which are "backward," or "depressed." A similar measure has been implemented by Fomento for many years by classification of "development zones."

iv. *Requirement Related to Foreign Ownership.*—Many of the developing countries have major restrictions limiting the percentage of foreign ownership. In Mexico, to qualify for tax incentives, companies must limit foreign capital participation to 40 percent. In Peru, majority-owned firms must agree to reduce foreign participation within 15 years in a contract with the government in order to receive tax benefits. There are no such requirements in Puerto Rico.

v. *Requirement Regarding Employment of Local Personnel.*—Many developing countries impose restrictions on the employment of foreigners. Certain levels of nationals must be employed by com-

panies as general labor requirements in several of the Latin American countries (including Brazil and Peru). Ireland considers the amount and nature of training provided for local workers in deciding the degree of some incentives to be received. Additional incentives are given to firms in Puerto Rico which employ more workers. Moreover, Fomento (PREDA) provides greater incentives to local firms than outside firms. Local firms are given a subsidy of \$250 per worker per year, which is not available to nonlocal firms.

vi. *Requirement Relating to Investor Financing and Access to Local Capital.*—A number of countries, in granting incentives, require that a certain proportion of financing be provided by the investing company. For example, Argentina requires investors seeking incentives to provide 20 percent of fixed asset costs from their own capital. Many countries also make a distinction between foreign-owned and domestically owned firms in access to local credit facilities. In Brazil, funds from the National Bank of Economic Development, a source of low-cost financing, are closed to foreign-controlled firms (although available to foreign investors).

In Puerto Rico, laws provide no significant differential treatment between local and nonlocal financing.

vii. *Restriction on Repatriation of Earnings and Capital.*—Both Brazil and Peru require foreign investors to register with the Central Bank in order to ensure profit remittances and repatriation and place restrictions on the levels which can be repatriated. Taiwan, for example, considers its guarantees, concerning the right of foreign investors to profit remittance and capital repatriation, as investment incentives.

In Puerto Rico, a tollgate tax is imposed on repatriated earnings.

viii. *Performance Requirement Regarding Export (or Import Substitution) Performance:*

Argentina.—No overall requirements regarding exports, but exports are considered in approving incentives.

Brazil.—Level of exports and extent of import substitution are among the factors considered in the case-by-case approval process. For some industries, e.g., to obtain financial assistance for mineral development and the special export incentives (BE-FIEX program) export commitments are required.

Ireland.—Basic incentive (long-term tax holiday) is conditioned upon exporting. Since all export profits are tax free, specific performance requirements are not used. "Norms" regarding exports are used, however, in approving some types of cash grants.

Mexico.—Several incentives conditions on level

of exports. Also, firms must provide proof that no contracts exist which limit exports.

Netherlands.—No export requirements.

Peru.—Export expansion and import substitution are considered in approving investments, but are not required for receiving incentives.

Taiwan.—Incentives in some cases are conditioned on export levels.

Puerto Rico.—No special incentives for import substitution. Exports represent one of the key criteria for approving an investment application.

ix. *Performance Requirements Related to Local Content and/or Value Added:*

Argentina.—Pressure to increase local content is applied mainly through import restrictions.

Brazil.—Specific requirements for auto manufacturing and less restriction on local content requirement for some other industries.

Ireland.—No requirements.

Mexico.—60 percent local content (including labor costs) required in order to receive several tax and tariff benefits.

Taiwan.—Local content requirements are published for a number of manufactured products, including TV receivers, telephone facilities, etc.

Puerto Rico.—There is no legal local content requirement on Fomento-assisted or promoted industries. There is little encouragement on the use of Puerto Rican products (inputs). There is a "5-percent production wages special deduction" which encourages the use of labor.

Conclusion

Fomento has increased its assistance to manufacturers in Puerto Rico substantially over the past three decades. Fomento programs are responsible for the development of the island's industrial sector and, more recently, the pharmaceutical and other highly technologically advanced, and higher profit industries.

However, there is a need to promote an industrial mix to strengthen the long-term economic base of Puerto Rico. The island economy, particularly the manufacturing sector, has been increasingly dependent on offisland investments, imported inputs, marketing and distribution knowledges of U.S. parent corporations, and U.S. and foreign imports of consumer goods. In part this reflects the low level of internal savings, necessitating the tapping of external savings to meet industrialization objectives.

Support for increased local investment in locally owned and operated businesses has not been fully developed. Programs which have a direct impact on the growth and development of the local private sector are common among reviewed countries. Such programs include the incentives which:

- increase local participation and ownership.
- promote the use of local inputs (improve inter-industry linkage).
- encourage industries to increase value added locally, including the increasing use of labor.
- encourage the production of economically feasible commodities for local markets.
- promote the marketing and distribution techniques to assist local industries.

The 1978 industrial incentive law has taken a first step forward by the inclusion of provisions to encourage the use of local labor (production wages incentives), and the reinvestment of profits earned by U.S. corporations (tollgate credit incentives in combination with the revisions of section 931 embodied in section 936). However, increased public support and financial incentives focusing on the development and employment of local resources are needed to help Puerto Rico develop an economy capable of sustaining the island's long-term economic objectives.

Appendix A—Long-term Tax Policy Considerations

INTRODUCTION

The status of tax-exempt industries whose exemption has expired is a serious concern for the firms involved and for Puerto Rican authorities. The conversion system adopted in the amended IIA (June 1978) represents a method of bringing the existing exempted firms gradually toward full taxation (see chapter 6 of the Industrial Sector Study). Under the present structure a company at the end of its exemption period has tended to close shop or shift to a new product line in order to obtain a new exemption. As a result, the Commonwealth is unable to expand its corporate tax base in a way that is consistent with the potential under the existing industrial structure.

Addressing this problem implies consideration at some point of a major revision in the corporate tax laws as they exist. The option presented here is only along general and illustrative lines. Development of the extensive detail required for a corporate tax law revision is beyond the scope of this sectoral analysis. However, the importance of the industrial sector's contribution to gross domestic product and gross domestic income implies that any tax reform must deal with the sector's problems. The study includes the section incorporated in this annex to deal with some of the considerations in applying a tax on corporate earnings (gross profits). The use of a 20-percent tax rate is simply for illustrative purposes and does not constitute a recommendation. The objective is to evaluate the revenue implications constrained by the need to retain investment. Obviously, the application of a tax and the rate structure should be closely analyzed before any policy decisions can be made. The static nature of the analysis alone should be taken as a cautionary sign, but the present analysis does point to important factors that must be considered by any Administration.

Current-Profits Tax

The apparent major objections to Puerto Rico's

current industrial incentives program can either be significantly reduced or eliminated. The attractiveness of Puerto Rico as a long-term industrial location can be enhanced by eliminating the company desire to obtain continued exemption through shifts in product lines and introducing a current flat rate (20 percent) tax on corporate profits. In addition, the Commonwealth might bring its property tax assessment data up to current-year standards, with the view to enact a current property tax once the assessment catch-up is made. Similarly, a current system of municipal charges could be considered.

The following sections present the argument in support of a current-profits tax:

Revenue Yield.—Perhaps the most important consideration respecting the Puerto Rican tax exemption program is need for the Commonwealth to generate increased public revenues on a continuing basis after the tax exemption has expired. The change for Puerto Rico from a labor-intensive to a capital-intensive industrial structure, coupled with some possible reduction of the cost advantage on the island, has been accompanied by a rapid increase in the growth of the Commonwealth's public sector. Between 1965 and 1969, the Commonwealth government's share of Puerto Rico's GNP rose from 13.9 to 15.4 percent. By 1973, due to expanded social needs and the government's role as a possible "last resort" employer, the government's share increased to 21.4 percent. These structural factors combined with the national recession of 1974 created a substantial Commonwealth fiscal imbalance requiring difficult steps to increase taxes and/or limit budgetary expenditures.

During the 4-year period ending in 1976, the Commonwealth's public debt more than doubled—from \$2.5 billion to \$5.9 billion. The higher costs of servicing debt, the increasing social needs expenditures, and the increased administrative costs are factors that will continue to put fiscal pressure on the Commonwealth.

In order to finance its spending, the government must either borrow externally or increase its taxes.

Extended and large borrowing by the Commonwealth is probably impractical over a long period of time. However, better planned borrowing to meet needs must be an integral part of government policy. This implies that taxation must be used, leading to two essential considerations: either increase tax rates on the existing tax base, or gradually broaden the existing tax base. The first of these options, higher taxes on the existing tax base, runs the risk of exacerbating the structural inequities and inefficiencies in the existing narrow-based revenue system. The option of tax-base broadening, however, is available once one examines the tax exempt portion of the industrial sector. Fomento currently estimates that more than half of its total business net income tax base is currently exempt from the Commonwealth's profits tax.¹ Although that figure is necessarily an approximation, the fiscal concern is clear.

Table 1 presents the estimated revenue data re-

Table 1.—Estimated Revenue Yield from 20-Percent Tax on Net Earnings of Manufacturers by Major Industry Group

	Yield (thousands of dollars)	Percentage of distribution of revenue yields	Ratio of tax payment to gross domestic income (percentage)
Food	23,447	8.5	7.7
Tobacco	5,141	1.9	9.5
Textiles	2,357	.9	6.0
Apparel	13,432	4.8	5.5
Furniture	395	.1	1.6
Paper	948	.3	6.5
Printing	1,859	.7	4.6
Chemicals	137,835	49.8	17.3
Petroleum	6,358	2.3	7.1
Rubber	3,058	1.1	7.6
Leather	1,637	.6	5.0
Stone-clay-glass	2,536	.9	3.3
Primary metals	275	(1)	1.8
Fabricated metals	6,803	2.5	9.7
Machinery, except electrical	10,754	3.9	13.4
Electrical machinery	39,760	14.4	13.8
Transportation	236	(1)	4.3
Instruments	16,468	5.9	11.8
Miscellaneous	3,689	1.3	8.0
Total	276,988	100.0	11.5

¹ Less than 0.01 percent.

Note: Details may not add to totals due to rounding.

Source: Computation based on unpublished income and product account data supplied by the Puerto Rico Planning Board.

lated to a 20-percent corporate profits tax based on the Puerto Rican Planning Board's estimates of industry net earnings (profits). Columns 1 and 2 show the dollar amounts and percentage distribution of the initial tax burden and, of course, reflect the relative size of each industry group's share of profits earned in the island's manufacturing sector.

In the last two columns of the table, a ratio of the total tax payment to net domestic income originat-

ing (a national account concept) is presented. Such a ratio is generally considered to be an acceptable measure of interindustry structural tax equity.² This follows since the net domestic income in the denominator measures at the same time the firm's total contribution to the economy and its total business costs; thus, the tax to net domestic income ratio provides a measure of the percentage of tax costs to the firm's total (private) costs.

As the table indicates, the gross revenue yield from enacting a current-profits tax (based on 1976 data) is approximately \$276 million.³ However, assuming that all manufacturing firms which are non-exempt (and currently paying corporate net income taxes at an effective rate of 35-40 percent) are also taxed at 20 percent, then the revenue yield from Puerto Rican manufacturing would have been \$216.8 million.⁴

Once a 20-percent current profits tax on manufacturing is adopted, consideration might be given to taxing all nonmanufacturing operations at a lower tax rate in order to more readily achieve the public finance goal of horizontal equity in general business taxation; i.e., initially treating all businesses (manufacturing and nonmanufacturing alike) equally.

² Robert D. Ebel, *The Michigan Business Activities Tax* (East Lansing: Michigan State University, 1972).

³ The 1976 gross corporate net income tax yield was computed by applying a 35-percent effective tax rate by industry group to the net earnings (profits) data provided by the Planning Board. The following measurement caveats should be considered in using the estimate:

a. The 35-percent rate is the low estimate. The U.S. Treasury (the Possessions Corporation System of Taxation, June 1978) uses 40 percent. Thus, the 35-percent figure tends to underestimate current gross yields.

b. Profits (net earnings) data for Puerto Rico manufacturers tends to be overestimated due to two features associated with possessions corporations; viz:

(1) Because of interfirm transfer pricing techniques, the parent tends to allocate as much accounting profits as it reasonably can to its Puerto Rican-based subsidiary;

(2) The U.S. parents allocate income-producing intangibles to their Puerto Rican subsidiaries. At the relatively low (20 percent) rate being proposed here, however, the profits base is probably not greatly overestimated for tax computation purposes. That is, because the 20-percent rate tax is still well below the rate a parent would pay in Federal plus State/local taxes on the mainland, the incentive to allocate profits away from mainland operations to Puerto Rico operations is still strong.

c. Since a positive tax is being proposed, some firms operating on the margin or considering some marginal investment/expansion will probably not invest.

⁴ These revenue figures were computed as follows:

(1) According to the February 1978 Fomento report (p. 3), exempt profits were 71.2 percent of net manufacturing income in 1976. Like Fomento (p. 3) we use profits as a measure of the net income figures. Using Puerto Rico Planning Board estimates, 1976 net earnings (profits) are approximately \$1,385 million. Using the 71.2 percent ratio, this means that the nonexempt profits equal \$399 million, and 35 percent of that yields \$139.7 million in revenues from nonexempt firms in 1976. ($\$399 \times .35 = \140 million). However, if these nonexempts are taxed at 20 percent as proposed, their revenue contribution falls to \$79.8 million ($\$399 \text{ million} \times .20$). Thus, the net yield from all manufacturing by an across-the-board 20 percent corporate-profits tax is approximately \$216.8 million ($\$277 \text{ million} - \$140 \text{ million} + \79.8 million).

(2) According to the latest (June 1978) estimate by the Puerto Rican Treasury, total corporate net income tax yields were \$170.6 million. By levying a 20-percent effective rate rather than a 35-percent rate, the tax yields from the nonmanufacturing sector, of \$90.8 million ($\$170.6 \text{ million} - \$79.8 \text{ million} = \$90.8 \text{ million}$) would fall to \$51.8 million ($\$90.8 \times .57$). This generates a total business profits tax yield of \$268.6 million ($\$216.8 \text{ million} + \$51.8 \text{ million} = \$268.6 \text{ million}$).

¹ Economic Analysis, chapter I.

Under these circumstances the gross corporate net income (profits) tax yield from the nonmanufacturing sector would fall from \$90.8 million to \$51.8 million (1976), thereby generating a net yield from a 20-percent current tax on all business profits of \$268.6 million.

Location/Expansion Incentive.—The current profits tax proposed is consistent with estimates of the rate at which the Commonwealth Government should be able to generate new revenues while retaining a significant amount of business activity on the island. The proposal eliminates the criticism of a "tax shock"—finding profits taxable at effective rates of nearly 45 percent—which provides a strong disincentive for a firm whose exemption is expiring to remain on the island. In this regard, the amended Industrial Incentives Act gradually increases the nominal tax burden over the life of the exemption. The postexemption period and business behavior remain areas for further research.

The conclusion that a 20-percent corporate profits tax could be levied by Puerto Rico is supported by the data presented in table 2. In making the

Table 2.—Comparison of Mainland Profit Rates with Profit Rates in Puerto Rico Based on 1973 and 1975 Data

Industry group	Mainland rate		Puerto Rican Rate with 20% tax	
	1973	1975	1975	1973
Printing and publications	12.2	11.8	25.3	17.1
Instruments	15.2	13.7	19.0	18.5
Chemicals	14.2	15.2	27.3	14.1
Machinery	12.8	13.5	14.6	13.8
Electrical machinery	12.6	9.0	21.4	16.5
Tobacco	14.4	15.6	21.0	12.6
Apparel	11.0	—	19.0	16.5
Fabricated metals	13.6	13.1	17.5	12.3
Transportation equipment	12.9	NA	35.4	47.0
Lumber	20.3	NA	—	16.4
Textiles	8.9	4.4	15.4	5.1
Rubber and plastic	11.7	8.0	11.6	10.6
Furniture	13.0	NA	12.3	17.7
Paper and products	12.5	12.6	18.4	9.2
Leather products	9.3	NA	12.8	17.6
Food products	12.3	14.4	10.8	13.8
Petroleum	11.2	12.5	20.2	5.5
Primary metals	9.8	8.5	37.0	1.9
Stone-clay-glass	10.8	6.8	18.8	1.9

Source: Calculated from data in table 3, chapter IV.

comparisons, Puerto Rican profit rates are reduced by 20 percent and compared with mainland after-tax rates in 2 years, 1973 and 1975.⁵

Using this data, industries may be placed in groups in accordance with effects of taxes on com-

⁵ This method understates profit rates for firms making a profit since profits and losses of all firms in the industry are added to arrive at total profits. It is not known whether losses were proportionately higher or lower in Puerto Rico than on the mainland. 1973 and 1975 were chosen since they are the most recent years for which both Puerto Rican and mainland rates were available.

parative Puerto Rican and mainland rates of profit as follows:

Imposition of 20-Percent Effective Tax Rate

Group 1.—Puerto Rican Aftertax Profits Rates Higher Than Mainland Rates

Printing and publishing
Apparel
Leather products
Electrical machinery
Instruments
Chemicals
Textiles
Rubber and plastics
Paper and paper products

Group 2.—Average Puerto Rico Aftertax Profit Rates Higher Than Mainland Rates but Annual Rates Lower in Some Years

Machinery (P.R. annual rate lower in 1975)
Tobacco (P.R. annual rate lower in 1975)
Fabricated metals (P.R. annual rate lower in 1975)
Petroleum refining and products (P.R. annual rate lower in 1975)

Group 3.—Puerto Rican Aftertax Profit Rate Lower Than Mainland Rate in All Cases

Food Products (needs disaggregation; rate for some products certain to be higher)

Rates of profit in the stone-clay-glass and primary metals industries varied widely with aftertax comparisons with mainland rates as follows:

Primary Metals

1973 Puerto Rican aftertax profit rates are much higher than mainland profit rates; however, in 1975 Puerto Rican profit rates are much lower than the mainland profit rates. Average Puerto Rican profit rates are somewhat higher than mainland profit rates.

Stone-Clay-Glass

1973 Puerto Rican aftertax profit rates are higher than mainland rates. In 1975 the Puerto Rican profit rate at 20 percent is lower than the 1973 mainland rate but higher than the 1975 mainland rate. Average Puerto Rican aftertax profit rate is lower than 1973 mainland rate but higher than 1975 mainland rate.

The above analysis suggests that imposition of a 20-percent corporate income tax would leave Puerto Rican profit rates for almost all industries higher than profit rates for the same industries on the mainland. (This assumes that the relatively low 1975 Puerto Rican profit rates for chemicals, machinery, tobacco, fabricated metals, and paper products are not typical.) Profits in some food products and possibly the furniture industry might, however, be lower than mainland rates. Rates in stone-clay-glass and primary metals have been too erratic to suggest definitive conclusions.

The proposed tax plan is presented as a means of possibly maintaining industrial activity after the expiration of the tax-exempt period, while permitting the Puerto Rican authorities to expand the corporate tax base (through reversing the historical pat-

tern of plant closures and product-line shifts after expiration of the exemption). In addition, Puerto Rican policy authorities might wish to introduce other objectives into such a tax plan aside from revenue generation. For example, the policy authorities might wish to maintain and/or increase industrial employment through a scheme of employee tax credits, or they might wish to increase linkages within the Puerto Rican economy by offering a tax credit based on the incremental value of intraindustry sales, or they might wish to stimulate the location of corporate headquarters in Puerto Rico by offering a credit against the percentage of total corporate operations located in Puerto Rico. In any event, once the tax system were in place the Government could introduce other policy objectives as a trade-off against revenue generation.

Appendix B—Industry Profiles

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The Drug Industry In Puerto Rico

INDUSTRY DEFINITION

This profile describes the drug and pharmaceutical industry in Puerto Rico (subgroup 283) which includes establishments primarily engaged in manufacturing, fabricating, or processing medicinal chemicals and pharmaceutical products. Also included in this group are establishments primarily engaged in the grading, grinding, and milling of botanicals. This subgroup of the chemical and allied products major group is composed of three industries:

a. SIC-2831: Biological products (includes establishments primarily engaged in the production of bacterial and virus vaccine, toxoids, and analagous products (such as allergenic extracts, serums, plasmas, and other blood derivatives for human or veterinary use).

b. SIC-2833: Medicinal, chemical, and biological products (includes establishments primarily engaged in (1) manufacturing bulk organic and inorganic medicinal chemicals and their derivatives; and (2) processing (grading, grinding, and milling) bulk botanical drugs and herbs).

c. SIC-2834: Pharmaceutical preparations (includes establishments engaged in manufacturing, fabricating, or processing drugs in pharmaceutical preparations for human or veterinary use. The greater part of the products of these establishments is finished in the form intended for final consumption, such as tablets, capsules, vials, ointments, and suspensions).

The drug and pharmaceutical industry subgroup is part of the chemical and allied products major industry group (SIC-28) and is the most significant component of that major industry group in Puerto Rico. In 1976, subgroup 283 accounted for nearly 40 percent of the establishments, half of the labor force, and almost 95 percent of the net income generated by the chemical and allied products major group. Also, subgroup 283 accounted for 60 percent of sales in major group 28 in 1976.

Pharmaceutical preparations is the most significant component of the drug and pharmaceutical subgroup, representing 63 of the 73 establishments

in the 283 subgroups in Puerto Rico as of October 1976 and accounting for 94 percent of the value of shipments in the subgroup in 1967 and 73 percent of the value of shipments in 1972.

SIZE AND GROWTH

The U.S.-based multinational pharmaceutical industry began significant production operations in Puerto Rico in the late 1960's. Since that time, the drug industry in Puerto Rico increased its net income from \$50 million in 1967 to well over \$870 million in 1977. The contribution of the drug industry to manufacturing net income increased from 7.4 percent in 1967 to 30.6 percent in 1977, an increase of over fourfold in 11 years. Drug industry employment as a percentage of total manufacturing employment in Puerto Rico increased more than five times in 10 years, from less than 1 percent in 1967, to 5.1 percent in 1976. (See table 1.) The ratio of labor income to net income for the group (shown in table 4) is indicative of the trend of factor remuneration. In contrast to property income, the labor share is almost totally income to Puerto Rico.

Only twice (1971, 1972) in the last 10 years has the profits-to-sales ratio gone below 50 percent and then only by less than 1 percentage point. This compares very favorably with the profit-to-sales ratio in the United States, which, according to the Federal Trade Commission, averages at about 12 percent a year. This large profit margin, matched with the freedom from United States and Puerto Rican taxation, has made Puerto Rico a most conducive environment for U.S. pharmaceutical investment.

The industry is still expanding in Puerto Rico. This expansion is evidenced by dramatic growth in the value of shipments and by continuing investment. However, expansion in 1977 is likely to be inflated as companies rally to get under the full exemption umbrella before the new Puerto Rican Tax Incentive Law is enacted.

Puerto Rico benefits from the presence of the pharmaceutical industry by the industry's substan-

Table 1.—Selected Economic Data on the Puerto Rican Drug Industry, Selected Years

	1954	1958	1963	1967	1972	1973	1974	1975	1976	1977
Number of establishments	33	21	25	28	40	54	58	60	69	NA
Total number of employees	437	364	666	1,074	3,833	4,965	5,449	5,964	7,315	NA
Employment as a percentage of sector employment .....	.63	.51	.68	.88	2.56	3.25	3.64	4.37	5.50	NA
Sales	NA	8.0	27.6	87.0	386.4	518.5	645.5	880.7	1,172.2	1,461.8
Sales as a percentage of sector sales	NA	1.04	1.87	3.83	9.33	10.2	9.02	11.31	13.36	14.50
Net income	NA	NA	NA	49.2	215.9	296.2	366.6	493.8	653.0	870.4
Net income as a percentage of sector income	NA	NA	NA	7.37	16.83	19.20	19.62	25.44	25.63	30.6
Value added by mfg. (thousands of dollars)	3,164	2,677	20,189	60,424	327,012	NA	NA	NA	NA	NA
WPI—drugs and pharmaceuticals (United States)	106.8	106.9	101.2	100.0	103.0	104.3	112.7	126.6	134.6	142.9
WPI—commodities, annual average (United States)	—	—	—	100.0	119.1	134.7	160.1	174.9	183.0	198.2
WPI—industrial commodities (United States)	85.0	93.6	94.7	100.0	117.9	125.9	153.8	—	—	—

NA—not available.

Sources: U.S. Bureau of the Census, Economic Censuses of Outlying Areas, *Puerto Rico: Census of Manufacturers*, 1963, 1967, 1972. (Washington, D.C.: Government Printing Office.)

Puerto Rico, Department of Labor, *Census of Manufacturing Industries of Puerto Rico*, various years.

Puerto Rico, Planning Board, *Puerto Rico Income and Product Accounts* (unpublished data).

tial contributions to manufacturing net income (\$871 million or 30.6 percent in 1977) and to manufacturing value added (\$327 million or 17.1 percent in 1972). Under the tollgate tax, the pharmaceutical industry could possibly serve as a substantial contributor to government revenues. As a case in point, the Puerto Rican Treasury Department collected \$8.8 million in December 1977 from one company, G. D. Searle and Co., on repatriated dividends under section 936 of the Internal Revenue Code and expects (under an agreement negotiated with the Secretary of the Treasury) to collect an additional \$6 million in fiscal 1978.

The pharmaceutical producers benefit from production operations in Puerto Rico by manufacturing one, two, or three high-volume, high-profit products in a favorable tax environment that enables them to maximize the returns on the short life expectancy of a new drug,¹ and to substantially reduce their effective (U.S.) corporate tax rates. Most of the pharmaceutical companies with a Puerto Rican plant run their Caribbean operations from Puerto Rico.

Pharmaceutical operations in Puerto Rico are basically production units, the majority of which are located in the 15-year tax exemption zone. This zone is where 46 or 67 percent of October 1976's Fomento operating plants are located. Twenty-one of the 69 plants are located in the 10-year zone, with the remaining 2 plants located in the 25-year zone.

According to the Puerto Rican Department of Labor's 1975 *Census of Manufacturing Industries*, the drug industry is represented on the island by 60 establishments employing 5,964 persons. Fifty-eight

of the sixty establishments were promoted by Fomento. These 58 establishments operated 69 plants of which 63 or 91 percent were subsidiaries of U.S. firms and 3 each were locally or foreign owned.

The following are some of the major U.S. producers with operations in Puerto Rico:

	Number of operations
1. Eli Lilly & Co. (Indianapolis, Ind.)	5
2. Searle & Co., Inc. (Chicago, Ill.)	3
3. Warner-Lambert Pharmaceutical Co. (Morris Plains, N.J.)	3
4. Abbott Laboratories (Chicago, Ill.)	2
5. Bristol-Myers Co. (New York, N.Y.)	2
6. Pfizer, Inc. (New York, N.Y.)	2
7. The Upjohn Co. (Kalamazoo, Mich.)	2

THE STATE OF THE INDUSTRY IN PUERTO RICO (HISTORY AND HIGHLIGHTS)

The first significant tax-free U.S. pharmaceutical production began in Puerto Rico in 1960. Although the Industrial Incentive Act was passed in 1948, U.S. pharmaceutical companies were slow to take advantage of this opportunity.

Since 1967 virtually all of the U.S. major pharmaceutical producers have opened some production operations in Puerto Rico. Presently, pharmaceutical plants on the island number over 70, including multiple operations of over 20 companies.

The drug industry is substantially benefiting from tax exemptions available to manufacturers in Puerto Rico because pharmaceutical products are high valued relative to shipping weight and because product lines include many exclusive high-volume patented specialities.

For the drug industry, direct costs, especially production costs, constitute a relatively small share of

¹ For drugs introduced in 1975-76, the average effective patent life is 11-15 years. This is a function of the differential between the date that the patent is effective and the effective date of new drug approval by the Federal Food and Drug Administration, which may vary between 5 to 7 years. The trend since 1971, when the average effective patent life was 18 years, has been toward a speedup of the processing of patents and a slowdown of FDA new drug approvals.

total costs. Fixed or overhead costs are notably heavy. These characteristics and a high profit margin enable the industry to easily absorb the higher costs of water and electricity on Puerto Rico relative to the mainland and even to absorb the local taxation of revenues that will result from the adoption of the new Investment Incentives Act.

Pharmaceutical production in Puerto Rico is concentrated on the manufacture of a very small number of the highest volume, highest profit products produced in bulk form² for marketing principally on the mainland. These products are primarily antibiotics (accounting for 30.3 percent of Puerto Rican drug exports in 1976); pharmaceutical preparations primarily affecting neoplasma, endocrine system, and metabolic disease (14 percent of 1976 exports); pharmaceutical preparations acting primarily on the central nervous system and the sense organs (10 percent of 1976 exports; and cardiovasculars 9.2 percent of 1976 exports). These four groups of high volume, high profit products, in which Puerto Rican drug production is concentrated, are also the four groups in which the majority of U.S. pharmaceutical research and development expenditures are concentrated and the groups from which "successful" innovations emanate.

² Ethical pharmaceuticals (drugs promoted to medical professionals and usually available only by prescriptions) are produced in bulk form rather than as finished, packaged products because there is a very small export market for the latter. Various foreign laws and policies governing the inspection of production facilities, the registration of medicines, and the marketing of pharmaceuticals make it difficult or impossible to market a product within a country unless it goes through final stage production in that country. Bulk form production, for the mainland market is a result of the above market pressures and the inadequacy of the Puerto Rican packaging methods.

Table 2.—Effective Tax Rate for Selected U.S. Pharmaceutical Companies

Company	Year of Puerto Rico startup	Tax rate (percentage) ¹				
		1971	1972	1973	1974	1975
Abbott Laboratories	1968	30.4	34.4	33.0	31.0	31.0
Alcon ²	1974	47.3	45.8	44.8	44.4	43.4
Allergan	1971	36.6	28.3	26.6	15.0	15.1
American Hospital Supply	1971	48.9	46.2	45.4	44.5	41.7
Baxter Laboratories	1958	21.9	18.6	20.9	19.8	20.0
Bristol-Myers	1971	46.1	44.6	43.9	43.9	44.2
Johnson & Johnson	1973	45.1	46.1	46.7	42.4	40.7
Eli Lilly	1966	32.9	35.7	38.8	40.9	39.3
Merck	1972	47.2	44.2	42.0	41.3	39.0
Pfizer	1973	42.0	41.3	37.3	34.7	30.7
Richardson-Merrell	1974	48.9	48.7	49.1	48.7	46.3
A. H. Robins	1974	49.5	49.3	50.2	49.1	46.4
Schering	1972	45.7	44.3	39.8	36.5	34.0
G. D. Searle	1969	30.6	27.3	26.1	20.3	13.7
SmithKline	1970	34.6	33.5	32.2	32.1	32.5
Squibb	1970	36.9	33.6	32.0	31.5	30.6
Sterling	1950	46.2	46.7	46.5	46.6	44.7
Technicon	1970	loss	loss	.8	23.9	23.4
Upjohn	1973	46.7	47.2	44.8	43.4	42.2
Warner-Lambert	1960	47.3	46.0	44.3	43.9	43.4

¹ Data from company annual reports.

² Tax rate for Alcon fiscal year April 30, 1976, reported at 41.5 percent.

Source: Chase Manhattan Bank Health and Personal Care Division. *The U.S. Pharmaceutical Industry in Puerto Rico*, New York, 1976

Table 3.—Effect of Puerto Rico Tax Benefit, Selected U.S. Pharmaceutical Companies¹

[In millions of dollars]

Company	Puerto Rican tax benefit				
	1971	1972	1973	1974	1975
Abbott Laboratories	4.8	7.4	8.1	12.0	12.6
Alcon ²	—	—	—	—	0.5
Allergan	0.1	0.4	0.5	1.0	1.4
American Hospital Supply	0.1	0.6	1.1	1.7	3.2
Baxter Laboratories ³	4.9	5.1	Est. 6.4	Est. 8.0	Est. 9.0
Bristol-Myers	NA	NA	Est. 8.3	Est. 11.7	Est. 14.8
Johnson & Johnson	—	—	—	1.4	7.8
Eli Lilly	17.7	17.9	13.2	18.1	17.3
Merck	—	1.3	6.7	9.6	16.5
Pfizer ⁴	—	—	Est. 13.0	Est. 18.0	Est. 20.0
Richardson-Merrell	—	—	—	—	Est. 0.2
A. H. Robins	—	—	—	"not material"	—
Schering	—	1.1	7.8	17.0	29.1
G. D. Searle	5.4	15.0	19.0	27.0	33.0
SmithKline	10.0	11.0	13.0	16.0	20.0
Squibb	1.7	8.8	13.7	16.9	17.3
Sterling	—	—	—	Est. 1.4	2.9
Technicon ⁵	—	—	2.6	3.6	3.5
Upjohn	—	—	—	Est. 0.4	Est. 2.6
Warner-Lambert	—	—	Est. 6.0	Est. 7.0	Est. 8.0
Total	44.7	68.6	119.4	170.8	219.7

¹ From company annual reports.

² Alcon's tax benefits for fiscal year ending April 30, 1976, were \$0.4 million.

³ Baxter's tax benefits for Ireland and Puerto Rico with estimated breakdown (in millions of dollars):

	1973	1974	1975
Ireland	1.2	2.3	3.3
Puerto Rico	6.4	8.0	9.0
Total	7.6	10.3	12.3

⁴ Pfizer's total tax benefits for Ireland and Puerto Rico with estimated breakdown (in millions of dollars):

	1973	1974	1975
Ireland	5.3	10.2	11.1
Puerto Rico	13.0	18.0	20.0
Total	18.3	28.2	31.1

⁵ Technicon had additional tax benefits from Ireland of \$6.2 million in 1974, \$2.8 million in 1975.

Source: Chase Manhattan Bank Health and Personal Care Division. *The U.S. Pharmaceutical Industry in Puerto Rico*, New York, 1976.

It is expected, within the drug industry, that any suitable exclusive new product successfully introduced in the market by a U.S. pharmaceutical company will be taken to Puerto Rico for production.³ The principal reason for this expectation is the desire to maximize growth of stockholder's equity through the tax savings available from production in Puerto Rico. The impact on the effective tax rate of Puerto Rican operations can be seen in percentage terms in table 2 and in dollar terms in table 3. As a result, many of the drug companies are also operating production facilities to serve the rapidly growing medical devices and diagnostic products market.

³ Ireland has a tax incentive structure similar to the Puerto Rican. Recent pharmaceutical manufacturing growth has been designed, however, to meet the specific demands of the European Economic Community market.

Table 4.—Labor Income as a Percentage of Industry Group (SIC-283) Contribution to Net Income

Item	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Net income (millions of dollars)	49.2	58.8	72.9	92.4	122.2	215.9	296.2	366.6	493.8	653.0	870.4
Labor income (millions of dollars)	5.1	5.5	8.1	10.3	15.4	25.0	32.9	43.9	58.0	71.9	99.4
Labor income as a percentage of net income	10.3	9.4	11.1	11.1	12.6	11.6	11.1	12.0	11.7	11.0	11.4
Manufacturing Labor income as a percentage of manufacturing net income	61.8	62.7	63.4	62.5	61.3	58.5	54.5	49.5	49.7	43.1	40.8
Rank of SIC-283 out of 25 industry groups	25	25	25	25	25	25	25	25	25	25	25

Source: Puerto Rico Planning Board, *Income and Products Accounts* (unpublished worksheet data).

INDUSTRY LINKAGES TO THE LOCAL ECONOMY

Raw materials of the drug industry may be plant, animal, or other biological products; inorganic elements and compounds; or organic compounds. The presence in Puerto Rico of a petrochemical industry producing both organic and inorganic chemicals would seem to indicate a potential linkage of domestic manufacturing production to the pharmaceutical industry. Industry experts indicate that the existing petrochemical industry does not produce the highly refined chemically active ingredients capable of meeting Food and Drug Administration and industry quality control standards nor germinate the microorganisms necessary to service a drug industry producing such highly specialized pharmaceuticals as antibiotics. In addition, as many of the processes of manufacturing these pharmaceuticals are patented, the same corporation that produces the finished bulk drug is required to also manufacture the raw material, as in the case of antibiotics. The ease and inexpensiveness of transporting drugs to and from Puerto Rico also serves to deter the establishment of petrochemical linkages.

Another possible linkage to the Puerto Rican industrial sector for the drug industry would be in product packaging and printing. However, it has been indicated by industry experts that the packaging and container industry is not sophisticated enough nor produces the quality needed to service the drug industry. Consequently, most packaging is imported into Puerto Rico.

Information on sales of products produced on

Puerto Rico is limited to census of manufacturers years and is therefore not available any later than 1972. As indicated by table 5, very little of what is produced on Puerto Rico is sold for local consumption. In fact, products shipped and contract receipts in Puerto Rico as a percentage of value of shipments declined from 5.3 percent in 1967 to .9 percent in 1972, yet Puerto Rico's market share almost doubled from \$29.4 million to \$51.4 million. The overwhelming majority of this growth (about 75 percent) can be attributed to the increase of imports from \$24.8 million in 1967 to \$47.9 million in 1972.

The division of local sales of pharmaceuticals by class of customer, as shown in table 5, indicates that more than three-fourths of all sales for the years 1963, 1967, and 1972 were made to wholesalers and retailers, with no direct sales being made to domestic consumers or other manufacturing enterprises. However, this behavior is not unlike U.S. domestic drug sales patterns, where in 1975, 75 percent of ethical sales were to wholesalers and retailers. In the United States in 1975, less than 1.3 percent of sales were to manufacturers and packagers.

Puerto Rican market demand is small by industry standards but doubled between 1967 and 1972 and is estimated to have doubled since then. This means a marketplace of about \$100-\$120 million a year, and yet local sales seem to be declining over time. A growth in local sales rather than an increase in imports to meet existing demand would require, to some extent, a change in the corporate practices of selling to the Puerto Rican market through international distribution branches that sell U.S. manufactured goods.

Table 5.—Drug Industry Linkages for Establishments Having 10 Employees or More, Selected Years

[In thousands of dollars]

Year	Value of shipments	Products shipped and contract receipts in Puerto Rico to—					
		Total	Wholesalers	Retailers	Domestic consumers	Other mfg. enterprises	Others incl. govt.
1963	27,071	1,980	1,072	508	—	—	401
1967	86,040	4,594	2,250	1,335	—	—	1,009
1972	383,546	3,505	3,038	166	—	—	301

Source: U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures, 1963, 1967, 1972*. (Washington, D.C.: Government Printing Office.)

GOVERNMENT INCENTIVES AND ASSISTANCE PROGRAMS AVAILABLE AND USED BY THE DRUG INDUSTRY

Among the incentives and assistance programs available to manufacturers who establish facilities in Puerto Rico are tax exemption and the provision of industrial sites, training assistance and financing. In addition, there are special locational incentives available in the form of cash grants for establishing manufacturing facilities in areas of high unemployment in Puerto Rico. These incentives can be applied toward some of the following purposes: training of supervisory personnel, payment of rent for up to 30 months on PRIDCO buildings during startup period of operations, and full or partial payment of flight on machinery and equipment from point of origin to the plant in Puerto Rico.

In January of 1977, the Puerto Rican Economic Development Administration's Office of Economic Research completed a cost-benefit analysis of job creation and maintenance in the pharmaceutical industry.⁷ Direct and indirect costs for all Fomento manufacturing jobs⁸ as well as the cost share of the pharmaceutical industry were presented. It was found that the 665 Fomento-created pharmaceutical jobs in 1975 were created at a total cost of \$3.2 million, or about 17 percent of the total costs of creating all Fomento manufacturing jobs. This is an aggregate cost per pharmaceutical job created of \$4,795.

The total cost of maintaining the 5,352 Fomento jobs in the pharmaceutical industry in 1975 was \$5.49 million or about 13.4 percent of the total cost of maintaining Fomento's manufacturing jobs. The aggregate cost of maintaining a job in the pharmaceutical industry was \$1,027 compared to \$380 for maintenance of a Fomento manufacturing job.

Direct program expenditures for creating and maintaining a job in the pharmaceutical industry, as shown in table 13, accounted in 1975 for 9.3 percent of total direct costs related to all Fomento manufacturing jobs. Ninety-three percent, or \$3.59 million of these direct pharmaceutical job costs were costs related to the operation of the Economic Development Administration. Also of note among the direct costs displayed in table 13 are the monies expended for the drug industry by the Office of Tax

⁷ The following assumptions underlie the cost-benefit analysis: (1) An 8.2-percent increase in average wage per hour for the next 5 years after creation of the job; (2) an 8-percent discount factor based on an 8-percent maturity interest rate of Puerto Rico Government bonuses; (3) employees' compensation as 52 percent of net income; (4) multiplier effect of manufacturing net income is 2.2; and (5) number of hours worked during the year is 2,080.

⁸ A Fomento job is any manufacturing job that exists in an establishment that has been granted tax exemption under the Investment Incentives Act of 1963. In the report cited above, all pharmaceutical jobs were Fomento jobs.

Table 13.—Direct Costs of Programs Related to the Creation and Maintenance of Fomento Jobs in the Pharmaceutical Industry, 1975

[In millions of dollars]

Concept	Total Fomento	Cost share of the pharmaceutical industry ¹
1. Operating costs of economic development administration:		
a. Created job	9.94	2.51
b. Maintained job	4.26	1.08
2. Imputed interest of PRIDCO:		
a. Created job	0.33	0.01
b. Maintained job	9.16	0.03
3. Imputed interest of G.D.B.:		
a. Created job	0.06	—
b. Maintained job	1.77	—
4. Special incentives:		
a. Created job	7.55	—
b. Maintained job	4.05	0.003
5. Office of tax exemption:		
a. Created job	0.56	*0.14
b. Maintained job	—	—
6. Expenditures on trade and industry program of area vocational and technical education:		
a. Created job	—	—
b. Maintained job	0.99	0.05
7. Tax exemption enforcement office of Treasury Department:		
a. Created job	—	(*)
b. Maintained job	0.20	0.05
8. Appropriation under Act No. 82 of 1967 for power to industry:		
a. Created job	—	—
b. Maintained job	2.60	—
Total direct costs	41.47	3.87
Created job	18.44	2.66
Maintained job	23.03	1.21

¹ Share of sectorial costs of total cost was determined according to the findings of the study "Cost Estimates of a Fomento Created Job and Maintained Job"—1975.

² Cost of Office of Tax Exemption is entirely allocated under creation of jobs.

³ Tax Exemption Enforcement Office cost is allocated under maintenance of jobs.

Source: Puerto Rico Economic Development Administration, Office of Economic Research, *Costs and Benefits Analysis of Job Creation and Maintenance in the Pharmaceutical Industry*, San Juan, January 1977.

Exemption and the Tax Exemption Enforcement Office.

Indirect program and incentive costs attributed to the pharmaceutical industry are displayed in table 14. Indirect costs account for 55 percent of total expenditures for creating and maintaining a pharmaceutical job. The pharmaceutical industry's share of indirect costs, \$4.81 million, accounts for 25 percent of total indirect costs and is largest in expenditures attributed to the Department of Transportation and Public Works (\$1.16 million) and to the Department of Labor (\$1.09 million). Also of note is the pharmaceutical industry share of imputed interest attributed to the Water Resources Authority (\$.91 million) and the Highway Authority (\$.64 million).

Table 14.—Indirect Costs Attributed to the Pharmaceutical Industry, 1975

[In millions of dollars]

	Total ¹ manufactur- ing industry	Pharma- ceutical industry share
I. Imputed interest attributed to:		
a. Ports Authority	1.34	0.34
b. Communications Authority .....	.14	.04
c. Water Resources Authority	3.58	.91
d. Highway Authority	2.53	.64
e. Aqueduct and Sewer Authority .....	.59	.15
Subtotal	8.18	2.08
II. Expenditures attributed to:		
a. Department of Transportation and Public Works	4.58	1.16
b. Overhead Commonwealth Government .....	.68	.17
c. Department of Labor	4.30	1.09
d. Law Enforcement	1.22	.31
Subtotal	10.78	2.73
Total	18.96	4.81

¹ Cost estimates of a Fomento created job and maintained job.

Source: Puerto Rico Economic Development Administration, Office of Economic Research, *Costs and Benefits of Job Creation and Maintenance in the Pharmaceutical Industry*. San Juan, January 1977, p. 10.

THE IMPACT OF REGULATORY PROGRAMS

The drug industry, operating either in the United States or in Puerto Rico, faces the same stringent U.S. Government regulations regarding product safety and efficacy and marketing. The Food and Drug Administration (FDA) of the Department of Health, Education, and Welfare has primary responsibility for monitoring industry compliance with drug laws passed by Congress. The FDA serves the role of industry monitor for drug research, new drug testing, drug development, marketing, and consumption. In addition, the FDA inspects manufacturing plants, tests batches of selected drugs, and inspects samples of imported drugs to make sure that they meet product efficacy and safety standards and are not in violation of various provisions of the Food, Drug, and Cosmetic Act of 1962 and other U.S. laws. The Food and Drug Administration maintains a branch office in Puerto Rico.

Puerto Rico has regulatory programs similar and yet in some ways distinct from those faced by the drug industry in the States. In addition to the FDA's inspection, the Puerto Rican Department of Health requires and conducts an annual inspection of pharmaceutical manufacturers and distributors.

There are three regulatory programs in Puerto Rico which impact upon the drug industry. The first of these is a requirement that all pharmaceutical products sold in Puerto Rico be registered and approved by the Puerto Rican Health Department.

Any product which fails to meet this requirement cannot be sold on the island. Enforcement of this program is lax due to limited staffing.

The second program, also administered by the Health Department, requires that a registered pharmacist be present during manufacturing or distribution plant operation.

The third program, under the Department of Consumer Affairs, is a limited price control system⁹ which applies to 75 products sold in Puerto Rico. This program was instituted under the Colon regime and is the result of the invocation of a 1942 emergency act which provides the Governor with price control powers over consumer products. This program sets a maximum allowable price to the consumer and controls the percentage markup allowable by pharmacists and wholesalers for 75 specified products. The cumulative result of these controls is to set a maximum allowable price for the manufacturer. Industry spokesmen indicate that applications for price increases have been automatic under the present Administration and that the Department of Consumer Affairs is considering an experimental lifting of price controls for 6 months.

THE FUTURE

Pharmaceutical operations in Puerto Rico are not likely to grow in great number in the foreseeable future, although there is potential for expansion of existing plants. However, in Puerto Rico, the number of establishments manufacturing medical devices¹⁰ and diagnostic products¹¹ are expected to increase in the near future.

Many pharmaceutical companies have entered or are entering this rapidly growing market but whether they locate in Puerto Rico depends on a number of

⁹ There is a limited national price control system in the United States which applies to pharmaceutical products. In 1976, the Department of Health, Education, and Welfare instituted the Maximum Allowable Cost (MAC) program, a plan whereby the Federal Government recommends plans, such as Medicare and Medicaid. This program has a limited impact on the industry due to the relatively small volume of drugs sold under these programs.

¹⁰ As defined by the Pharmaceutical Manufacturers Association (PMA), medical devices are instruments, apparatus, implements, machines, contrivances, implants, and other similar or related articles, including their components, parts, and accessories intended for use in the cure, mitigation, treatment or prevention of disease or other physical condition. Also included are those devices intended to affect the structure or any function of the body which do not achieve any of the principally intended purposes through chemical action within or on the body and which are not metabolized in the achievement of any of those purposes. Reagents and related products are excluded. (PMA, *Factbook 1976*, p. 84.)

¹¹ As defined by the Pharmaceutical Manufacturers Association (PMA), diagnostic products are of two types. *In vivo* diagnostic agents are products used in the living body. *In vitro* diagnostic products are those reagents, instruments, and system intended for use in the diagnosis of disease or in the determination of the state of health in order to cure, mitigate, treat or prevent disease or its sequelae. Such products are intended for use in the collection, preparation, and examination of specimens taken from the human body. (PMA, *Factbook 1976*, p. 83.)

factors, including their treatment under the IIA. The U.S. Department of Commerce estimates that total industry shipments reached \$4.4 billion in 1975. The value of industry goods shipped increased 148 percent from 1967 to 1975, 11 percent alone between 1974 and 1975. The Bureau of Domestic Commerce forecasts significant gains in the medical service industry through the end of the decade, with shipments to reach nearly \$7 billion by 1980, an average annual gain of 9.6 percent from 1974. (MPA, *Factbook 1976*, p. 77.)

The Puerto Rican pharmaceutical industry can be characterized as a stable growth industry over the

past decade. It has been a leading contributor to employment and income. The industry has exhibited a relatively high amount of new investment, high capital intensity, and high labor productivity.

This industry exhibits high growth potential as indicated by net employment growth and high compensation growth, i.e., this group appears to have a continuing or consistent growth potential in the present period. As a high growth, high profit industry which displays such a high capital to labor ratio, this industry group has the potential to make increasingly significant contributions to Puerto Rico in tax revenues.

The Electrical and Electronic Machinery, Equipment, and Supplies Industry in Puerto Rico

INDUSTRY DEFINITION

The electrical and electronic machinery, equipment, and supplies major group includes establishments engaged in manufacturing machinery, apparatus, and supplies for the generation, storage, transmission, transformation, and utilization of electrical energy. The manufacture of household appliances is included in this group, but industrial machinery and equipment powered by built-in detachable electric motors are classified under major group 35. Establishments primarily engaged in manufacturing instruments for indicating, measuring, and recording electrical quantities are classified in industry 3825.

The electrical and electronics industry; major SIC group 36, is divided into the following eight subgroups:

- a. SIC-361: Electrical transmission and distribution equipment (includes regulators, transformers, switchboards and switchgears).
- b. SIC-362: Electrical industrial apparatus (includes generators, converters, resistors, capacitors, and condensers).
- c. SIC-363: Household appliances.
- d. SIC-364: Electrical wiring and lighting equipment.
- e. SIC-365: Radio and television receiving equipment, except communication types.
- f. SIC-366: Communication equipment (includes telephone and telegraph apparatus, and radio and television transmitting, signaling and detection equipment and apparatus).
- g. SIC-367: Electronic components and accessories (includes receiving type, transmitting, industrial, and special purpose electron tubes, and electronic capacitors, resistors and connectors).
- h. SIC-369: Miscellaneous electrical machinery, equipment, and supplies (includes batteries, X-ray apparatus, and electromedical and electrotherapeutic apparatus).

Industry analysts sometimes divide the electrical and electronics industry into four groups: consumer electronics; communications and industrial products; government products; and electronic components. The communications and industrial group and the government sector together are by far the largest markets for the products of the electrical and electronics industry. Of the total \$38.9 billion in U.S. electronic product sales in 1976, about 48.1 percent went into the communications and industrial market and 32 percent into the government market.

SIZE AND GROWTH

It has only been within the last 20 years that the electrical and electronic industry became a significant industry in Puerto Rico's manufacturing sector. In 1940, its contribution to net income was included along with that of primary and fabricated metals, machinery (except electrical), transportation equipment, and professional and scientific instruments which altogether provided less than 2 percent of the manufacturing sector contribution to net income. Its contribution to net income was not reported separately until 1967, at which time it was \$55.5 million, 8.3 percent of net income produced by the sector. It has increased steadily since that year. In absolute terms, it has increased more than seven times since 1967 to a value of over \$400 million in 1977, this was about 14 percent of the manufacturing sector contribution to net income. (See table 1.)

Employment in the industry has increased steadily since its 1958 level of 1,454. Employment in the Puerto Rican electrical and electronics industry reached its numerical height in 1973 at 14,817 persons, representing about 9.7 percent of sector employment. In 1976, employment in major group SIC-36 was 13,337 persons, representing about 9.3 percent of employment in manufacturing for that year. The ratio of labor income to net income for

Table 1.—Selected Economic Data on the Puerto Rican Electrical and Electronic Machinery Industry, Selected Years

	1954	1958	1963	1967	1972	1973	1974	1975	1976	1977
1. Number of establishments	31	49	73	98	105	122	137	134	131	NA
2. Total number of employees	1,454	3,049	5,573	8,720	14,671	14,817	12,548	9,919	13,337	NA
3. Employment as a percentage of sector employment	2.1	5.1	5.7	7.2	9.8	9.69	8.39	7.26	9.21	NA
4. Sales (millions of dollars)	NA	38.9	90.3	143.0	287.5	424.8	514.7	546.4	662.0	966.4
5. Sales as a percentage of sector sales	NA	5.02	6.1	6.3	6.94	8.35	7.2	7.01	7.55	9.6
6. Net income (millions of dollars)	NA	NA	NA	55.5	150.5	182.6	224.3	232.1	287.3	402.1
7. Net income as a percentage of sector net income	NA	NA	NA	8.31	11.73	11.84	12.0	11.96	12.06	14.13
8. Value added by manufacture (thousands of dollars)	4,744	21,837	50,856	86,250	169,572	NA	NA	NA	NA	NA

NA—not available.

Sources: U.S. Bureau of the Census, Economic Censuses of Outlying Areas, *Puerto Rico: Census of Manufactures*, 1963, 1967, and 1972. (Washington, D.C.: Government Printing Office.)
 Puerto Rico, Department of Labor, *Census of Manufacturing Industries of Puerto Rico*, various years.
 Puerto Rico, Planning Board, *Puerto Rico Income and Product Accounts* (unpublished data).

the group (shown in table 4) in indicative of the trend of factor remuneration. In contrast to property income, the labor share is almost totally income to Puerto Rico.

Total group sales increased from \$143.0 million in 1967 to \$966.4 million in 1977, a gain of 575 percent. As a percentage of total manufacturing sales this was an increase from 6.3 percent in 1967 to 9.6 percent in 1977. (See table 1.)

In October 1976, there were 131 electrical and electronic establishments in Puerto Rico. Of this total 125 establishments operating 148 plants had been promoted by Fomento. The 148 Fomento plants were distributed by subgroup, as follows:

Number SIC	Description	Number of Fomento plants
	Total	148
361	Electrical transmission and distribution equipment	31
362	Electrical industrial apparatus	12
363	Household appliances	6
364	Electric lighting and wiring equipment	23
365	Radio and television receiving sets, except communication types	7
366	Communication equipment	15
367	Electronic components and accessories	45
369	Miscellaneous electric machinery, equipment, and supplies	9

As of October 1976, the industry was predominantly mainland owned with 122 or 82 percent of the Fomento plants being subsidiaries of U.S. firms. Twenty-five of the Fomento plants (17 percent) were locally owned and three plants were foreign owned.

The 122 U.S. plants are owned by 58 firms, 10 of which are bluechip corporations. The General Electric Company operates 23 plants in Puerto Rico, and Westinghouse Electric operates 16.

In 1963, the electrical and electronics industry group was dominated by three subgroups: electrical transmission and distribution equipment (specifically, switchgear and switchboard apparatus [SIC-3613]); household appliances (specifically electrical housewares and fans [SIC-3634]); and electronic components. Together, in 1963, these three subgroups accounted for 72.4 percent of SIC-36 employment, 73.5 percent of the value of group shipments, and 70.2 percent of group value added.

By 1967, the electrical transmission and distribution equipment subgroup maintained its dominance. The electronic components subgroup substantially increased its contribution to group employment to 25.2 percent (from 20.0 percent in 1963), its contribution to group sales to 21.7 percent (from 15.8 percent in 1963), and its contribution to SIC-36 value added to 24.7 percent (from 18.5 percent in 1963). Between 1963 and 1967, the household appliances industry (subgroup 363) virtually collapsed with employment falling 97 percent from 1,420 employees to 45, and the value of subgroup shipments falling 97 percent from \$29.9 million to \$980,000.

In 1972 and 1976, employment in the electrical and electronics industry in Puerto Rico was dominated by the electrical transmission and distribution equipment and the electrical industrial apparatus subgroups. Together, these two subgroups employed 25.2 percent of the major group's workers in 1972 and 39.9 percent of the workers in 1976. In 1976, the electrical components subgroup was also a large employer in the SIC-36 group, employing 30.5 percent of the workers. See table 2 for subgroup employment statistics.

Subgroup contribution to SIC-36 group shipments in 1972, the latest year for which such information is available, were as follows: electrical components accounted for 22.1 percent of group shipments; electrical industrial apparatus accounted for 21.4 percent; and electrical transmission and distribution

Table 2.—Electrical and Electronics Industry Subgroup Employment

Industry group	1963		1967		1972		1976	
	Total	Percent- age of sector	Total	Percent- age of sector	Total	Percent- age of SIC-36	Total	Percent- age of SIC-36
Total electrical industry	5,573	5.7	8,720	7.2	14,671	9.8	13,337	—
SUBGROUPS	Total	Percent- age of SIC-36	Total	Percent- age of SIC-36	Total	Percent- age of SIC-36	Total	Percent- age of SIC-36
361—Electrical transmission and distribution equipment ¹	1,501	26.9	2,402	27.5	2,079	14.2	5,318	39.9
362—Electrical industrial apparatus	212	3.8	908	10.4	1,619	11.0		
363—Household appliances	1,420	25.5	45	0.5	NA	NA	85	0.6
364—Electrical lighting and wiring devices	581	10.4	648	7.4	1,179	8.0	1,070	8.0
365—Radio and television receiving equipment	70	1.3	837	9.6	NA	NA	2,059	15.4
366—Communication equipment	527	9.5	1,399	16.0	5,990	38.1		
367—Electrical components	1,117	20.0	2,200	25.2	2,793	19.0	4,068	30.5

¹ Electrical measuring instruments were dropped from subgroup 361 in 1972.

NA—not available.

Sources: U.S. Bureau of the Census, Economic Censuses of Outlying Areas, *Puerto Rico: Census of Manufactures*, 1963, 1967, 1972. (Washington, D.C.: Government Printing Office.)

Puerto Rico, Department of Labor, *Census of Manufacturing Industries of Puerto Rico*, various years.

equipment accounted for 18.6 percent of SIC-36's 1972 value of shipments. See table 3 for subgroup contributions to the value of shipments.

INDUSTRY TRENDS

Environmental Demands

The electrical and electronics products industry

is estimated as being an average consumer of energy when ranked among all industry groups in Puerto Rico. Its consumption of fuels and electricity as a percentage of the total cost of materials for the industry is almost equivalent to such costs for the manufacturing sector as a whole.

Between 1967 and 1972, the industry's fuels and electricity costs rose an estimated 110 percent from \$1.9 million to \$3.9 million. These costs, as a per-

Table 3.—Electrical and Electronics Industry Subgroup Shipments

[In millions of dollars]

Industry group	1963		1967		1972	
	Dollar value	Percentage of SIC-36	Dollar value	Percentage of SIC-36	Dollar value	Percentage of SIC-36
Total group	90.3		143.0		287.5	
SUBGROUPS						
361—Electrical transmission and distribution equipment ¹	22.1	24.5	39.6	27.7	53.5	18.6
362—Electrical industrial apparatus	2.9	3.2	18.7	13.1	61.6	21.4
363—Household Appliances	29.9	33.2	1.0	0.7	NA	NA
364—Electrical lighting and wiring devices	10.2	11.3	13.0	9.1	37.3	13.0
365—Radio and television receiving equipment	0.7	0.7	17.6	12.3	NA	NA
366—Communication equipment	8.2	9.1	16.0	11.2	27.8	9.7
367—Electrical components	14.3	15.8	31.1	21.7	63.6	22.1

¹ Electrical measuring instruments were dropped from subgroup 361 in 1972.

NA—not available.

Sources: U.S. Bureau of the Census, Economic Censuses of Outlying Areas, *Puerto Rico: Census of Manufactures*, 1963, 1967, 1972. (Washington, D.C.: Government Printing Office.)

Puerto Rico, Department of Labor, *Census of Manufacturing Industries of Puerto Rico*, various years.

Table 4.—Labor Income as a Percentage of Industry Group 36 Contribution to Net Income

Item	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Net income (millions of dollars)	55.5	70.5	84.9	97.3	106.1	150.5	182.6	224.3	232.1	287.3	402.1
Labor income (millions of dollars)	27.9	32.3	36.9	45.4	51.2	69.6	82.5	91.1	90.5	97.6	129.4
Labor income as percentage of net income	50.2	45.7	43.4	46.6	48.3	46.2	45.1	40.5	39.0	33.9	32.1
Manufacturing labor income as a percentage of manufacturing net income	61.8	62.7	63.9	62.5	61.3	58.5	54.5	49.5	49.7	43.1	40.8
Rank of SIC-36 out of 25 industry groups	20	21	21	21	20	23	20	20	23	22	23

Source: Puerto Rico Planning Board, *Income and Products Accounts* (unpublished worksheet data).

centage of total materials costs increased slightly from 3.2 percent in 1967 to 3.4 percent in 1972.

The manufacturing sectors' fuels and electricity costs rose from \$34.8 million to \$77.6 million, an increase of over 120 percent. These costs as a percentage of total materials costs increased from 2.8 percent in 1967 to 3.7 percent in 1972.

It would appear that fuels became favored over electricity as an energy source for SIC-36 industries during the time period from 1967 to 1972; the cost of fuels consumed as a percentage of total energy costs increased from 20.7 percent to 32.7 percent; and even though electricity costs increased 77 percent, such costs as a percentage of total energy costs decreased from 79.3 percent in 1967 to 67.3 percent in 1972.

Industry Linkages

The portion of industry group shipments which went to onisland customers during the 1963-72 period increased slightly from 8.1 percent of total shipments by value in 1963 to 10.4 percent in 1972; with total onisland sales increasing from \$7.3 million in 1963 to \$13.8 million in 1967 to \$29.5 million in 1972. Shipments to other Puerto Rican manufacturers increased in value from \$794,000 in 1963 (10.9 percent of total onisland shipments) to \$4.6 million in 1967 (33.2 percent of onisland shipments) to \$5.6 million in 1972 (19.0 percent of total shipments to Puerto Rican customers).

As can be seen in table 5, group onisland shipments to wholesalers and retailers increased, as a percentage of onisland sales, from 23.7 percent in 1963 (\$1.7 million) to 42.5 percent in 1972 (\$12.5 million). Electrical and electronics products shipments to domestic consumers increased as a percentage of Puerto Rican shipments from 0.9 percent in 1963 to 6.0 percent in 1972. Onisland shipments to others including government decreased markedly from 64.5 percent of the value of shipments in 1963 to 32.5 percent in 1972.

Data on onisland shipments by SIC-36 industry subgroups is not consistent for the years presented. Therefore, it is difficult to note linkage trends. Subgroup 364, electrical lighting and wiring equipment, shows a linkage trend similar to that exhibited by the industry as a whole, as well as by the manufacturing sector. Shipments to onisland customers as a percentage of all shipments increased between 1963 and 1967 as did shipments to other manufacturing firms. However, this trend reversed itself between 1967 and 1972 and interindustry linkages weakened.

The one subgroup which appears to have markedly improved its linkages to other manufacturing firms is the electronic components and accessories industry (SIC-367) which increased its interindustry sales from 23.5 percent of its Puerto Rican shipments in 1963 to 62.0 percent on onisland sales in 1967.

Table 5.—Electrical Machinery and Electronics Products Industry Onisland Linkages

(Values in thousands of dollars)

Products shipped and contract receipts in Puerto Rico to—													
Value of shipments		Total	Sales as a percentage of value of shipments	Wholesalers	As a percentage of Puerto Rican shipments	Retailers	As a percentage of Puerto Rican shipments	Domestic consumers	As a percentage of Puerto Rican shipments	Other manufacturing enterprises	As a percentage of Puerto Rican shipments	Others including government	As a percentage of Puerto Rican shipments
1963													
36	89,531	7,256	8.1	976	13.5	741	10.2	68	0.9	794	10.9	4,677	64.5
361	21,944	377	1.7	112	29.7	4	1.0	—	—	231	61.3	30	8.0
363	29,927	1,427	4.8	324	22.7	320	22.4	68	4.8	256	17.9	460	32.2
364	9,956	693	7.0	48	6.9	18	2.6	—	—	252	36.4	375	54.1
366	8,214	3,586	43.7	—	—	—	—	—	—	—	—	3,586	100.0
367	13,104	234	1.8	179	76.5	—	—	—	—	55	23.5	—	—
1967													
36	141,692	13,827	9.8	2,035	14.7	(D)	—	(D)	—	4,586	33.2	5,020	36.3
361	39,188	2,915	7.4	(D)	—	(D)	—	—	—	1,442	49.5	1,015	36.1
364	12,728	2,392	18.8	851	35.6	(D)	—	(D)	—	(D)	—	(D)	—
1972													
36	283,863	29,525	10.4	7,762	26.3	4,785	16.2	1,792	6.0	5,603	19.0	9,583	32.5
364	36,639	3,767	10.3	2,321	61.6	215	5.7	58	1.5	1,109	29.4	64	1.8
367	62,076	2,099	3.4	65	3.1	36	1.7	415	19.8	1,301	62.0	282	13.4

(D)—data not disclosed.

Source: U.S. Bureau of the Census, Economic Census of Outlying Areas, *Puerto Rico: Census of Manufactures, 1963, 1967, 1972*. (Washington, D.C.: Government Printing Office.)

Table 6.—Rates of Return for the Electrical Machinery and Electronics Industry

	1960	1963	1967	1968	1970	1972	1973	1974	1975	1977
Return on equity (Fomento firms filing income tax returns):										
Puerto Rico	37.2	26.3	20.1	24.3	29.4	16.8	20.7	22.8	20.6	—
United States	—	—	—	—	—	—	13.1	—	9.0	—
Return on sales (Fomento firms filing income tax returns)	37.6	27.9	26.3	29.2	26.0	31.6	25.7	29.4	33.9	—
Return on sales (all SIC-36 firms):										
Puerto Rico	—	—	22.3	27.1	27.3	24.4	25.0	27.6	26.8	29.4
United States	—	—	—	—	—	—	4.3	—	3.2	—
Return on sales (entire manufacturing sector)	—	—	11.7	11.7	11.0	12.5	13.7	13.3	12.6	17.2

Sources: Unpublished data provided by Fomento. U.S. rates calculated from U.S. Federal Trade Commission, *Quarterly Financial Report for Manufacturing, Mining and Trade Corporations*, (various years.) U.S. rates are for profits after taxes. Puerto Rican rates are for corporations receiving tax exemptions.

EARNINGS, COSTS, AND COMPETITIVE POSITION

The productivity and profitability of the electrical and electronics products industry as a whole has been improving over time and at points exceed that exhibited by firms in the U.S. SIC-36 industry group.

The ratio of return on equity of Fomento assisted firms filing income tax returns in the years in question decreased from 37.2 percent in 1960 to 20.6 percent in 1975. (Data on later years is not available.) However, in the 2 years for which comparable data is available, the Puerto Rican rate of return exceeded the U.S. rate. (See table 6.)

Profits on sales from Fomento firms filing income tax returns fell from 37.6 percent in 1960 to 33.9 percent in 1965. The ratio of profits to sales for the entire electrical and electronics industry (Fomento-promoted and nonpromoted), a ratio which is likely to be lower than for promoted plants filing returns, increased from a low of 22.3 percent in 1967 to 29.4 percent in 1977. In 1973, the Puerto Rican return on a sales rate of 25.0 percent was more than five times greater than the U.S. rate of 4.3 percent; and, in 1975, the Puerto Rican ratio of 26.8 percent was more than eight times greater than the U.S. rate of 3.2 percent. (See table 6.)

Table 7 presents rate of return data broken down by subgroup for EDA promoted firms that filed income tax returns in 1975.

Table 7.—SIC-36 Subgroup Rates of Return, 1975
(EDA Firms that Filed Income Tax Returns)

Subgroup	Percentage profit to equity	Percentage profit to sales
361—Electric transmission and distribution equipment	23.2	34.3
362—Electrical industrial apparatus	19.5	44.9
363—Household appliances	50.9	27.5
364—Electric lighting and wiring equipment	15.4	39.3
366—Communication equipment	38.7	38.5
367—Electronic components and accessories	18.2	32.3
369—Miscellaneous electrical machinery, equipment, and supplies	27.0	23.7

Source: Unpublished data provided by Fomento.

The steadily improving ratio of profits to sales for the group as a whole suggests increasing productivity in the industry.

Wage costs have declined as an element of total costs. Their share in total costs has changed as presented in table 8. A downward trend in wage rates as a portion of total costs is clearly evident.

Table 8.—Wages and Benefits as a Percentage of Total Costs

	1968	1970	1972	1974	1975	1976	1977
Percentage	29.7	32.0	27.4	24.4	22.6	21.1	18.9

Source: Puerto Rico Planning Board, *Income and Product Accounts* (unpublished worksheet data).

Output per worker in the electrical and electronics industry in 1967 was \$16,204 as compared with \$32,815 in 1974 and \$26,346 in 1976, in constant prices.¹

Average wages and benefits per employee in 1967 were \$3,199; by 1976, they had increased to an average of \$7,317. In 1972, the electrical and electronics industry's average wage of \$4,744 was 5.8 percent below the average manufacturing wage of \$5,017. This differential improved in 1976 as the average wage per SIC-36 worker of \$7,317 was 3 percent higher than the average manufacturing wage of \$7,101.

The average weekly earnings (not including benefits) of workers in the various electrical and electronics industry subgroups is presented in table 9. As indicated in this table, the electrical transmission and distribution equipment and the electrical industrial apparatus subgroups have historically paid the highest wages in the industry. Together these two subgroups accounted for 40 percent of the value of group shipments in 1972 and 25.2 percent of employees for that year. In 1976, they accounted for 40 percent of industry group employment.

However, over time the differential between the average weekly wage paid by lowest paying sub-

¹ The U.S. Department of Labor Wholesale Price Index for electrical machinery and equipment was used to deflate 1974 and 1976 sales prices to constant dollars.

**Table 9.—Average Weekly Earnings by Subgroup,
SIC-36, Selected Years**

(In dollars)

Subgroup	1967	1972	1974	1976
Electrical transmission and distribution equipment; electrical industrial apparatus	65.41	91.43	107.19	138.04
Household appliances	42.63	50.96	93.86	104.52
Electrical lighting and wiring equipment	64.74	87.05	102.75	121.44
Radio, phonograph, and communication equipment	65.97	92.80	95.26	103.98
Electronic components and accessories	60.49	78.14	83.22	105.19
Miscellaneous electrical machinery, equipment, and supplies	54.49	77.76	80.60	98.84

Sources: Puerto Rico, Department of Labor, *Census of Manufacturing Industries* (various years).

group and the highest paying subgroup has narrowed. In 1967, this differential was about 55 percent; by 1974, it had narrowed to 33 percent.

The appliances subgroup, which paid the lowest wage in 1967, is the industry that has most substantially improved the wage position of its employees by increasing their average weekly earnings 145 percent from \$65.41 in 1967 to \$138.04 in 1976. The electrical transmission and distribution equipment and electrical industrial apparatus subgroups increased the average weekly earnings of their workers by 110 percent between 1967 and 1976. The lowest wage rate increase was exhibited by the electronic components and accessories subgroup which increased the average weekly earnings of their employees by only 58 percent between 1967 and 1976.

In 1972, value added per employee in the industry as a whole was \$11,558. This compares with \$12,791 for the Puerto Rican manufacturing sector as a whole and with \$18,409 for the electrical and electronics industry group on the mainland. In real terms (1954 dollars) value added per employee decreased from about \$7,278 in 1963 to \$7,166 in 1972.

SIC-36 group productivity, as measured by output (sales) and value added per employee, is presented in table 10. Although both output and value added per employee in Puerto Rico has improved in

Table 10.—SIC-36 Productivity

Year	Output per employee		Value added per employee	
	Puerto Rico	United States	Puerto Rico	United States
1958	\$12,750	\$17,135	\$7,162	\$9,313
1963	16,204	19,738	9,127	11,252
1967	16,400	23,127	9,891	13,251
1972	19,596	32,144	11,558	18,409

Sources: U.S. Bureau of the Census, *Census of Manufactures-Industry Statistics* (various years) (Washington, D.C.: Government Printing Office.)

U.S. Bureau of the Census, Economic Census of Outlying Areas, *Puerto Rico: Census of Manufactures* (various years) (Washington, D.C.: Government Printing Office.)

absolute terms for the electrical and electronics industry as a whole, productivity in the industry has deteriorated relative to the SIC-36 industry in the United States. In 1958, output per Puerto Rican employee was about 74 percent of that per U.S. worker in this industry group. By 1972, output per employee had decreased to 61 percent of that of the U.S. worker. In 1958, value added per employee in Puerto Rico's SIC-36 industry was 77 percent of that of its U.S. counterpart. By 1972, value added per employee had declined to 63 percent of that of the U.S. SIC-36 worker.

Productivity data for three subgroups, namely: SIC-361 (electrical transmission and distribution equipment); SIC-362 (electrical industrial apparatus); and SIC-367 (electronic components and accessories), is presented in tables 11, 12, and 13, respectively. These three subgroups are the industry's leading employers and leading contributors to the group's value of shipments and value added. As is clear from tables 11 and 13, both the electrical industrial apparatus and the electronic components and accessories subgroups have steadily improved their productivity in Puerto Rico, as measured by output and value added per employee, and have substantially narrowed the productivity differential between the industry's performance in Puerto Rico relative to its performance in the United States.

Table 11.—SIC-361 Productivity

Year	Output per employee		Value added per employee	
	Puerto Rico	United States	Puerto Rico	United States
1958	\$9,747	\$16,952	\$6,334	\$9,950
1963	14,736	19,424	9,358	11,618
1967	16,506	23,121	10,542	14,279
1972 ¹	25,757	30,909	17,319	17,761

¹ Excludes electrical measuring.

Sources: U.S. Bureau of the Census, *Census of Manufactures-Industry Statistics* (various years) (Washington, D.C.: Government Printing Office.)

U.S. Bureau of the Census, Economic Census of Outlying Areas, *Puerto Rico: Census of Manufactures* (various years) (Washington, D.C.: Government Printing Office.)

Table 12.—SIC-362 Productivity

Year	Output per employee		Value added per employee	
	Puerto Rico	United States	Puerto Rico	United States
1958	(D)	\$15,604	(D)	\$9,268
1963	\$13,458	19,589	\$7,642	11,734
1967	20,585	22,434	15,196	13,545
1972	38,051	28,736	25,789	17,116

(D)—Date not available.

Sources: U.S. Bureau of the Census, *Census of Manufactures-Industry Statistics* (various years) (Washington, D.C.: Government Printing Office.)

U.S. Bureau of the Census, Economic Census of Outlying Areas, *Puerto Rico: Census of Manufactures* (various years) (Washington, D.C.: Government Printing Office.)

Table 13.—SIC-367 Productivity

Year	Output per employee		Value added per employee	
	Puerto Rico	United States	Puerto Rico	United States
1958	\$6,495	\$11,343	\$3,854	\$7,242
1963	12,789	13,552	8,432	8,694
1967	14,133	18,475	9,671	10,806
1972	22,767	26,268	14,992	15,791

Sources: U.S. Bureau of the Census, *Census of Manufactures-Industry Statistics* (various years) (Washington, D.C.: Government Printing Office.)

U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures* (various years) (Washington, D.C.: Government Printing Office.)

In 1958, output per Puerto Rican employee in the electrical transmission and distribution equipment industry was about 58 percent of that of its counterpart U.S. worker. By 1972, output per Puerto Rican worker in the SIC-361 subgroup was 83 percent of that by its U.S. counterpart in this industry group. The value added per employee measure of productivity improved more dramatically in this subgroup, with the percentage differential changing from 53 percent in 1958 to 95 percent in 1972. In 1958, output per Puerto Rican employee in the electronic components and accessories industry was 57 percent of that of the U.S. counterpart worker. By 1972, output per Puerto Rican worker in the SIC-367 subgroup was 87 percent of that of the U.S. worker in this industry group. The value added per employee measure of productivity improved more dramatically in this subgroup, with the percentage differential changing from 64 percent in 1958 to 97.5 percent in 1972.

As indicated in table 12, productivity per employee in the Puerto Rican electrical industrial apparatus industry exceeded that of the U.S. worker as of 1972 and by a substantial margin. The output per employee in Puerto Rico in 1972 of \$38,051 was 32.4 percent greater than the U.S. output of \$28,736. The Puerto Rican value added per employee in 1972 of \$25,789 was 50.7 percent greater than the U.S. value added of \$17,116.

The average hourly wages paid to workers in the electronics and electrical industry in Puerto Rico is lower (with the differential increasing over time)

Table 14.—SIC-36 Hourly Wage Rates

October of each year	Puerto Rico	United States	Differential
1976	\$3.05	\$5.04	\$1.99
1975	2.83	4.66	1.83
1974	2.55	4.14	1.59
1973	2.24	3.91	1.67
1972	2.16	3.72	1.56
1971	2.02	3.52	1.50

Sources: Puerto Rico Department of Labor: *Census of Manufacturing Industries of Puerto Rico*.

U.S. Department of Labor: *Employment and Earnings*.

than wages paid by this industry in the United States. (See table 14.)

In 1976, the electrical and electronics industry ranked third by volume of employment among 20 industry groups, and third among the 20 in terms of net employment contribution, adding over 4,600 new employees during the 1967-76 period, and fourth in terms of total industrial compensation. The industry indicates a relatively high labor productivity but with returns to labor a relatively low proportion of value added. The electrical and electronics industry in Puerto Rico is considered to be a high growth, capital-intensive industry. It ranked second in 1976 in terms of net earnings (profits) per worker.

Because of the industry's high profit margin relative to labor costs, it could relatively easily absorb the total cost increases that would occur in meeting the 1980 Federal minimum wage level of \$3.10 an hour.

DEMAND AND PROSPECTS FOR PROMOTION FOR LOCAL AND EXPORT MARKETS

The evidence suggests that the market for Puerto Rican production of electrical and electronic products is increasing. The increase in sales from \$143 million in 1967 to \$966.4 million in 1977 is indicative of this fact. Likewise is the increase in the Puerto Rican share of the local market which has increased from 13.2 percent in 1967 to 19.7 percent in 1973.

Both local and export demand for electrical and electronic products increased as indicated in table 15.

Between 1967 and 1972, it is estimated that exports grew 113 percent while imports increased only 32 percent. This trend reversed itself during the 1972-76 period when exports increased 36 percent in value and imports increased 58 percent. The four

Table 15.—Local and Export Markets for Electrical and Electronic Products (SIC-36)

[In millions of dollars]

	1967	1972	1976
Onisland sales from—			
Local production	13.84	29.53	NA
Imports from United States	90.85	120.00	190.10
Total local demand	104.69	149.53	NA
Exports to United States	86.75	184.56	250.39
Total demand	191.44	334.09	NA

Sources: U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures*, 1967 and 1972. (Washington, D.C.: Government Printing Office.)

U.S. Bureau of the Census, *U.S. Trade with Puerto Rico and U.S. Possessions*, FT 800/1967, 1972, and 1976 Annuals. (Washington, D.C.: Government Printing Office.)

commodities listed below in table 16 have consistently accounted for two-thirds of the value of imports of electrical and electronic products from the United States to Puerto Rico during the time period under consideration.

Table 16.—Electrical and Electronic Imports from the United States to Puerto Rico

Schedule B subgroup code	Commodity description	Value in millions of dollars		
		1967	1972	1976
722.1	Electrical power machinery and parts	10.7	11.4	21.4
722.2	Electric apparatus for making electric circuits, etc.	14.3	18.1	27.8
724.9	Telecommunications equipment, not elsewhere classified	16.6	20.4	35.4
725.0	Electric household equipment and appliances and parts	16.9	28.1	46.5
	Total imports from the United States	90.9	120.0	190.1

Source: U.S. Bureau of the Census, *U.S. Trade with Puerto Rico and U.S. Possessions*, FT 800, Washington, D. C.: Government Printing Office, 1967, 1972 and 1976 Annuals.

The five commodities listed below in table 17 have represented the majority of the value of exports to the United States from Puerto Rico.

Table 17.—Puerto Rican Electrical and Electronic Exports to the United States

Schedule P number	Commodity description	Value in millions of dollars		
		1967	1972	1976
72224	Electrical apparatus for making and protecting electrical circuits, n.e.c. and parts, n.e.c.	41.4	81.7	107.5
72410	Television broadcast receivers	5.3	14.3	8.6
72499	Other telecommunications equipment, including radar; and parts, n.e.c.	7.2	25.5	47.4
72600	Electrical apparatus for medical purposes; and radiological, including industrial, apparatus, and parts, n.e.c.	0.03	4.7	0.33
72999	Electrical machinery, apparatus, appliances, etc. and parts, n.e.c.	2.9	25.9	25.8
	Total exports to the United States	86.75	184.56	250.39

Source: U.S. Bureau of the Census, *U.S. Trade with Puerto Rico and U.S. Possessions*, FT 800/1967, 1972, and 1976 Annuals. (Washington, D.C.: Government Printing Office.)

The household appliances industry was a major subgroup in the electrical and electronics industry major group in 1963. The household appliances industry's shipments accounted for 33.4 percent of the value of the group's shipments in 1963. But only \$1.4 million or 4.8 percent of the \$29.9 million that this subgroup produced in that year was sold locally. Imports from the United States to Puerto Rico of household appliances amounted to \$13.3 million in 1963. As indicated earlier, household appliances account for a large proportion of the value of imports from the United States. (See table 16.)

In the period from 1963 to 1976, imports of household appliances from the United States have grown at a compounded annual rate of 9.3 percent. At the same time, Puerto Rican production of household appliances decreased 97 percent between 1963 and 1967, dropping from \$29.9 million to \$980,000. Local production data for years beyond 1967 is not available but production can be estimated to be very low as employment in this subgroup has averaged below 75 workers for the past 10 years.

Local consumption of household appliances grew at a compounded annual rate of 6.2 percent between 1971-76, while imports of household appliances from the United States grew at a compounded annual rate of 11 percent in this time period.

The Puerto Rican market for household appliances in 1972 is estimated as having been \$30.0 million, with imports supplying almost 100 percent of market demand. Given the economies of scales exhibited in the U.S. household appliances industry, it would appear (from the analysis presented below) that a number of firms in the asset ranges stated could profitably serve, and profitably compete with U.S. subsidiaries to serve, the Puerto Rican market.

As indicated in table 18, economies of scale in the U.S. household appliances industry exist for firms with total assets ranging from \$500,000 to \$10 million, \$25 million to \$50 million, and \$100 million to \$250 million, which display a net profit before tax ranging from 5.2 percent to 7.6 percent of net sales. There appears to be some diseconomies of scale for firms with assets ranging below \$500,000, between \$10 and \$25 million, between \$50 and \$100 million, and \$250 million and over, which dis-

Table 18.—Household Appliances Industry Economies of Scale

Item description for accounting period 7/73 through 6/74	Total for entire industry	Asset values (in thousands of dollars)										
		Order 100	100-250	250-500	500-1,000	1,000-5,000	5,000-10,000	10,000-25,000	25,000-50,000	50,000-100,000	100,000-250,000	250,000 and-over
Average receipts per unit millions of dollars	18.42	.17	.29	.86	1.58	4.84	1.92	29.4	72.1	102.6	221.8	1,004.0
Net profit before tax as a percentage of sales	3.8	(1)	3.5	4.6	5.9	5.2	6.1	3.6	7.3	.9	7.6	2.5

Note: Puerto Rico market share (imports and local sales)—1972 = \$30.0 million.

¹ Indicates returns with or without income, a loss before tax in an industry or asset size within an industry.

Source: *The Almanac of Business and Financial Ratios*, from which this data is derived, deals with all corporate returns.

play a net profit to sales ratio which is about one-fifth to one-half of that of the earlier range.

The market share of firms with assets ranging from \$500,000 to \$10 million is between 5.3 and 6.4 percent of the market share that existed in Puerto Rico in 1972. It would appear then that a number of firms in these asset ranges could profitably serve the Puerto Rican market.

SUMMARY AND CONCLUSIONS

Electrical and electronic equipment is classified by industry experts by the end product user. Three divisions are designated: consumer, industrial-communications, and government. These three main divisions are impacted quite differently by the economic environment.

The consumer electronic products market includes the following products: television and radio receiving sets, phonographs (high fidelity and stereophonic sound equipment), tape recorders, citizens band radios, electronic calculators, and digital watches. This division of the industry is characterized by low manufacturers' profits, which are a result of the highly competitive nature of the international market. U.S. producers are increasingly pressed by foreign competition and the need to develop new product lines and new strategic marketing plans to counter the market encroachment of such sophisticated competitors as Japan. The viability of the U.S. consumer electronics industry will be dependent upon the U.S. manufacturers' capability in participating in the development and marketing of such new product lines as electronic games and video players and recorders. Employment in the industry division has been declining in recent years as import competition has increased; U.S. firms establish offshore assembly activities (such as the production units operating in Puerto Rico); and automation in this assembly industry increases.

Representative industrial and commercial SIC-36 products include computers, testing and measuring instruments, industrial control and processing equipment, television and radio broadcasting equipment, and medical and therapeutic equipment.

Industry products produced for government use include vital parts of missiles, spacecraft, guidance and checkout systems, ground tracking and support systems, and detection and navigational equipment. As the U.S. Government is the single most important purchaser of electronic systems and equipment, the planned procurements of the governments are important indicators of the trend of the industry as a

whole. Federal research and development budget support of basic research and the budget allocations for defense, space, energy, and transportation serve as yardsticks of industry trends.

All three of these divisions are represented in Puerto Rico; however, production of electrical and electronic products on the island is dominated by the manufacture of products for industrial and communications use. Such U.S. manufacturing operations have found the island to have the high production skills necessary for such operations.

The Puerto Rican electrical and electronics products industry has become a high growth, mainstay, core industry of the Commonwealth's industrialization. The industry is characterized by a relatively high amount of new industry investment, a large net earnings per worker ratio (ranks second out of 19 industry groups), and a low proportion of labor costs in value added. SIC-36 is a major contributor to employment and income and can be characterized as a stable growth industry over the last decade.

Between 1971 and 1976, this major group's production (as measured by value of shipments) grew at a compounded annual rate of 12.8 percent and group labor income grew at a rate of 12.1 percent compounded annually. Employment is the most direct indicator of an industry's contribution to Puerto Rican economic development and the electrical and electronics industry group employment, as measured by volume, growth (percentage change), and compensation, is substantial. Of 19 industry groups, the electrical and electronics industry ranks as the third largest employer by volume, the fifth largest by employment growth (73.5 percent change between 1967-76), and fourth in total compensation growth (363.9 percent change between 1967-76).

The electrical machinery and electronics products industry is a significant contributor to the Puerto Rican work force. This industry group exhibits high growth potential as indicated by net employment growth and high compensation growth; i.e., this group appears to have a continuing or consistent growth potential in the present period.

The industry is characterized by high labor productivity or capital intensiveness and a high profit level compared to the Puerto Rican manufacturing sector in general and its mainland counterpart in particular. SIC-36 has been shown to be *not* susceptible to additional labor or energy costs. This group has exhibited a stable industrial employment growth pattern in the past and appears to have continuing potential in this regard.

The Measuring, Analyzing, and Controlling Instruments; Photographic, Medical, and Optical Goods; Watches and Clocks Industry in Puerto Rico

INDUSTRY DEFINITION

The measuring, analyzing, and controlling instruments; photographic, medical, and optical goods; watches and clocks industry, major group SIC-38, and herein to be known as the professional and scientific instruments industry, is a rather diverse collection of industry subgroups. This major group includes establishments engaged in manufacturing instruments (including professional and scientific) for measuring, testing, analyzing, and controlling, and their associated sensors and accessories; optical instruments and lenses; surveying and drafting instruments; surgical, medical, and dental instruments, equipment, and supplies; ophthalmic goods; photographic equipment and supplies; and watches and clocks. Major group 38 is divided into the following seven subgroups:

a. SIC-381: Engineering, laboratory, scientific and research instruments and associated equipment (including nautical, navigational, aeronautical, surveying and drafting equipment).

b. SIC-382: Measuring and controlling instruments (including automatic controls for regulating residential and commercial environments and appliances; industrial instruments for measurement, display, and control of process variables (such as flow, viscosity, combustion, humidity, pressure, etc.); registering fluid meters and counting devices; and instruments for measuring and testing of electricity and electrical signals).

c. SIC-383: Optical instruments and lenses (apparatus—except photographic—that projects or magnifies, such as binoculars, prisms, and lenses; optical sighting and fire control equipment; and related analytical instruments).

d. SIC-384: Surgical, medical, and dental instruments and supplies (including orthopedic and prosthetic appliances and supplies).

e. SIC-385: Ophthalmic goods (including eyeglasses, lenses, frames, and contact lenses).

f. SIC-386: Photographic equipment and supplies (including motion picture cameras and projection apparatus; photocopy and microfilm equipment; and sensitized film, paper, cloth, plates, and prepared photochemicals for use therein).

g. SIC-387: Watches, clocks, clockwork operated devices, and parts.

SIZE AND GROWTH

The professional and scientific instruments industry is one of the fastest growing industries in Puerto Rico, both in terms of production and employment, and exhibits a high growth potential for the future. The industry is characterized by a relatively high contribution to employment, relatively high employment growth, and relatively high labor productivity.

However, in the early years, this major group was of little importance to Puerto Rico's development program. In 1947, its contribution to net income was included along with that of primary metals, machinery, transportation equipment, and fabricated metal products which altogether provided less than 2 percent of the manufacturing sector's contribution to net income. The group's net income was first reported separately in 1967 at which time it was \$17 million or 2.6 percent of the manufacturing sector's net income. Major group 38's contribution to sector net income has grown in absolute terms since 1967, increasing 852 percent between 1967 and 1977 from a value of \$17 million to \$161.8 million. However,

Table 1.—Selected Economic Data on the Puerto Rican Instruments and Related Products (SIC-38) Industry, Selected Years

	1954	1958	1963	1967	1972	1974	1975	1976	1977
Number of establishments	12	15	13	29	44	70	81	79	NA
Total number of employees	1,056	1,148	1,801	3,548	6,066	9,534	10,829	10,611	NA
Employment as percentage of sector employment	1.5	1.6	1.8	2.9	4.1	6.4	7.9	7.3	NA
Sales (millions of dollars)	NA	7.4	21.5	47.6	130.5	155.6	180.0	291.7	348.0
Sales as a percentage of sector sales	NA	1.0	1.5	2.1	3.1	2.2	2.3	3.3	3.5
Net income (millions of dollars)	NA	NA	NA	17.0	57.4	72.9	91.8	139.6	161.8
Net income as a percentage of sector net income	NA	NA	NA	2.6	4.6	3.9	4.7	5.9	5.7
Value added by manufacture (thousands of dollars)	2,390	3,932	11,954	29,733	84,162	NA	NA	NA	NA

Sources: U.S. Bureau of the Census, Economic Censuses of Outlying Areas, *Puerto Rico: Census of Manufacturers*, 1963, 1967, 1972. (Washington, D.C.: Government Printing Office.)
 Puerto Rico, Department of Labor, *Census of Manufacturing Industries of Puerto Rico*, various years.
 Puerto Rico, Planning Board, *Puerto Rico Income and Product Accounts* (unpublished data).

in relative terms, the group's contribution to sector net income has shown some variability, reaching its height in 1976 at 5.9 percent. In 1977, the professional and scientific instruments industry ranked fifth among all industry groups based on its contribution to Puerto Rican net income. (See table 1.)

Employment in this industry group has increased rapidly in the last 14 years of its operation in Puerto Rico. Employment increased 489 percent between 1963 and 1976, increasing in absolute terms from 1,801 workers to 10,611. Employment during these

14 years increased at a compounded annual rate of more than 13 percent. Employment in major group 38 reached its height in 1975 in both absolute and relative terms, with 10,829 workers accounting for 7.9 percent of manufacturing sector employment. In 1976, the industry ranked fifth in employment by volume, third by net employment growth (with a 223.1 percent change between 1967 and 1976), and fifth in total industrial compensation. The ratio of labor income to net income for the group (shown in table 3) is indicative of the trend of factor re-

Table 2.—Size of Industry and Industry Subgroups, SIC-38

Item	1963	1967	1972	1975
1. Number of plants:				
Industry total	13	29	44	81
(382) Measuring and controlling devices	NA	NA	15	32
(3821) Mechanical measuring devices	4	10	14	28
(384) Medical instruments and Supplies	3	8	NA	—
2. Employment:				
Industry total	1,801	3,548	6,066	10,829
(382) Measuring and controlling devices	NA	NA	1,089	1,811
(3821) Mechanical measuring devices	138	636	NA	NA
(384) Medical instruments and Supplies	432	1,114	1,055	5,437
3. Value of shipments (thousands of dollars):				
Industry total	21,516	47,575	130,507	NA
(382) Measuring and controlling devices	NA	NA	28,329	NA
(3821) Mechanical measuring devices	(D)	6,834	NA	NA
(384) Medical instruments and Supplies	(D)	18,239	31,831	NA
4. Value added (thousands of dollars)				
Industry total	11,954	29,733	84,162	NA
(382) Measuring and controlling devices	NA	(D)	21,184	NA
(3821) Mechanical measuring devices	(D)	4,761	NA	NA
(384) Medical instruments and Supplies	(D)	11,054	17,643	NA

NA—not available.

(D)—withheld to avoid disclosing figures by individual companies.

Sources: U.S. Bureau of the Census, Economic Census of Outlying Areas, *Puerto Rico: Census of Manufactures*, 1963, 1967, and 1972. (Washington, D.C.: Government Printing Office.)
 Puerto Rico, Economic Development Administration, Office of Economic Research, Industry Profile Series, *The Measuring, Analyzing and Controlling Instruments; Photographic, Medical and Optical Goods; Watches and Clocks Industry in Puerto Rico*. (San Juan, March 1977.)

Table 3.—Labor Income as a Percent of Industry Group (SIC-38) Contribution to Net Income

Item	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Net income (millions of dollars)	17.0	23.4	31.2	36.8	46.0	57.4	69.4	72.9	91.8	139.6	161.8
Manufacturing labor income as a percentage of manufacturing net income	11.2	14.7	18.9	21.3	25.9	33.6	39.0	44.0	48.4	62.2	72.8
Labor income (millions of dollars)	65.7	62.9	60.7	58.0	55.5	58.6	56.1	60.3	58.1	44.5	45.0
Labor income as a percentage of net income	61.8	62.7	63.9	62.5	61.3	58.5	54.5	49.5	49.7	43.1	40.8
Rank of SIC-38 out of 25 industry groups	14	15	17	17	18	19	17	13	15	20	19

Sources: Puerto Rican Planning Board, *Income and Products Accounts* (unpublished worksheet data).

muneration. In contrast to property income, the labor share is almost totally income to Puerto Rico.

Major group 38 shipments by value increased over 600 percent between 1967 and 1977, growing from \$47.6 to \$348 million. This was a growth in the value of shipments at a compound rate of almost 20 percent per year. The value of shipments has grown more rapidly in the 1970's than in the late 1960's. Professional and scientific instruments sales as a percent of sector sales, although increasing over-time, is relatively small, growing from 2.1 percent in 1967 to 3.5 percent in 1977.

In October 1976, this industry was represented on the island by 79 establishments of which 75 had been promoted by Fomento. These 75 Fomento promoted establishments operate 80 plants. The 80 plants are distributed among the subgroups as shown below:

SIC number	Description	Number of Fomento plants
381	Engineering, laboratory, scientific, and research instruments, and associated equipment	1
382	Measuring and controlling instruments	32
383	Optical instruments and lenses	1
384	Surgical, medical, and dental instruments and supplies	28
385	Ophthalmic goods	10
386	Photographic equipment and supplies	1
387	Watches, clocks, clockwork operated devices, and parts	7

As of October 1976, the industry was predominantly mainland owned with 66 or 82.5 percent of the Fomento promoted plants being subsidiaries of U.S. firms. Among the leading U.S. firms with more than one plant in operation in Puerto Rico are: American Hospital Supply Co. (7); Baxter Labs, Inc. (6); Daystrom, Inc. (4); General Electric Co. (3); Westinghouse Electric Co. (3); and Bell and Howell Instruments (2). Seven of the professional and scientific instruments Fomento promoted plants or 8.75 percent are foreign based companies and the remaining seven or 8.75 percent of 80 plants are locally owned. The foreign based firms are concentrated in the manufacture of watches. One SIC-387 firm, Timex, Inc. (Bermuda), operates four plants which employ over 2,000 workers.

Since 1963, the professional and scientific instruments industry has been dominated by two subgroups; namely, measuring and controlling instruments (SIC-382); and surgical, medical, and dental instruments and supplies (SIC-384). These two groups have historically accounted for between one-half to three-fourths of the major group's establishments, employees, value of shipments, and value-added. (See table 2.) Although subgroup statistical

data is limited beyond 1972, data on employment indicates the dramatic growth in the medical instruments and supplies subgroup 384 in which employment between 1972 and 1975 grew at a compounded annual rate of over 30 percent. This phenomenal growth in medical instruments and supplies parallels the growth of the pharmaceutical industry in Puerto Rico. In the 1970's, the U.S. pharmaceutical industry has expanded corporate investment in medical devices and diagnostic products, notably in the Commonwealth.

As is evident from table 2, in 1963 and 1967 the leading subgroup in major group 38 was medical instruments and supplies. This dominance is confirmed by all four of the industry characteristics presented. In 1972, the two subgroups 382 and 384 reached parity. And while 382, mechanical measuring devices, had a 66 percent increase in employment, the 415 percent increase in employment in medical instruments and supplies (specifically in groups 3841 and 3842) dramatically reestablished the dominance of the latter group within the Puerto Rican professional and scientific instruments industry.

INDUSTRY LINKAGES AND ENVIRONMENTAL DEMANDS

The portion of professional and scientific instruments group shipments which went to onisland customers has traditionally been very small, averaging between 3 percent and 4 percent of the total value of shipments between 1963 and 1972. The value of onisland shipments has increased 636 percent in absolute terms during this time period, growing from \$674,000 in 1963 to \$4.96 million in 1972. However, in percentage terms, onisland sales as a percentage of the total value of group shipments increased very slightly from only 3.1 percent in 1963 to 3.8 percent in 1972. (See table 4.)

As is clear from table 4, in 1963 and 1967 major group 38 onisland shipments went predominantly to wholesalers with no shipments to other Puerto Rican manufacturers. This trend reversed itself completely in 1972 when 83.9 percent (\$4.2 million) of the group's \$4.96 million on onisland shipments went to other manufacturing enterprises. Eighty-two percent of this \$4.2 million in shipments to other manufacturing enterprises was shipments from the measuring and controlling instruments subgroup. This particular trend, i.e., an increasing percentage of the value of onisland shipments being distributed to other manufacturing enterprises, is very different from that experienced by the manufacturing sector as a whole in which interindustry purchases increased only slightly between 1963 and 1972.

Table 4.—Professional and Scientific Instruments Onisland Linkages

Products shipped and contract receipts in Puerto Rico to— (In thousands of dollars)									
Value of shipments	Total	Onisland sales as a percentage of value of shipments	As a percentage of Puerto Rican shipments		As a percentage of Puerto Rican shipments		Other manufacturing enterprises	As a percentage of Puerto Rican shipments	
			Wholesale sales	Re-tailers	Domes-tic con-sumers	Domestic con-sumers		Others including govern-ment	As a percent- age of Puerto Rican ship-ments
1963								54	8.0
38	21,516	3.1	620					(D)	
1967									
38	47,321	3.4	1,429						
1972									
38	129,637	3.8	126	33	15	15	4,164	625	12.6
382	28,329	13.8	5	5			3,415	477	12.2
384	24,474	.5	108	25					
386	9,122	.1	13						

Source: U.S. Bureau of the Census, Economic Census of Outlying Areas, *Puerto Rico: Census of Manufactures, 1963, 1967, 1972*. (Washington, D.C.: Government Printing Office.)

Table 5.—Rates of Return for the Professional and Scientific Instruments Industry

	1960	1963	1967	1968	1970	1972	1973	1974	1975	1977
Return on equity (Fomento firms filing income tax returns):										
Puerto Rico	59.9	40.1	17.6	38.1	28.6	22.7	23.7	24.9	23.1	—
United States	—	—	—	—	—	—	15.9	—	13.7	—
Return on sales (Fomento firms filing income tax returns):										
Puerto Rico	24.2	27.5	21.9	27.1	26.8	19.7	29.7	26.5	27.1	—
United States	—	—	20.3	20.3	22.1	23.2	24.5	25.7	26.8	26.4
Return on sales (entire mfg. sector):										
United States	—	—	11.7	11.7	11.0	12.5	8.5	13.3	7.8	17.2

Sources: Unpublished data from Fomento; U.S. Federal Trade Commission, *Quarterly Financial Report for Manufacturing, Mining and Trade Corporations, 1973 and 1975*. U.S. rates are for profits after taxes. Puerto Rican rates are for corporations receiving tax exemptions.

As can also be seen from table 4, shipments to others including government increased both in absolute and relative terms between 1963 and 1972, increasing in value from \$54,000 to \$625,000 and as a percentage of Puerto Rican shipments from 8.0 percent to 12.6 percent. The measuring and controlling instruments subgroup (of the subgroups for which linkage information is available) had the largest onisland sales in both absolute terms (\$3.9 million or \$4.96 million in total group onisland shipments) and relative terms (13.8 percent of the total value of shipments compared to 3.8 percent for major group 38 as a whole). Over 87 percent (or \$3.4 million) of subgroup 382's onisland sales went to other manufacturing enterprises with almost all of the remainder of shipments being sold to others including government. A very small proportion of 384 (medical instruments) shipments were sold locally (\$133,000 or 0.5 percent of the \$24.5 million in subgroup shipments in 1972) and these sales were made exclusively to wholesalers (\$108,000 or 81.2 percent) and retailers (\$25,000 or 18.8 percent). One hundred percent of subgroup 386 (photographic equipment and supplies) onisland shipments (\$13,000 of \$9.1 million in total value of shipments) was sold to wholesalers.

Environmental Demands

The professional and scientific instruments industry's consumption of fuels and electricity is a small percentage of the total cost of materials for the industry, relative to such costs for the manufacturing sector as a whole. Between 1967 and 1972, electricity costs rose 220 percent from \$232,000 to \$742,000, but as a percentage of total materials costs they rose slightly from 1.23 percent to 1.56 percent. The cost of fuels consumed is only available from 1972, at which time fuel costs amounted to \$78,000. In 1972, this major group's combined energy consumption costs accounted for 1.7 percent of total materials costs as compared to 3.7 percent for the manufacturing sector as a whole.

The professional and scientific instruments industry's biggest consumers of electricity and fuels, by value, are measuring and controlling instruments (382) and medical instruments (384). In 1972, these two subgroups accounted for 37.2 percent of the cost of fuels consumed in major group 38 and 51.6 percent of the electricity.

In 1972, fuel and electricity costs per professional and scientific instruments industry employee was only \$106, which placed this industry in 15th place when ranked with the other 20 groups. This indicates that an increase in employment in this industry group

would not significantly increase demand on Puerto Rican energy, one of the island's potentially scarce resources. When energy costs are presented as a proportion of value added, industry groups can be identified as to their relative sensitivity to increasing fuel prices. The resulting rank listing suggests that because fuel costs appear to be such a small proportion of major group 38 value added (0.9 percent) relative price increases *alone* should not be a major hindrance to industrial growth on the island.

EARNINGS, COST, AND COMPETITIVE POSITION (PRODUCTIVITY AND PROFITABILITY)

Although the productivity and profitability of the professional and scientific instruments industry as a whole has been somewhat variable, particularly in regard to returns on equity, it has generally been improving over time. The rate of return on equity of Fomento assisted firms filing income tax returns in the years in question decreased from 59.9 percent in 1960 to 23.1 percent in 1975. Profit on sales for such firms rose from 24.2 percent in 1960 to 29.7 percent in 1973 and then fell slightly to 27.1 percent in 1975. The rate of profits to sales for the entire professional and scientific instruments industry group (Fomento promoted and nonpromoted), a rate which is likely to be lower than for Fomento firms filing income tax returns, increased steadily from a low of 20.3 percent in 1967 to 26.4 percent in 1977. The rates of profits by years are shown in table 5, p. 161.

For firms which filed income tax returns in 1975, measuring and controlling instruments (382) showed a 17.9 percent return on equity and a 30.6 percent return on sales. The ratio of return for medical instruments subgroup (384) was 28.9 percent and 26.5 percent, respectively.

The steadily improving ratio of profits to sales suggests increasing productivity in the industry paralleling that of the entire manufacturing sector. A similar trend, as shown in table 6, in the relation of profits to total costs indicates that the gross profitability is increasing over time or that at least total costs were not increasing as fast as selling prices.

Table 6.—Profits as a Percent of Total Costs, SIC-38

Year	1968	1970	1972	1974	1975	1976	1977
Percentage	23.5	28.4	30.2	34.6	36.7	39.3	35.8

Source: Puerto Rico Planning Board, *Income and Product Accounts* (unpublished worksheet data).

Wage costs have declined as an element of total costs. (See table 7.) Their share in total costs has changed as follows:

Table 7.—Wages and Benefits as a Percent of Total Costs, SIC-38

Year	1968	1970	1972	1974	1975	1976	1977
Percentage	41.3	38.6	39.0	38.1	36.7	29.7	28.4

Source: Puerto Rico Planning Board, *Income and Product Accounts* (unpublished worksheet data).

A downward trend in wages as a portion of total costs is clearly evident, particularly after 1975, indicating increasing capital intensity.

As shown in table 8 below, the average hourly earnings paid by this industry in Puerto Rico are lower than those paid in the United States and the differential has been increasing over time. The Puerto Rican average wage does, however, exceed the U.S. minimum wage. Analysis indicates that this industry group would have little difficulty in meeting increasing labor costs as such costs account for a relatively small share of total costs.

Table 8.—Professional and Scientific Instruments Industry, Average Hourly Wage Rates

October of each year	Puerto Rico	United States	Differential
1968	\$1.73	\$3.03	\$1.30
1970	1.92	3.41	1.49
1972	2.18	3.73	1.55
1973	2.32	3.93	1.61
1974	2.57	4.30	1.73
1975	2.81	4.61	1.80
1976	3.05	4.95	1.90

Sources: Puerto Rican, Department of Labor, *Census of Manufacturing Industries of Puerto Rico*.

U.S. Department of Labor, *Employment and Earnings*.

Output per professional and scientific instruments employee in 1967 was \$13,409 as compared with \$10,983 in 1974 and \$15,653 in 1976, in constant prices.¹

Average wages and benefits per employee in 1967 were \$3,157; by 1976, they had increased to an average of \$5,859. In 1972, the major group 38 average wage of \$5,541 per employee was 10.4 percent higher than the average of \$5,017 for the manufacturing sector as a whole. By 1976, the average manufacturing wage per employee of \$7,101 was 21 percent greater than that of the SIC-38 average wage for that year.

The productivity of labor, or capital intensive-

¹ The U.S. Department of Labor Wholesale Price Index for durable manufactures was used to deflate 1974 and 1976 sales prices to constant dollars.

ness, of the professional and scientific instruments industry in Puerto Rico is indicated in table 9.

Table 9.—Professional and Scientific Instruments Productivity

Year	Output per employee		Value added per employee	
	Puerto Rico	United States	United States	Puerto Rico
1958	\$6,471	\$15,428	\$3,425	\$9,710
1963	11,947	20,026	6,637	13,067
1967	13,409	27,217	8,380	17,935
1972	21,515	34,260	13,874	23,345

Sources: U.S. Bureau of the Census, *Census of Manufactures—Industry Statistics* (various years). (Washington, D.C.: Government Printing Office.)

U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures* (various years). (Washington, D.C.: Government Printing Office.)

As can be seen from table 9, even though output (sales) and value added per Puerto Rican major group 38 employee increased at a compounded average annual rate that was greater than that of the counterpart mainland employee, Puerto Rican productivity in this industry group was still below U.S. levels in 1972 (for the indicators chosen). Output per employee in the Puerto Rican professional and scientific instruments industry increased at an average annual rate of over 8 percent compared to a 5 percent increase in the U.S. industry group over the 15-year period from 1958 to 1972. Value added per Puerto Rican employee increased from \$3,425 in 1958 to \$13,874, an average annual increase (compounded) of 10 percent as compared with a 6 percent increase in the United States. Yet, in 1972, the Puerto Rican output (sales) per employee of \$21,515 was only about 63 percent of the U.S. figure of \$34,260. Likewise, the Puerto Rican value added per employee of \$13,874 was only about 59 percent of the U.S. figure of \$23,345. (See table 9.)

Limited data is available on SEC-38 subgroup productivity. However, data for 1972 indicate that for two leading subgroups, namely 382 (measuring and controlling instruments) and 384 (medical instruments and supplies) output per Puerto Rican employee almost equaled that of the U.S. worker and in the case of group 382 value added per Puerto Rican employee was greater than that of the U.S. industry group worker. In 1972, output per employee in Puerto Rican subgroup 382 was \$26,014 compared with \$26,128 in the United States and value added was \$19,453 compared with \$17,824. In medical instruments and supplies in 1972 output per employee in Puerto Rico was \$30,172 compared to the U.S. worker's \$31,107 and value added was \$16,723 compared with \$20,058.

DEMAND AND PROSPECTS FOR PRODUCTION FOR LOCAL AND EXPORT MARKETS

The evidence suggests that the market for Puerto Rican production of professional and scientific instruments is increasing. The increase in sales from \$47.6 million in 1967 to \$348.0 in 1977 is indicative of this fact. Likewise, is the increase in the Puerto Rican share of the local market which has more than tripled from 2.65 percent in 1967 to 8.8 percent in 1972.

Both local and export demand for professional and scientific instruments increased as indicated in table 10.

Table 10.—Local and Export Markets for SIC-38 Products

[In millions of dollars]

	1967	1972	1976
Onisland sales from local production	0.67	4.96	NA
Imports	24.60	51.16	51.02
Total local demand	25.27	56.12	NA
Exports	41.85	48.98	100.08
Total demand	67.12	105.10	NA

Sources: U.S. Bureau of the Census, *Economic Censuses of Outlying Areas, Puerto Rico: Census of Manufactures, 1967 and 1972*. (Washington, D.C.: Government Printing Office.)

U.S. Bureau of the Census, *U.S. Trade with Puerto Rico and U.S. Possessions, FT 800 1967, 1972 and 1976 Annuals*. (Washington, D.C.: Government Printing Office.)

Between 1967 and 1972, exports grew at an average compounded annual rate of 2 percent while imports increased on the average of 12.5 percent per annum. This trend reversed itself during the 1972-76 period when exports increased at an average compounded annual rate of over 15 percent while imports declined slightly.

The three commodities listed below in table 11 have consistently accounted for between 50 percent and 70 percent of the value of imports of professional and scientific instruments from the United States to Puerto Rico during the time period under consideration. Notable is the almost 82 percent decrease in

Table 11.—Professional and Scientific Instruments Imports From the United States to Puerto Rico

Schedule B subgroup code	Commodity description	Value in millions of dollars		
		1967	1972	1976
8617	Medical, dental instruments, except electrical	2.89	5.51	12.63
8619	Measuring, control, etc., instruments	7.37	24.77	4.52
8641	Watches, watch cases, and case parts	2.29	5.44	12.54
	Total U.S. imports	24.60	51.16	51.02

Source: U.S. Bureau of the Census, *U.S. Trade with Puerto Rico and U.S. Possessions, FT 800, 1967, 1972, and 1976 Annuals*. (Washington, D.C.: Government Printing Office.)

the value of measuring and controlling instruments imports between 1972 and 1976, dropping in value from \$24.8 million to \$4.5 million.

The two commodities listed below in table 12 have represented almost all the products by value of major group 33's exports to the United States. Of note is the almost 8 percent per annum average growth rate of the value of watch exports to the United States, which as of 1976 represented more than half of the value of the \$100 million in total exports to the United States.

Table 12.—Puerto Rican Professional and Scientific Exports to the United States

Schedule P number	Commodity description	Value in millions of dollars		
		1967	1972	1976
86,100	Scientific, medical, optical, measuring, and controlling instruments and apparatus	26.37	13.26	45.77
86,400	Watches and clocks, including parts	14.78	35.34	51.91
	Total exports to U.S.	41.85	48.98	100.08

Source: U.S. Bureau of the Census, *U.S. Trade with Puerto Rico and U.S. Possessions, FT 800, 1967, 1972, and 1976 Annuals*. (Washington, D.C.: Government Printing Office.)

The market for photographic equipment and supplies in Puerto Rico has been growing over time and has been met almost entirely by imports from the United States. In 1972, photographic equipment and supplies imports from the United States were valued at almost \$9.6 million or 18.7 percent of the value of total U.S. SIC-38 imports. By 1976, the value of imports of these commodities from the United States increased to \$16.97 million, which represented 33.3 percent of the value of U.S. professional and scientific instruments shipments to Puerto Rico. The following analysis is designed to serve as an indication of the potential of serving the Puerto Rican market competitively and profitably through local production.

The Puerto Rican market for photographic equipment and supplies in 1972 is estimated as having been about \$10 million, with imports supplying almost 100 percent of market demand. Given the economies of the scale exhibited in the U.S. photographic equipment and supplies industry, it would appear, from the analysis presented below, that a number of firms in the asset ranges stated could serve profitably and compete profitably with U.S. subsidiaries to supply the Puerto Rican market.

As indicated in table 13, economies of scale in the U.S. photographic equipment and supply industry exist for firms with total assets ranging from \$250,000 to \$1 million and \$250 million and over, which display a net profit before tax ranging from

Table 13.—Photographic Equipment and Supply Industry Economies of Scale

[Asset values (in thousands of dollars)]

Item description for accounting period 7/73 through 6/74	Total	Under 100	100– 250	250– 500	500– 1,000	1,000– 5,000	5,000– 10,000	10,000– 25,000	25,000– 50,000	50,000– 100,000	100,000 250,000	250,000 and over
Average receipts per unit (millions of dollars)	9.2	.078	.19	.64	1.30	3.12	5.48	25.44	—	102.07	—	1,568.98
Net profit before tax as a percentage of sales	13.8	1.3	2.7	9.0	9.5	3.8	1.8	1.7	—	(¹)	—	15.7

¹ Indicates returns with or without income, a loss before tax in an industry or asset size within an industry.

Source: *The Almanac of Business and Financial Ratios*, from which this data is derived, deals with all corporate returns.

Note: Puerto Rican market share (imports and local sales)—1972 = \$10.0 million.

9.0 percent to 15.7 percent of net sales. There appear to be some diseconomies of scale for firms with assets ranging below \$250,000 and between \$1 million and \$25 million, which display a net profit-to-sales ratio which is about one-tenth to one-half that of the earlier range.

The market share of firms with assets ranging from \$250,000 to \$1 million is between 6.4 percent and 13 percent of the market share that existed in Puerto Rico in 1972. It would appear then that a number of firms in these asset ranges could serve the Puerto Rican market profitably through local production.

SUMMARY AND CONCLUSIONS

The Puerto Rican professional and scientific investments industry has become a high growth, mainstay, core industry of the Commonwealth's industrialization. The industry is characterized by a relatively high amount of new industry investments, a large net earnings (profits) per worker ratio (ranks

fifth out of 19 industry groups), and a low proportion of labor costs in value added.

Employment is probably the most direct indication of an industry's contribution to Puerto Rican economic development. SIC-38 is a major contributor to employment and income and can be characterized as a stable growth industry over the last decade. The professional and scientific instruments industry group employment, as measured by volume, growth (percentage change), and compensation, is substantial. Of 19 industry groups, the professional and scientific instruments industry ranks as the fifth largest employer by volume, the third largest by employment growth (223.1 percent change between 1967-76), fifth in total compensation and third in total compensation growth (549.7 percent change between 1967-76).

This industry exhibits high growth potential as indicated by net employment growth and high compensation growth; i.e., this group appears to have a continuing or consistent growth potential in the present period.

The Machinery, Except Electrical Industry in Puerto Rico

INDUSTRY DEFINITION

The industry group consists of establishments engaged in manufacturing machinery and equipment, other than electrical equipment and transportation equipment, which are classified under major groups 36 and 37, respectively. Machines powered by built-in or detachable motors ordinarily are included in this major group, with the exception of electrical household appliances (major group 36). Portable tools, both electric and pneumatic powered, are included in this major group, but hand tools are classified in major group 34.

The machinery, except electrical major group is composed of the following nine subgroups:

a. SIC-351: Engines and turbines (excluding aircraft, guided missile and space propulsion, and automotive (except diesel) engines).

b. SIC-352: Farm and garden machinery and equipment.

c. SIC-353: Construction, mining and materials handling machinery and equipment (includes oil-field machinery and equipment, elevators, moving stairways, conveyors, industrial cranes, and trucks).

d. SIC-354: Metalworking machinery and equipment.

e. SIC-355: Special industry machinery, except metalworking machinery (includes machinery for use by food products and beverage manufacturing industries, and by textile, woodworking, paper and printing, glass making, tobacco working, and shoe-making industries).

f. SIC-356: General industrial machinery and equipment (includes pumps, compressors, speed changers and drives, industrial process furnaces and ovens, and mechanical power transmission equipment).

g. SIC-357: Office, computing and accounting machines (includes typewriters, computers, calculators, and scales and balances).

h. SIC-358: Refrigeration and service industry machinery (includes commercial and industrial dry cleaning and laundry equipment and systems, and vending machines).

i. SIC-359: Miscellaneous machinery, except electrical.

SIZE AND GROWTH

The nonelectrical machinery industry was of little importance during the early years of Puerto Rico's development program. In 1947, its contribution to net income was included along with that of primary and fabricated metals, electrical machinery, transportation equipment, and professional and scientific instruments which altogether provided less than 2 percent of the manufacturing sector contribution to net income. Employment in the industry is reported as having been 703 in 1958 and the value of shipments in that year was stated as being about \$6.6 million or less than 1 percent of sector sales.

However, in the 1970's, specifically from 1973 to 1977, the nonelectrical machinery industry has emerged as a high growth industry in Puerto Rico in terms of employment and income generation. Between 1973 and 1976 this industry group was the leading group in net employment growth, with an addition of 3,000 workers (a 235 percent increase). This employment increase represents an average annual compounded growth rate of 35 percent. Between 1967 and 1977, SIC-35 ranked second of 19 industry groups in terms of total compensation growth (564.2 percent increase). In 1976, this industry group paid the fourth highest average hourly wage of the 20 industry groups and the tenth highest average annual salary per worker. Employment has increased from 703 in 1958 to 1,155 in 1967 to 1,438 in 1972 to 3,347 in 1974 and to 4,325 in 1976. (See table 1.) Employment growth in this industry was pushed by an increase of 2,931 workers in the general industrial machinery (356) and service industry machinery (358) subgroups. In 1976, these two subgroups accounted for over 80 percent of

Table 1.—Selected Economic Data on the Puerto Rican Nonelectric Machinery Industry, Selected Years¹

	1958	1963	1967	1972	1974	1975	1976	1977
Number of establishments:								
United States source	26	33	35	64	NA	NA	NA	NA
Puerto Rican source	NA	NA	37	38	51	57	53	NA
Total number of employees:								
United States source	703	952	1,006	2,229	NA	NA	NA	NA
Puerto Rican source	NA	NA	1,155	1,438	3,347	3,055	4,325	NA
Employment as a percentage of sector employment:								
United States source	0.99	0.97	0.83	1.49	NA	NA	NA	NA
Puerto Rican source	NA	NA	0.92	0.98	2.24	2.24	2.99	NA
Sales (millions of dollars):								
United States source	6.6	10.9	16.7	56.1	NA	NA	NA	NA
Puerto Rican source	NA	NA	23.6	82.0	145.1	187.1	233.4	360.3
Sales as a percentage of sector sales:								
United States source	0.85	0.74	0.73	1.35	NA	NA	NA	NA
Puerto Rican source	NA	NA	1.11	1.97	2.03	2.40	2.66	3.57
Net income (millions of dollars)	NA	NA	9.6	26.6	49.4	58.2	80.2	126.4
Net income as a percentage of sector net income	NA	NA	1.44	2.07	2.64	3.00	3.37	4.44
Value-added by manufacture (thousands of dollars)	4,153	7,651	12,207	37,628	NA	NA	NA	NA
Value-added as a percentage of sector value-added	1.42	1.23	1.22	1.96	NA	NA	NA	NA

¹ Due to statistical discrepancies in regard to employment and sales, two data sources are cited.

Sources: U.S. Bureau of the Census, Economic Censuses of Outlying Areas, *Puerto Rico: Census of Manufacturers*, 1963, 1967, 1972. (Washington, D.C.: Government Printing Office.)

Puerto Rico, Department of Labor, *Census of Manufacturing Industries of Puerto Rico*, various years.

Puerto Rico, Planning Board, *Puerto Rico Income and Product Accounts* (unpublished worksheet data).

major group 35 employment. The number of firms in these subgroups almost doubled from 11 to 21 during the 1973-76 period. While both the absolute and relative changes in this group appear striking, the statistics should be considered in light of the fact that in 1976, at the height of its employment level, the nonelectrical machinery industry represented only 3 percent of total industrial employment. The ratio of labor income to net income for the group (shown in table 3) is indicative of the trend of factor remuneration. In contrast to property income, the labor share is almost totally income to Puerto Rico.

Although nonelectrical machinery sales have been increasing in absolute terms over time, as a percentage of total sector sales, they still remain relatively small. In 1967, sales were \$23.6 million or 1.1 percent of total sector sales. By 1972, sales had more than tripled to \$82 million, which represented shipments of major group 35 increased at an average compounded rate of 23 percent per year with sales valued at \$360.3 million in 1977. This figure represented 3.6 percent of the sales of the manufacturing sector as a whole.

This industry group's contribution to net income in 1967 was \$9.6 million or 1.4 percent of net income produced by the manufacturing sector. The group's contribution to sector net income has increased 375 percent in absolute terms between 1972 and 1977, growing in value from \$26.6 million to \$126.4 million. In 1977, SIC-35 accounted for 4.4 percent of the net income produced by the manufacturing sector.

Very little data exists regarding the ownership of Puerto Rico's nonelectrical machinery industry. That which is available is from a sample survey conducted

by the U.S. Department of Labor Wage and Hour Division in February 1975.¹ Of the nine nonelectrical machinery firms included in that survey, four were subsidiaries of U.S. firms and the remaining five

¹ U.S. Department of Labor, Employment Standards Administration, Wage and Hour Division, *The Metal, Machinery, Transportation Equipment, and Allied Products, and the Electrical, Instrument, and Related Products Industry in Puerto Rico*. (Washington, D.C.: Government Printing Office, May 1975.)

Table 2.—Size of Industry and Industry Subgroups, SIC-35

Item	1963	1967	1972	1976
1. Number of plants:				
Industry total	33	35	64	53
(354) Metalworking machinery	9	16	22	14
(355) Special industry machinery	8	6	9	NA
(356) General industry machinery	3	3	NA	
(358) Service industry machinery	2	NA	NA	21
2. Employment:				
Industry total	952	1,006	2,229	4,325
(354) Metalworking machinery	135	296	350	198
(355) Special industry machinery	482	454	312	NA
(356) General industry machinery	49	21	NA	
(358) Service industry machinery	(D)	NA	NA	3,514
3. Value of shipments (thousands of dollars):				
Industry total	10,906	16,598	56,133	233,400
(354) Metalworking machinery	2,727	5,622	5,033	NA
(355) Special industry machinery	5,332	7,833	15,743	NA
(356) General industry machinery	(D)	399	NA	NA
(358) Service industry machinery	(D)	NA	NA	NA
4. Value added by manufacture (thousands of dollars)				
Industry total	7,651	12,207	37,628	NA
(354) Metalworking machinery	1,746	4,061	3,682	NA
(355) Special industry machinery	4,004	5,730	12,172	NA
(356) General industry machinery	(D)	282	NA	NA
(358) Service industry machinery	(D)	NA	NA	NA

NA—Not available.

(D)—Withheld to avoid disclosing figures reported by individual companies.

Sources: U.S. Bureau of the Census, Economic Census of Outlying Areas, *Puerto Rico: Census of Manufacturers*, 1963, 1967, and 1972. (Washington, D.C.: Government Printing Office.)

Puerto Rico, Department of Labor, *Census of Manufacturing Industries of Puerto Rico*, various years (San Juan).

Table 3.—Labor Income as a Percentage of Industry Group (SIC-35) Contribution to Net Income

Item	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Net income — (millions of dollars) —	9.6	9.8	10.3	13.1	14.7	26.5	37.2	49.4	58.2	80.2	126.4
Labor income — (millions of dollars) —	6.8	6.9	7.3	8.7	9.6	13.3	17.4	21.3	25.2	30.8	45.1
Labor income as a percent of net income	70.7	70.2	69.8	66.9	65.6	51.8	46.8	43.1	43.3	38.4	35.7
Manufacturing labor income as a percent of manufacturing net income	61.8	62.7	63.9	62.5	61.3	58.5	54.5	49.5	49.7	43.1	40.8
Rank of SIC 35 out of 25 industry groups	9	10	12	15	14	21	19	19	22	21	20

Source: Puerto Rican Planning Board, *Income and Products Accounts* (unpublished worksheet data).

were local companies. In general, the nine SIC-35 firms tended to purchase their materials from sources offisland and to sell their finished products locally. The four U.S. based firms obtained almost all of their products from external sources (predominantly from the United States) and to dispose of their finished products to the U.S. mainland.

Between 1963 and 1972, the Puerto Rican nonelectrical machinery industry was dominated by two subgroups; namely, special industry machinery (SIC-355), and metalworking machinery (SIC-354). (See table 2.) These two groups, between 1962 and 1967, accounted for over one-half of the group's establishments, and almost three-fourths of its labor force, value of shipments, and value added. By 1972, these two subgroups had begun to lose their dominance and fell back to accounting for less than one-half of the establishments, only 52 percent of the employment (from 75 percent in 1967), less than 40 percent of the value of shipments (from over 80 percent in 1967), and about 40 percent of the group's value added (from 80 percent in 1967). Although subgroup statistical data is limited beyond 1972, data on employment indicates the dramatic growth of the general and service industry machinery subgroups (356 and 358) in which employment in 1976 accounted for over 80 percent of employment in the nonelectrical machinery major group.

INDUSTRY LINKAGES AND ENVIRONMENTAL DEMANDS

Linkages

The portion of nonelectrical machinery group shipments which went to onisland customers has traditionally been significant when compared to other relatively capital intensive industries. Onisland shipments as a percentage of the value of total industry group shipments decreased from 37.7 percent in 1963 to 21.3 percent in 1967, increasing to 34.5 percent in 1972. (See table 4.) However, this industry group has lost footing in terms of forward linkages, as measured by the ratio of interindustry shipments (sales)² to total value of shipments by

Puerto Rican industry groups. Between 1963 and 1972, the nonelectrical machinery industry's inter-industry sales ratio decreased by about 32 percent, declining from 18.7 percent in 1963 to 12.8 percent in 1972. Major group 35 is one of six industry groups out of 20 to experience such an interindustry sales ratio decrease.

Some of major group 35 industry subgroups did not experience a forward linkage decrease. In the metalworking machinery subgroup (354), the inter-industry sales ratio increased from 14.1 percent in 1963 to 25.6 percent in 1972. A much more dramatic improvement was experienced by the miscellaneous machinery industry subgroup (359), (a group which has traditionally sold almost all of its products locally), in which the interindustry sales ratio increased from 19.3 percent in 1963 to 53.3 percent in 1972.

Environmental Demands

The nonelectrical machinery industry's consumption of fuels and electricity is a small percentage of the total cost of materials for the industry, relative to such costs for the manufacturing sector as a whole. Between 1967 and 1972, electricity and fuels costs increased 86.5 percent from \$193,000 to \$360,000, but as a percentage of total materials cost, they decreased markedly from 4.6 percent to 1.9 percent.

In 1972, fuel and electricity costs per nonelectrical machinery industry employee was only \$56, which placed this industry last when rank-ordered among 20 industry groups. This indicates that an increase in employment in this industry group would not significantly increase demand on Puerto Rican energy, one of the island's potentially scarce resources. When energy costs are presented as a proportion of value added, industry groups can be identified as to their relative sensitivity to increasing fuel prices. The resulting rank listing suggests that because fuel costs appear to be such a small proportion of major group 35 value added (0.96 percent) relative price increases *alone* should not be a major hindrance to industrial growth on the island. See chapter IV on scarce resource utilization.

² Interindustry group shipments represent sales to both wholesalers and other manufacturing enterprises.

Table 4.—Nonelectrical Machinery Onisland Linkages

[In thousands of dollars]

Products shipped and contract receipts in Puerto Rico to—													
	Value of shipments	Total	Onisland sales as a percent of value of shipments	Whole-salers	As a percent—age of Puerto Rican shipments	Retailers	As a percent—age of Puerto Rican shipments	Domestic consumers	As a percent—age of Puerto Rican shipments	Other manufac-turing enter-prises	As a percent—age of Puerto Rican shipments	Others including govern-ment	As a percent—age of Puerto Rican shipments
1963													
35	10,268	3,866	37.7	.94	10.2	635	16.4	260	6.8	1,524	39.4	1,053	27.2
354	2,384	336	14.1	28	8.3	—	—	—	—	308	91.7	—	—
355	5,332	1,867	35.0	2	.1	15	8	121	6.5	1,208	64.7	520	27.9
359	1,202	1,172	97.5	232	19.8	272	23.2	139	11.9	—	—	529	45.1
1967													
35	15,528	3,313	21.3	456	13.8	(D)	—	(D)	—	2,455	74.1	(D)	—
1972													
35	54,389	18,783	34.5	2,595	13.8	10,784	57.4	522	2.8	4,382	23.3	500	2.7
354	4,237	1,241	29.3	40	3.2	62	5.0	93	7.5	1,046	84.3	—	—
359	1,643	1,485	90.4	—	—	10	.7	429	28.9	876	59.0	170	11.4

(D)—Data not disclosed.

Source: U.S. Bureau of the Census, Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures, 1963, 1967, 1972. (Washington, D.C.: Government Printing Office.)

Table 5.—Rates of Return for the Nonelectrical Machinery Industry

Item	1960	1963	1967	1968	1970	1972	1973	1974	1975	1977
Return on equity (Fomento firms filing income tax returns):										
Puerto Rico	34.5	16.8	21.4	17.3	35.0	24.6	18.2	22.0	17.3	—
United States	—	—	—	—	—	—	13.4	—	13.6	—
Return on sales (Fomento firms filing income tax returns)	27.2	30.8	25.4	15.3	32.0	23.5	34.0	23.0	21.9	—
Return on sales (all SIC-35 firms):										
Puerto Rico	—	—	10.7	11.5	13.8	17.0	19.0	20.3	18.5	24.3
United States	—	—	—	—	—	—	5.6	—	6.3	—
Return on sales (entire manufacturing sector)	—	—	11.7	11.7	11.0	12.5	13.7	13.3	12.6	17.2

Sources: Unpublished data provided by Fomento. U.S. rates calculated from the U.S. Federal Trade Commission, *Quarterly Financial Report for Manufacturing, Mining and Trade Corporations*, various years. U.S. rates are for profits after taxes. Puerto Rican rates are for corporations receiving tax exemptions.

EARNINGS, COST AND COMPETITIVE POSITION (PRODUCTIVITY AND PROFITABILITY)

Although the productivity and profitability of the nonelectrical machinery industry has been declining by some indicators, particularly in regard to returns to equity, it has generally been improving over time. By some profit indicators, the Puerto Rican nonelectrical machinery industry is performing better than its U.S. counterpart. The rate of return on equity of Fomento assisted firms filing income tax returns in the years in question decreased from 34.5 percent in 1960 to a low of 16.8 percent in 1963 to a high of 35.0 percent in 1970 to 17.3 percent in 1975. Profits on sales for such firms rose from 27.2 percent in 1960 to a high of 34.0 percent in 1973, falling to 21.9 percent in 1975. The rate of profits to sales for the entire nonelectrical machinery industry (Fomento promoted and nonpromoted), a rate which is likely to be lower than for Fomento firms filing income tax returns, increased steadily from a low of 10.7 percent in 1960 to 20.3 percent in 1974, fell slightly to 18.5 percent in 1975, and rose to a high of 24.3 percent in 1977. The rates of profits by years are shown in table 5.

The steadily improving ratio of profits to sales suggests increasing productivity in the industry paralleling that of the entire manufacturing sector. A similar trend, as shown in table 6, in the relation of profits to total costs, indicates that the gross profitability is increasing over time or that, at least, total costs were not increasing as fast as selling prices.

Table 6.—Profits as a Percentage of Total Costs, SIC-35

	1968	1970	1972	1974	1975	1976	1977
Percentage	12.8	16.0	20.4	25.4	22.8	30.0	32.2

Source: Puerto Rico Planning Board, *Income and Products Accounts* (unpublished worksheet data).

Wage costs have declined as an element of total

costs. Their share in total costs has changed as follows:

Table 7.—Wages and Benefits as a Percentage of Total Costs, SIC-35

	1968	1970	1972	1974	1975	1976	1977
Percentage	32.4	31.0	20.2	18.4	16.5	17.2	16.5

Source: Puerto Rico Planning Board, *Income and Products Accounts* (unpublished worksheet data).

A downward trend in wages as a portion of total costs is clearly evident. As shown in table 8, the average hourly earnings paid by this industry in Puerto Rico are notably lower than those paid in the United States, and the differential has been increasing over time.

Table 8.—Nonelectrical Machinery Industry, Average Hourly Wage Rates

Year	Puerto Rico	United States	Differential
1968	\$2.04	\$3.36	\$1.32
1970	2.24	3.77	1.53
1972	2.83	4.28	1.45
1973	2.85	4.56	1.71
1974	2.90	4.92	2.02
1975	3.20	5.36	2.16
1976	3.48	5.76	2.28

Source: Puerto Rico, Department of Labor, *Census of Manufacturing Industries in Puerto Rico*.

U.S., Department of Labor, *Employment and Earnings*.

The Puerto Rican average wage does, however, exceed the U.S. minimum wage. Analysis indicates that this industry group would have little difficulty in meeting increasing labor costs as such costs account for a relatively small share of total costs; the industry has kept apace with U.S. wage standards; and this industry has a profit margin sufficiently large enough to absorb such increasing costs and remain profitable and competitive.

Output per nonelectrical machinery employee in

1967 was \$11,456 as compared with \$29,168 in 1974, and \$30,728 in 1976.³

Average wages and benefits (total compensation) per employee in 1967 were \$6,751; by 1976, they had increased to an average of \$7,124. In 1972, the major group 35 total compensation of \$6,174 employee was 23.1 percent higher than the average of \$5,017 for the manufacturing sector as a whole. By 1976, the SIC-35 average of \$7,124 was only slightly higher than the average of \$7,101 for the industry sector.

The productivity of labor, or capital intensiveness, of the nonelectrical machinery industry in Puerto Rico is indicated in table 9.

Table 9.—Nonelectrical Machinery Productivity

Year	Output per employee		Value added per employee	
	Puerto Rico	United States	Puerto Rico	United States
1958	\$9,401	\$16,883	\$5,908	\$9,194
1963	11,456	20,805	8,037	11,851
1967	16,598	26,000	12,134	14,930
1972	25,183	36,013	16,881	20,552

Sources: U.S. Bureau of the Census, *Census of Manufactures—Industry Statistics* (various years). (Washington, D.C.: Government Printing Office.)

U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures* (various years). (Washington, D.C.: Government Printing Office.)

As can be seen from table 9, even though output (sales) and value added per Puerto Rican major group 35 employee increased at a compounded average annual rate that was greater than that of the counterpart mainland employee, Puerto Rican productivity in this industry group was still below U.S. levels in 1972 (for the indicators chosen). In 1972, the Puerto Rican output (sales) per employee of \$25,183 was only about 70 percent of the U.S. figure of \$36,013. Likewise, the Puerto Rican value added per employee of \$16,881 was only 82 percent of the U.S. figure of \$20,552. Puerto Rican productivity per employee may, however, have increased rapidly in later years as the industry increased its capitalization.

DEMAND AND PROSPECTS FOR PRODUCTION FOR LOCAL AND EXPORT MARKETS

The evidence suggests that the market for Puerto Rican production of nonelectrical machinery is increasing. The increase in sales from about \$20 million in 1967 to over \$360 million in 1977 is indicative of this fact. Likewise is the increase in

³ The U.S. Department of Labor Wholesale Price Index for durable manufactures was used to deflate 1974 and 1976 sales prices to constant dollars.

the Puerto Rican share of the local market which has increased more than five times from 8.4 percent in 1972 to 42.0 percent in 1976.

Local demand increased more than 60 percent between 1972 and 1976, while export demand decreased slightly. As can be seen from table 10, almost all of the increase in total local demand was met by onisland sales from local production. Imports increased less than 2 percent in these 5 years. This evidence indicates that local manufactures in major group 35 are doing well in satisfying the increasing demand of the local market.

Table 10.—Local and Export Markets for SIC-35 Products

[In millions of dollars]

	1967	1972	1976
Onisland sales from local production	3.3	18.8	¹ 150.0
Imports	122.4	204.8	208.5
Total local demand	125.7	223.6	358.5
Exports	15.7	47.0	42.8
Total demand	141.4	270.6	401.3

¹ Estimated

Sources: U.S. Bureau of the Census, *Economic Censuses of Outlying Areas, Puerto Rico: Census of Manufactures*, 1967 and 1972. (Washington, D.C.: Government Printing Office.)

U.S. Bureau of the Census, *U.S. Trade with Puerto Rico and U.S. Possessions*, FT 800/1967, 1972, and 1976 Annuals. (Washington, D.C.: Government Printing Office.)

The market for office and computing machines in Puerto Rico has been growing over time and has been met almost entirely by imports from the United States. In 1972, office and computing machines imports from the United States were valued at almost \$16.6 million or slightly more than 8 percent of the value of total U.S. SIC-35 imports. By 1976, the value of imports of these commodities from the United States increased to \$19.6 million with the value of typewriters and check-writing machines imported from the United States increasing from \$2.6 million in 1972 to \$11.4 million in 1976. The statistical data necessary to perform an analysis designed to serve as an indicator of the potential of serving the Puerto Rican market competitively and profitably through local production is not adequate enough for such an analysis to be complete.

SUMMARY AND CONCLUSIONS

The nonelectrical machinery industry in Puerto Rico is characterized by a labor-relative-to-capital utilization ratio which is low (i.e., it is capital intensive), by high profit rates, and by a combined labor and property income which is high in relation to capital investment required. The industry group indicates a relatively high contribution to employment, relatively high employment growth, relatively high

labor productivity, but returns to labor which are a low proportion of value-added relative to other industry groups. It has been indicated that this industry is an "emerging" high growth industry in Puerto

Rico; however, whether its direct contribution to Puerto Rico in terms of employment and labor income will continue to grow at the rates exhibited in the last few years remains unknown.

The Rubber and Miscellaneous Plastics Products Industry in Puerto Rico (SIC-30)

INDUSTRY DEFINITION

This industry group consists of establishments manufacturing rubber products such as tires, rubber footwear, mechanical rubber goods, heels and soles, flooring and rubber sundries from natural, synthetic, or reclaimed rubber, gutta percha, balata, or gutta siak. This group also includes establishments engaged in molding primary plastics for the trade, and manufacturing miscellaneous finished plastics products.

This major industry group is divided into the following subgroups:

- a. SIC-301: Tires and inner tubes.
- b. SIC-302: Rubber and plastics footwear.
- c. SIC-303: Reclaimed rubber.
- d. SIC-304: Rubber and plastics hose and belting.
- e. SIC-306: Fabricated rubber products, not elsewhere classified.
- f. SIC-307: Miscellaneous plastics products.

SIZE AND GROWTH

The rubber and miscellaneous plastics products industry was of little importance during the early years of Puerto Rico's development program and has remained so to date. In 1954, its contribution to net income was included along with that of petroleum refining and related products and miscellaneous manufacturing which altogether provided less than 7 percent of the manufacturing sector contribution to net income.

Employment in the industry is reported as having been 1,022 in 1954. Employment doubled between 1963 and 1967 and increased about 65 percent between 1967 and 1972, when it reached 3,494 persons. Employment in the rubber and miscellaneous plastics products group was at its highest as a

percentage of manufacturing employment at 2.4 in both 1974 and 1976, with 3,641 and 3,499 persons being employed respectively.

The industry's contribution to net income was first reported separately in 1967 when it was \$11.4 million, or 1.7 percent of net income produced by the manufacturing sector. The industry's contribution to net income has grown in absolute terms since that time. However, since 1972, its contribution to sector net income has been declining. (See table 1.) In 1977, the industry's contribution to net income was \$43 million, or 1.5 percent of total net income for manufacturing. The ratio of labor income to net income for the group (shown in table 3) is indicative of the trend of factor remuneration. In contrast to property income, the labor share is almost totally income to Puerto Rico.

Although rubber and miscellaneous plastics products sales have been increasing in absolute terms over time, they have been a very small percentage of total sector sales. In 1967, sales were \$28.8 million or 1.3 percent of total sector sales. Industry sales were at their highest in 1976 at \$122.1 million or 1.4 percent of the sector's sales. By 1977, sales declined slightly to \$118.8 million, which was only 1.2 percent of manufacturing total sales for that year.

Rubber footwear (SIC-302) and miscellaneous plastics products (SIC-307) are the most important subgroups in the rubber and miscellaneous plastics products industry. The relative positions of the subgroups is shown in table 2. In 1972, these two subgroups accounted for 87.5 percent of the plants, for 93.7 percent of the employees, 89 percent of the sales, and 92 percent of the value added in major group 30. Indications are that in more recent years, the rubber footwear industry in Puerto Rico has been declining, as it has in the United States, and that the miscellaneous plastics products industry has come to be the dominant subgroup in the rubber and miscellaneous plastics products major group.

Table 1.—Selected Economic Data on the Puerto Rican Rubber and Miscellaneous Plastics Products Industry (SIC-30), Selected Years

	1954	1958	1963	1967	1972	1974	1975	1976	1977
1. Number of establishments	6	14	24	35	56	73	66	67	NA
2. Total number of employees	(D)	1,022	1,160	2,235	3,494	3,641	2,744	3,499	NA
3. Employment as a percentage of sector employment	NA	1.4	1.2	1.8	2.3	2.4	2.0	2.4	NA
4. Sales	(millions of dollars) NA	7.9	13.3	28.8	48.0	78.1	102.3	122.1	118.8
5. Sales as a percentage of sector sales	NA	1.0	.9	1.3	1.2	1.1	1.3	1.4	1.2
6. Net income	(millions of dollars) NA	—	—	11.4	24.4	30.9	31.4	40.2	43.0
7. Net income as a percentage of sector net income	NA	NA	NA	1.7	1.9	1.7	1.6	1.7	1.5
8. Value-added by manufacture	(thousands of dollars) (D)	4,036	6,292	14,415	27,440	NA	NA	NA	NA

NA—Not available.

(D)—Withheld to avoid disclosing figures for individual companies.

Sources: U.S. Bureau of the Census, Economic Censuses of Outlying Areas, *Puerto Rico: Census of Manufactures*, 1963, 1967, 1972, (Washington, D.C.: Government Printing Office.)

Puerto Rico, Department of Labor, *Census of Manufacturing Industries of Puerto Rico*, various years.

Puerto Rico Planning Board, *Puerto Rico Income and Products Accounts* (unpublished data).

Table 2.—Size of Industry and Industry Subgroups, SIC-30

Item	1963	1967	1972	1976
1. Number of plants:				
Industry total	24	35	56	67
Rubber footwear	3	7	6	NA
Plastic products, n.e.c.	18	18	43	40
2. Employment:				
Industry total	1,160	2,235	3,494	3,499
Rubber footwear	626	1,536	2,038	NA
Plastic products, n.e.c.	479	496	1,237	1,753
3. Value of shipments (thousands of dollars):				
Industry total	13,279	28,793	47,971	122,073
Rubber footwear	5,689	13,342	17,182	NA
Plastic products, n.e.c.	6,920	9,288	25,503	NA
4. Value added (thousands of dollars):				
Industry total	6,292	14,415	27,440	NA
Rubber footwear	2,702	6,345	9,562	NA
Plastic products, n.e.c.	3,237	4,550	15,603	NA

NA—not available.

Sources: U.S. Bureau of the Census, Economic Census of Outlying Areas, *Puerto Rico: Census of Manufactures*, 1963, 1967, and 1972, (Washington, D.C.: Government Printing Office.)

Puerto Rico, Department of Labor, *Census of Manufacturing Industries of Puerto Rico* (various years) (San Juan).

According to the Puerto Rico Department of Labor's Annual Census of Manufacturing Industries, there were 42 miscellaneous plastics products establishments on the island in October 1975. Of this total, Fomento had promoted 32 establishments operating 54 plants. Forty-eight percent of the operating manufacturing plants in Puerto Rico are of local origin and 50 percent are subsidiaries of U.S. firms. The U.S. mainland is by far the largest market for Puerto Rican produced miscellaneous plastics

products, with 96 percent of all merchandise exported in 1975 being shipped to the mainland.

As of October 1976, eight of Puerto Rico's rubber footwear plants were mainland owned. The bulk of Puerto Rico's rubber footwear production is destined for markets in the United States. Industry experts estimate that about 10 percent of the shoes made on the island are sold locally.

INDUSTRY LINKAGES AND ENVIRONMENTAL DEMANDS

Linkages

The portion of industry group shipments which went to onisland customers increased from 21.5 percent in 1963 to 47.5 percent in 1972, as can be seen in table 4, with total onisland sales increasing from \$2.8 million in 1963 to \$8 million in 1967 to \$22 million in 1972. Shipments to other Puerto Rican manufacturing enterprises, however, decreased steadily as a percentage of onisland shipments in this time period, from 41.2 percent (or \$1.2 million of \$2.8 million in onisland shipments) to 19.7 percent (\$4.3 million of \$22 million). The decrease in inter-industry shipments was picked up by increasing shipments to others including government (\$1.5 million or 18.7 percent on onisland shipments) in 1967 and by increasing shipments to wholesalers (\$15.3 million or 69.7 percent of onisland shipments) in 1972.

The miscellaneous plastics products industry

Table 3.—Labor Income as a Percentage of Industry Group SIC-30 Contribution to Net Income

Item	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Net income	(millions of dollars) 11.4	14.1	11.2	19.2	23.3	24.4	23.5	30.9	31.4	40.2	43.0
Labor income	(millions of dollars) 9.7	11.4	13.3	14.7	16.5	20.9	22.5	21.7	22.7	24.8	27.0
Labor income as percentage of net income	85.0	80.8	77.1	76.5	70.7	—	—	—	—	—	—
Manufacturing labor income as a percentage of manufacturing	61.8	62.7	63.9	62.5	61.3	58.5	54.5	49.5	49.7	43.1	40.8
Rank of SIC-30 out of 25 industry groups	1	4	10	9	10	3	2	9	9	12	11

Source: Puerto Rico Planning Board, *Income and Products Accounts* (unpublished worksheet data).

Table 4.—Rubber and Miscellaneous Plastics Onisland Linkages
(In thousands of dollars)

Products shipped and contract receipts in Puerto Rico to—													
Value of shipment	Total	Onisland sales as a percentage of value of shipments	Wholesale	As a percentage of Puerto Rican shipments	Re-tailers	As a percentage of Puerto Rican shipments	Domes-tic con-sumers	As a percentage of Puerto Rican shipments	Other manu-facturing enter-prises	As a percentage of Puerto Rican shipments	Others includ-ing gov-ernment	As a percent-age of Puerto Rican ship-ments	
1963													
30	13,063	2,814	21.5	1,453	51.6	184	6.6	1	(1)	1,159	41.2	16	0.6
3021	5,089	757	13.3	709	93.8	47	6.2	1	(2)	—	—	—	—
3079	6,704	1,850	27.6	671	36.3	114	6.2	—	—	1,049	56.7	16	.8
1967													
30	28,446	7,984	28.1	3,258	48.0	789	9.9	—	—	2,447	30.6	1,490	18.7
3079	8,941	4,292	49.1	2,792	65.1	(D)	—	—	—	1,030	24.0	(D)	—
1972													
30	46,296	21,993	47.5	15,320	69.7	1,554	7.0	400	1.8	4,324	19.7	395	1.8
3079	24,090	12,026	49.9	7,554	62.8	349	2.9	400	3.3	3,454	28.8	269	2.2

¹ Less than one-tenth of one percent.

Source: U.S. Bureau of the Census, Economic Census of Outlying Areas, *Puerto Rico: Census of Manufactures, 1963, 1967, and 1972*. (Washington, D.C.: Government Printing Office.)

(SIC-307) is the only subgroup for which linkage data are available. SIC-307's onisland shipments increased more than six times in absolute terms from \$1.85 million in 1963 to \$12 million in 1972. As a percentage of all subgroup shipments, SIC-307 onisland shipments increased from 27.6 percent to 49.9 percent. The predominance of other manufacturing firms as recipients of onisland miscellaneous plastics products in 1963, when interindustry shipments were \$1.05 million or 56.7 percent of onisland sales, gave way to the predominance of shipments to wholesalers in 1967 and 1972. By 1967, miscellaneous plastics products interindustry sales had decreased to 24 percent (\$1.03 million) of local sales; increasing slightly to 28.8 percent (\$3.45 million) in 1972. SIC-307 shipments to wholesalers increased from \$671,000 or 36.3 percent of onisland shipments in 1963 to \$2.8 million or 65.1 percent in 1967 and decreased slightly in 1972 to 62.8 percent of local sales.

The U.S. Department of Labor Wage and Hour Division conducted, in November 1975, a survey of all the rubber and plastics footwear establishments in Puerto Rico. The nine establishments in the industry at that time manufactured a variety of footwear and components of footwear, principally canvas shoes and slippers. Four of the nine establishments in the survey reported receiving all their raw materials from the U.S. mainland. The remaining five received their raw materials from both local and mainland sources in various proportions.

However, the two largest firms, employing 62 percent of the workers covered by the survey, imported all their raw materials from the United States. Some

of the raw materials purchased locally were thread, starch, lining and binding. Fabrics (canvas), vinyl plastic, thermoplastic pellets, rubber, and insoling material were, in general, purchased from mainland sources. This suggests a somewhat weak linkage with the Puerto Rican petrochemical industry; petrochemicals are the major feedstocks for synthetic rubber and plastics.

Environmental Demands

The rubber and miscellaneous plastics products industry is estimated as being an above average consumer of energy when ranked among all industry groups in Puerto Rico. Its consumption of fuels and electricity is a relatively large percentage of the total cost of materials for the industry, relative to such costs for the manufacturing sector as a whole. Between 1967 and 1972, the industry's fuels and electricity costs rose an estimated 19 percent from \$744,000 to \$883,000. As a percentage of total materials costs, however, they decreased slightly from 4.8 percent in 1967 to 4.6 percent in 1972.

The manufacturing sector's fuels and electricity costs rose from \$34.8 million to \$77.6 million, an increase of over 120 percent. These costs as a percentage of total materials cost increased from 2.8 percent in 1967 to 3.7 percent in 1972. It would appear that electricity became favored as an energy source for the SIC-30 industry, over fuel consumption during this time period as the cost of fuels consumed decreased from \$146,000 in 1967 to \$134,000 in 1972 and the cost of electricity increased more than 25 percent from \$598,000 in 1967 to \$749,000 in 1972.

EARNINGS, COSTS, AND COMPETITIVE POSITION (PRODUCTIVITY AND PROFITABILITY)

The productivity and profitability of the rubber and plastics industry as a whole has varied over time. The ratio of return on equity (after taxes) of Fomento assisted firms filing income tax returns in the years in question decreased from 38.2 percent in 1960 to a low of 8.9 percent in 1967, rising to 16.4 percent in 1972. The recession following 1972 led to a decline in 1973 to a low 4.5 percent. Since that time, returns on equity have substantially improved and in 1975 the Puerto Rican rate of 15.2 percent exceeded the U.S. rate of 3 percent for that year. (See table 5.)

Profit on sales (after taxes) for such firms followed a very similar pattern, falling from 16.3 percent in 1960 to a low of 5.1 in 1967, rising to 17.5 percent in 1972. Following the 1972 mainland recession, profits on sales for Puerto Rican rubber and miscellaneous plastics products firms filing income tax returns fell to 2.4 percent in 1973. Profits on sales quickly recovered, however, and were 14.8 percent in 1975.

The rate of profits to sales for the entire rubber and miscellaneous plastics products industry group (Fomento promoted and nonpromoted), a rate which is likely to be lower than for Fomento firms filing income tax returns, fell to a low of 2.1 percent in 1973, rising to 7.6 percent in 1975 (which was higher than the U.S. rate of 3.0 percent for that year) and to 13.1 percent in 1977. (See table 5, above.)

The steadily improving ratio of profits to sales, in the late 1970's, suggests increasing productivity in the industry paralleling that of the entire manufacturing sector. A similar trend, as shown in table 6, in relation of profits to total costs indicates that at least total costs were not increasing as fast as selling prices.

Table 6.—Profit as a Percentage of Total Costs

	1968	1970	1972	1974	1975	1976	1977
Percentage	6.4	7.9	4.8	12.3	8.3	14.3	15.1

Source: Puerto Rico Planning Board, *Income and Product Accounts* (unpublished worksheet data).

Wage costs have declined as an element of total costs. Their share in total costs has changed as follows:

Table 7.—Wages and Benefits as a Percentage of Total Costs

	1968	1970	1972	1974	1975	1976	1977
Percentage	31.9	30.2	34.9	31.1	24.2	23.3	26.2

Source: Puerto Rico Planning Board, *Income and Product Accounts* (unpublished worksheet data).

A downward trend in wage rates as a portion of total costs is evident.

Output per worker (as measured by sales) in 1967 was \$12,883 as compared with \$15,749 in 1974 and \$22,223 in 1976, in constant prices.¹

Average wages and benefits per employee in 1967 were \$4,323, by 1976 they had increased to an average of \$7,098. In 1972, the rubber and miscellaneous plastics products industry's average wage of \$5,969 per employee was 16 percent higher than the average of \$5,017 for the manufacturing sector as a whole. By 1976, however, the average manufacturing wage per employee of \$7,101 was slightly higher than the SIC-30 industry wage per employee of \$7,098.

For the miscellaneous plastics products industry (SIC-307), for which such information is available, average weekly earnings (not including benefits) increased from \$51.59 in 1967, to \$82.82 in 1972, to \$97.81 in 1974, and to \$119.17 in 1976.

In 1972, value added per employee in the industry as a whole was \$7,853; this compares with \$12,791 for the Puerto Rican manufacturing sector as a

¹ The U.S. Department of Labor Wholesale Price Index for rubber and plastics products was used to deflate 1974 and 1976 sales prices to constant dollars.

Table 5.—Rates of Return SIC-30 Rubber and Plastics Products

	1960	1963	1967	1968	1970	1972	1973	1974	1975	1977
Return on equity (Fomento firms filing income tax returns):										
Puerto Rico	38.2	20.7	8.9	9.6	11.5	16.4	4.2	19.0	15.2	—
United States	—	—	—	—	—	—	12.1	—	8.0	—
Return on sales (Fomento firms filing income tax returns)	16.3	15.1	5.1	5.4	6.4	17.5	2.4	18.6	14.3	—
Return on sales (all SIC-30 firms):										
Puerto Rico	—	—	4.7	6.0	7.3	4.5	2.1	11.0	7.6	13.1
United States	—	—	—	—	—	—	4.0	—	3.0	—
Return on sales (entire manufacturing sector)	—	—	11.7	11.7	11.0	12.5	13.7	13.3	12.6	17.2

Sources: Unpublished data provided by Fomento. U.S. rates calculated from the U.S. Federal Trade Commission, *Quarterly Financial Reports for Manufacturing, Mining and Trade Corporations*, various years. U.S. rates are for profits after taxes. Puerto Rican rates are for corporations receiving tax exemptions.

whole. In real terms (1954 dollars) value added per employee increased from about \$4,350 in 1963 to \$4,410 in 1972.

For the two important subgroups, SIC-302 (rubber footwear) and SIC-307 (miscellaneous plastics products), output per employee (as measured by sales) and value added per employee are presented in tables 8 and 9. As is evidenced in table 8, productivity in the rubber footwear industry stagnated between 1963 and 1972. This has been the result of a steady decline of industry employment and industry shipments as a result of increased international competition for the U.S. market. Indications are that this trend has been accelerating in the late 1970's.

Table 8.—Subgroup of SIC-302 Productivity

Year	Output per employee		Value added per employee	
	Puerto Rico	United States	Puerto Rico	United States
1958	NA	\$11,245	NA	\$7,333
1963	\$9,088	12,172	\$4,316	7,457
1967	8,686	14,673	4,131	8,416
1972	8,431	19,048	4,692	11,752

Sources: U.S. Bureau of the Census, *Census of Manufacturers-Industry Statistics* (various years). (Washington, D.C.: Government Printing Office.)

U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures* (various years). (Washington, D.C.: Government Printing Office.)

Table 9 indicates that productivity in the miscellaneous plastics industry has been increasing steadily over time.

Table 9.—Subgroup SIC-307 Productivity

Year	Output per employees		Value added per employee	
	Puerto Rico	United States	Puerto Rico	United States
1958	\$7,266	\$16,061	\$3,478	\$7,988
1963	14,447	19,034	6,758	9,987
1967	18,726	21,520	9,173	11,795
1972	20,617	30,846	12,614	17,314

Sources: U.S. Bureau of the Census, *Census of Manufacturers-Industry Statistics* (various years). (Washington, D.C.: Government Printing Office.)

U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures* (various years). (Washington, D.C.: Government Printing Office.)

The average hourly wage per employee in the rubber and miscellaneous plastics products industry in Puerto Rico in 1976 was \$2.75. This is slightly less than 60 percent of the U.S. average hourly wage of \$4.63 in this industry group for the same year. SIC-30's average wage per hour of \$2.75 in 1976 was above the present minimum wage of \$2.65 an hour. However, as this industry is characterized by above average labor utilization, it could be somewhat adversely affected in meeting the 1980 minimum wage rate of \$3.10 an hour. As an indicator of this

industry group's sensitivity to wage rates, the following calculations might be made. Based on the rubber and miscellaneous plastics products industry's 1975 hourly wage of \$2.56, in meeting the 1980 minimum wage of \$3.10 an hour, the industry's labor costs would increase 21 percent. Such an increase would result in the following cost increases and rates of return decreases:

1975 Total costs would increase by 5.1 percent.
1975 Wage bill would increase by \$4.8 million to \$27.5 million.

Profit would fall by \$4.8 million to \$3.03 million.
Profit to equity would fall from 15.2 percent to 5.9 percent.

Profit to sales would fall from 7.6 percent to 3.0 percent.

Profit to total costs would fall from 8.3 percent to 3.2 percent.

These calculations would seem to indicate that the rubber and miscellaneous plastics products industry is relatively sensitive to wage rate increase when compared to such industries as electrical machinery, instruments, and pharmaceuticals. The rates of return would decrease in all of the above cases by more than 50 percent and total costs would increase slightly over 5 percent. Federal minimum wage applications to the rubber and miscellaneous plastics products industry could possibly make this industry group marginally profitable, and make it difficult for industries to maintain a competitive location in Puerto Rico.

The rubber footwear industry, which has historically paid a wage less than the industry average and whose 1976 average hourly wage of \$2.46 was below the present U.S. minimum, is likely to be more adversely affected in meeting the Federal minimum wage level for 1980 than is the industry group as a whole. In addition to this subgroup needing to bridge a larger gap, it is also more labor intensive than SIC-30 as a whole and has been losing its competitive position in the U.S. market to increasing imports that in 1976 represented more than 45 percent of the domestic market. (Imports of rubber-soled fabric upper footwear to the United States increased 35 percent between 1975 and 1976 from 74 million pairs to over 100 million pairs.)

DEMAND AND PROSPECTS FOR PRODUCTION FOR LOCAL AND EXPORT MARKETS

Evidence suggests that the market for Puerto Rican production of rubber and miscellaneous plastics products is increasing. The increase in sales from \$31.3 million in 1967 to \$118.8 million in

1977 is indicative of that fact. Also indicative of the growth in the market for SIC-30 products is the increase in percentage in 1967 to 39 percent in 1972.

Both local and export demand for rubber and miscellaneous plastics products increased as indicated in table 10. Imports from the United States more than doubled between 1967 and 1976, increasing from an estimated \$20.2 million to \$53.7 million. Rubber tires and inner tubes contributed substantially to this import growth, with this commodity alone accounting for 59 percent of imports by value in 1967 and 71 percent of imports by value in 1976. In 1976, Puerto Rico imported \$32.8 million in rubber tires and inner tubes from the United States.

Table 10.—Local and Exports Markets for SIC-30 Products

	1967	1972	1976
Onisland sales from local production	8.0	22.0	NA
Imports (United States)	20.2	34.2	53.7
Total local demand	28.2	56.2	NA
Exports (United States)	31.0	32.7	70.0
Total demand	59.2	88.9	NA

Sources: U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures, 1967 and 1972*. (Washington, D.C.: Government Printing Office.)

U.S. Bureau of the Census, *U.S. Trade with Puerto Rico and U.S. Possessions*, FT 800/1967, 1972, and 1976 Annuals. (Washington, D.C.: Government Printing Office.)

Puerto Rican rubber and miscellaneous plastic products exports to the United States increased in value more than 125 percent between 1967 and 1976. As can be seen in the commodity breakdown presented in table 11, during this time period there are two notable shifts in exports. First, there was the 57-percent decrease in the value of rubber shoes (85111, 85112) between 1972 and 1976. Second, there was the over 400-percent increase in the value of artificial plastic articles, not elsewhere classified (89309).

As indicated in table 12, economies of scale in the U.S. miscellaneous plastics products industry exist for firms with total assets ranging from \$5 to \$25 million, which display a net profit before tax ranging from 5.5 percent of net sales to 5.9 percent. The market share of firms in these assets ranges is

Table 11.—SIC-30 Exports to the United States by Schedule P Commodity

[In thousands of dollars]

Schedule P number	Commodity description	1967	1972	1976
62100	Rubber materials	15.4	425.1	9.8
62900	Rubber articles, n.e.c.	3,247.6	4,312.4	3,566.4
35111	Canvas shoes with rubber soles	17,906.4	20,238.7	12,878.1
85112	Rubber footwear, n.e.c.	50.3	196.8	124.4
89301	Gloves—vinyl or plastic	—	487.7	—
89309	Artificial plastic articles, n.e.c.	9,791.4	32,029.9	49,375.0

Source: U.S. Bureau of the Census, *U.S. Trade with Puerto Rico and U.S. Possessions*, FT 800/1967, 1972, and 1976 Annuals. (Washington, D.C.: Government Printing Office.)

between 30 and 55 percent of the 1972 Puerto Rican market share of \$35 million. It would appear that a number of firms in these assets ranges could serve profitably and compete profitably with U.S. subsidiaries to supply the Puerto Rican market.

CONCLUSION

The Puerto Rican rubber and miscellaneous plastics products industry has been and remains a relatively minor industry group in the manufacturing sector. In 1976, the industry group employed only about 3,500 persons and had sales valued at less than \$125 million. The industry in Puerto Rico is characterized by above average labor utilization (specifically in the rubber footwear subgroup), below average profits, and a combined labor and property income which is low in relation to capital investment required. As indicated earlier, this industry would seem to be one in which nonresident investment but not resident investment would be more desirable.

The rubber footwear industry in Puerto Rico, a major subgroup in the rubber and miscellaneous plastics products industry, has been declining both in terms of employment and output in recent years. This trend mirrors that being experienced on the mainland, as domestic shipments of rubber-soled fabric upper footwear declined and imports from the Republic of China, Korea, and Hong Kong increased their share of the domestic market to almost 50 percent.

Table 12.—Miscellaneous Plastics Products Economies of Scale

Item description for accounting period 7/73 through 6/74	Asset values (in thousands of dollars)										
	Total entire for industry	Under 100	100 to 250	250 to 500	500 to 1,000	1,000 to 5,000	5,000 to 10,000	10,000 to 25,000	25,000 to 50,000	50,000 to 100,000	100,000 to 250,000 and over
Average receipts per unit (millions of dollars)....	1.13	0.17	0.38	0.78	1.56	3.7	10.2	19.1	51.3	95.2	—
Net profit before tax as a percentage of sales	4.7	2.4	4.4	5.0	3.7	4.8	5.5	5.9	4.5	6.5	—

Note: Puerto Rican market share (imports and local sales)—1972=\$35 million.

Sources: *The Almanac of Business and Financial Ratios*.

The miscellaneous plastics products industry shipments has grown in value in recent years, as it has on the mainland, as a result of growth in consump-

tion and price changes. (As plastics are petrochemical derivatives, the price changes are a result of the quadrupling of oil prices, as well as inflation.)

The Food and Kindred Products Industry in Puerto Rico

INDUSTRY DEFINITION

The food and kindred products industry includes establishments which manufacture or process food and beverages for human consumption, and certain related products such as manufactured ice, chewing gum, vegetable and animal fats and oils, and prepared feeds for animals and fowl. This industry group is divided into the following subgroups:

- a. SIC-201: Meat products.
- b. SIC-202: Dairy products.
- c. SIC-203: Canned and prepared fruits and vegetables.
- d. SIC-204: Grain mill products.
- e. SIC-205: Bakery products.
- f. SIC-206: Sugar and confectionery products.
- g. SIC-207: Fats and oils.
- h. SIC-208: Beverages.
- i. SIC-209: Miscellaneous food preparations and kindred products.

SIZE AND GROWTH

Historically, food processing has been one of the most important industries in Puerto Rico. In 1940, its contribution to net income was half that of the entire manufacturing sector and in 1947, was 52.5 percent of total sector net income. From 1947 to 1977, its contribution increased from \$48.6 million to \$307 million. (See table 1.) In real terms (1954 dollars), there was an increase of 188 percent.

Its relative position in the economy has, however, declined continuously since 1947. Its contribution relative to the rest of the sector declined steadily as shown below in table 2.

While its percentage contribution to sector net income has been declining, it remains third among all industry groups in terms of that contribution, with its contribution being exceeded only by chemicals and electrical machinery. The ratio of labor income to net income for the group (shown in table 6) is indicative of the trend of factor remuneration.

Table 1.—Selected Economic Data on the Puerto Rican Food and Kindred Products Industry (SIC-20), Selected Years

	1949	1954	1958	1963	1967	1972	1973	1975	1976	1977
1. Number of establishments	526	497	510	471	443	321	422	375	364	—
2. Total number of employees	23,243	18,864	17,082	21,141	21,187	27,739	22,712	22,950	24,171	—
3. Employment as percentage of sector employment	42.2	27.3	24.0	21.4	17.4	18.5	14.9	16.8	16.7	—
4. Sales (millions of dollars)	—	—	301.2	553.6	675.2	970.6	1,021.2	1,272.3	1,415.9	1,631.6
5. Sales as percentage of sector sales	—	—	38.9	37.4	29.7	23.4	20.1	16.3	16.1	16.2
6. Net income (millions of dollars)	40.2	50.3	57.4	109.3	129.6	196.4	208.8	274.5	302.9	307.0
7. Net income as percentage of sector net income	49.4	32.4	25.8	24.2	19.4	15.3	13.5	14.1	12.7	10.8
8. Value-added by manufacture (thousands of dollars)	52,432	81,161	95,617	189,680	259,825	343,435	—	—	—	—

Sources: U.S. Bureau of the Census, Economic Censuses of Outlying Areas, *Puerto Rico: Census of Manufacturers*, 1963, 1967, 1972. (Washington, D.C.: Government Printing Office.)

Puerto Rico, Department of Labor, *Census of Manufacturing Industries of Puerto Rico*, various years.

Puerto Rico, Planning Board, *Puerto Rico Income and Product Accounts* (unpublished data).

Table 2.—Net Income from Food Processing and Manufacturing as a Percentage of Manufacturing Sector Net Income

	1947	1949	1955	1960	1965	1967	1970	1972	1975	1976	1977
SIC-20 net income as a percentage of sector net income	52.5	49.4	29.4	23.1	22.6	19.4	16.8	15.3	14.1	12.7	10.8

Source: Puerto Rico Planning Board, *Income and Product Accounts*.

In contrast to property income, the labor income is almost totally income to Puerto Rico.

Total sales increased (including a large element of price increases) from \$675.2 million in 1967 to \$1,632 million in 1977. However, food processing industry sales as a percentage of total manufacturing sales fell from 29.7 percent in 1967 to 16.2 percent in 1977.

Employment in the industry has shown no particular trend. It decreased from 23,242 in 1949 to 17,082 in 1958, rose to a high of 27,739 in 1972, and then declined to 24,171 in 1976. In terms of percentage of total sector employment, there was a fall from 42.2 percent in 1949 to 16.7 percent in 1976. In spite of the decline in percentage of sector employment, however, employment in the industry in 1976 was second only to that in the apparel industry and was almost more than twice that of the third largest industry group employer (electrical and electronic machinery).

In October 1976, there were 364 food industry establishments in Puerto Rico. Of this total, 105 establishments operating 182 plants had been promoted by Fomento. Of the 182 plants, 40 were in canned and preserved fruits and vegetables, 31 in bakery products, 27 in meat products, and 26 in miscellaneous food preparations and kindred products.

As of October 1976, the industry was predominantly locally owned with 123 (65 percent) of the Fomento promoted plants. Fifty-five (29 percent) of the Fomento plants were mainland-owned and 11 (5.8 percent) were foreign owned.

Among the leading U.S. firms with more than one operation are Goya Foods, Libby McNeill and Libby, Nebraska Consolidated Mills, Beatrice Food, Coca-Cola Bottling, Ralston Purina, and Seagrams Ltd. The better known local firms, which also export to the mainland, include LaFamosa, Casera Foods, India, Flanes Cedo, Corona, and Congelados Criollos.

In 1940 and 1950 the industry group was dominated by sugar milling, which produced 70 percent of the industry group's contribution to net income in 1940, 1947, and 1950. Even by 1954, its contribution was more than half (58.3 percent) that of the group. By 1963, however, its share had fallen to 30.4 percent and in 1972, was only 4.3 percent. It is shown as being 12.5 percent in 1975 and 1977. It provided 63.3 percent (14,705) of industry group employment in 1949. Employment fell to 6,032 in 1967 and then rose to 8,848 in 1972, about 32 percent of total employment in the industry group. It is estimated that in 1976, the industry employed only about 3,800 workers, providing only about 16 percent of the industry group's employment in that year.

Among the myriad of problems faced by the long-

declining sugar industry, according to a high official of the Sugar Corporation of Puerto Rico, are the high cost of production relative to current market price. It was estimated that in 1977, Puerto Rico lost about \$37 million on the 120,000 tons of sugar it shipped to the mainland. Among the high production costs is the cost of labor, which is continuing to escalate in this labor-intensive industry.

Additional difficulties faced by the industry are rising capital, fuel, water, and shipping costs; increasing expenditures on pollution control equipment needed for industry compliance with Federal environmental regulations; and insect infestation. All these factors contributed to substantial losses in recent years for the Sugar Corporation which produces about 65 percent of the island's sugar.

The sugar industry is presently subsidized by a Federal price support system which guarantees sugar farmers a minimum of 13.5 cents a pound. The program is worth about \$20 million a year to Puerto Rico.¹ The Puerto Rican government plans to take out of sugar cultivation 15,000 acres of land and to produce only enough sugar for local consumption plus a slight surplus. Mechanization of the industry, currently 50 percent, is expected to increase another 20 percent in the coming years. The Government is currently considering the processing in Puerto Rico of a more highly refined variety of sugar to substitute for some of the estimated 20,000 tons imported a year for sale to the pharmaceutical and soft drink industries.

The beverages and bakery products industries were the only industries, other than sugar, which were significant to the food processing and manufacturing group until the mid-1960's. In terms of industry group contribution to net income in 1949, beverages and bakery products provided 8.5 percent each. By 1958, their contribution had become 29.3 percent and 9.4 percent, respectively. In 1949, the beverage industries employed 3,174 (13.7 percent of industry group employment) and 2,750 (11.8 percent) were employed in the bakery products industry. By 1963, these industries provided 18.6 percent and 11.7 percent, respectively, of total employment in the industry group. (See tables 3 and 5.)

In the mid-1950's these industries grew more slowly while others, particularly dairy products, grain mill products, canned and preserved fruits, vegetables and seafood, and beverages began to develop.

¹ In May of 1978 a 17.5-cent price support bill for domestic sugar was cosponsored by Puerto Rico's resident commissioner. The bill as introduced to the U.S. Congress would replace the current 13.5-cent price support program, which expires this year, with a program which, in addition to supporting the price of domestic sugar, would direct the Secretary of Agriculture to set a worldwide import quota after projecting domestic production (including Puerto Rico).

The program, as proposed, could mean an additional \$25 to \$30 million a year for the Puerto Rican sugar cane industry which is presently producing 280,000 tons a year at a cost of 26 cents a pound.

Table 3.—Food Processing Industry Contribution to Net Income
[Amounts in millions of dollars]

Industry group	1949		1954		1958		1963		1967		1972		1975	
	Amount	Percent- age of sector	Amount	Percent- age of sector	Amount	Percent- age of sector	Amount	Percent- age of sector	Amount	Percent- age of sector	Amount	Percent- age of sector	Amount	Percent- age of sector
Total:														
All firms	40.2	49.4	50.3	32.4	57.4	25.4	109.3	24.2	130.4	19.4	187.8	15.0	285.4	15.8
Promoted firms	NA		0.7	.45	2.2	1.0	15.4	3.4	37.8	5.6	84.8	6.8	143.7	8.0
Sub-groups														
Bakery products:														
All firms	3.4	8.5	3.7	7.4	5.4	9.4	8.0	7.3	12.5	9.7	14.1	7.5	23.2	8.1
Promoted firms	—		—		—		—		3.3	2.5	4.3	2.3	8.4	2.9
Sugar:														
All firms	30.8	76.6	29.3	58.3	24.3	42.3	33.2	30.4	25.8	19.8	8.0	4.3	35.6	12.5
Promoted firms	—		—		—		—		—		—		—	
Beverages:														
All firms	3.4	8.5	9.6	19.1	16.8	29.3	29.6	27.1	41.6	31.9	76.6	40.8	83.4	29.2
Promoted firms	—		—		—		—		4.3	3.3	19.7	10.5	26.6	9.3
Alcoholic beverages:														
All firms	2.2	5.5	7.7	15.3	14.4	25.1	24.1	22.0	28.7	22.0	44.9	23.9	46.3	16.2
Promoted firms	—		—		—		—		.2	.15	.4	.2	4.7	1.6
Soft drinks:														
All firms	1.3	3.2	1.9	3.8	2.4	4.2	5.4	4.9	12.9	9.9	31.7	16.9	37.1	13.0
Promoted firms	—		—		—		—		4.1	3.1	19.3	10.3	22.0	7.7
Dairy products:														
All firms	NA		NA		NA		NA		12.2	9.4	17.9	9.5	20.9	7.3
Promoted firms	NA		NA		NA		NA		1.3	1.0	.9	.5	1.3	.5
Meat products:														
All firms	NA		NA		NA		NA		2.1	1.6	5.3	2.8	6.7	2.3
Promoted firms	NA		NA		NA		NA		1.9	1.5	4.1	2.2	5.8	2.0
Canned and preserved fruits and vegetables and seafood:														
All firms	NA		NA		NA		NA		19.8	15.2	41.6	22.2	84.1	29.5
Promoted firms	NA		NA		NA		NA		19.6	15.0	41.2	21.9	82.0	28.7
Grain mills:														
All firms	NA		NA		NA		NA		5.8	4.4	11.6	6.2	16.1	5.6
Promoted firms	NA		NA		NA		NA		5.8	4.4	11.6	6.2	16.1	5.6

NA—Not available.

Source: Puerto Rico Planning Board, *Income and Product Accounts, 1975*.

In 1972, SIC-20 plants in Puerto Rico shipped a total of \$970,586,000 in products. Of this, beverages, sugar and confectionary products, miscellaneous food and kindred products, dairy and grain mill products, accounted respectively for \$281.2 million, \$110 million, \$268.4 million, \$101.1 million, and \$91.8 million, or 88 percent of the total for that year. Table 4 shows shipments by industry subgroups in 1958, 1963, 1967, 1972, and 1977 and the percentage such shipments were of total food industry shipments. The marked decline in the importance of sugar is clearly reflected in this table. While the total value of SIC-20 industrial shipments more than tripled between 1958 and 1972, that of sugar and confectionery products declined over the same period by almost one-third, with shipments as a percentage of all food shipments declining from about 51 percent to 11.3 percent.

Beverages (SIC-207) and miscellaneous foods and kindred products have shown marked increases as percentage of total shipment values between 1958 and 1972. The increase in value of beverage shipments reflects (at least between 1958 and 1967) a relative increase in the value of distilled nonbrandy liquor (primarily rum) shipments. In 1958, for example, the shipment of distilled nonbrandy liquors (SIC-2085) amounted in value to \$14.9 million, or 26.6 percent of the total of \$56 million for all beverages. By 1967, such shipments had risen to \$81.4 million, or 44.8 percent of the total valuation of \$181.8 for all beverages, apparently reflecting an increase in rum production. Soft drinks also reached some importance after 1967 and by 1972 shipments of this subgroup accounted for about 35 percent of

beverage shipments and over 10 percent of all food shipments.

Miscellaneous foods and kindred products shipments increased suddenly in value after 1967, reflecting the inclusion of canned and cured seafoods as components of this subgroup. Their shipment value rose from \$70.7 million in 1967 to \$227.5 million 5 years later, an increase of about 222 percent.

The distribution of employment by industries within the group is shown by table 5. As may be seen from this table, the largest employers in 1972 were the sugar, seafood canning, and beverage industries. Within the beverage industry, beer was the largest employer, closely followed by soft drinks. Employment in the dairy products industry was slightly larger than that in the beer industry. Comparable data by industry group is not available for later years. It does appear, however, from such data as is available that employment in the sugar industry has continued its sharp decline.

All the indicators of the importance of various subgroups, as measured by percentage contribution to group sales, employment, and net income, reflect the present importance of the beverage, sugar, and seafood canning industries.

INDUSTRY TRENDS

The food processing industry, as a contributor to manufacturing sector sales, net income, and employment, has been declining continuously since 1947. However, it is still an important industry group and

Table 4.—Food Product Industry Subgroup Shipments

[Dollar value in million of dollars]

Industry group	1958		1963		1967		1972		1977	
	Dollar value	Percent-age of SIC-20	Dollar value	Percent-age of SIC-20	Dollar value	Percent-age of SIC-20	Dollar value	Percent-age of SIC-20	Dollar value	Percent-age of SIC-20
Total group										
U.S. Bureau of the Census	301.2		553.6		675.2		970.6			
P.R. Planning board worksheets					669.0		891.6		1,631.6	
Subgroups										
Meat products	(D)		4.1	0.7	15.7	2.3	28.7	3.0		
Dairy products	29.4	9.8	53.2	9.6	76.5	11.3	101.1	10.4		
Canned and frozen products	17.0	5.6	62.4	11.3	104.2	15.4	55.2	5.7		
Grain mills	(D)		59.4	10.7	71.8	10.6	91.8	9.5		
Bakery products	18.3	6.1	25.5	4.6	32.7	4.8	34.5	3.6		
Sugar and confectionery	152.9	50.8	200.8	36.3	164.1	24.3	109.7	11.3		
Beverages	56.0	18.6	121.4	21.9	181.9	26.9	281.2	29.0	457.7	28.1
a. Alcoholic	43.7	14.5	54.1	9.8	141.4	20.9	177.9	18.3		
b. Soft drinks	12.0	4.0	(D)		(D)		98.0	10.1		
Miscellaneous food and kindred products ²	24.7	8.2	26.8	4.8	28.4	4.2	268.4	27.7		

(D)—Withheld to avoid disclosing figures reported by individual companies.

¹ This figure is value of shipments of distilled liquor except brandy only.

² Includes canned and cured seafood.

Sources: U.S. Bureau of the Census, Economic Census of Outlying Areas, *Puerto Rico: Census of Manufactures*, 1963, 1967, and 1972. (Washington, D.C.: Government Printing Office.)

Puerto Rico Planning Board, *Income and Product Accounts* (unpublished and worksheet data).

Table 3.—Food Industry Employment

Industry group	1949		1954		1958		1963		1967		1972		1976	
	Total	Percent- age of sector	Total	Percent- age of sector	Total	Percent- age of sector	Total	Percent- age of sector	Total	Percent- age of sector	Total	Percent- age of sector	Total	Percent- age of sector
Total food industry	23,243	42.2	18,864	27.3	17,082	24.8	21,141	21.4	21,187	17.4	27,739	18.5	24,171	16.7
SUBGROUPS														
Meat products	NA		(D)		(D)									
Dairy products	311	1.3	928	4.9	1,357	7.9	1,849	8.7	2,532	12.0	2,193	2.2	NA	8.7
Canned and preserved fruits and vegetables	1,132	4.9	1,158	6.1	913	5.3	1,283	6.1	1,295	6.1	1,311	7.9	2,100	NA
Seafood, canned	NA		(D)		(D)		1,924	9.1	2,380	11.2	3,687	20.5	NA	NA
Bakery products	2,750	11.8	2,486	13.2	2,483	14.5	2,483	11.7	2,503	11.8	1,923	6.9	2,577	10.7
Sugar and confectionary products	14,705	63.3	9,990	53.0	7,894	46.2	8,013	37.9	6,032	28.5	8,848	31.9	3,814	15.8
All beverages	3,174	13.7	3,101	16.4	3,292	19.3	3,938	18.6	4,588	21.7	5,356	19.3	4,474	18.5
a. Malt Beverages	799	3.4	(D)		1,119	6.6	1,365	6.5	1,499	7.1	2,108	7.6	2,747	11.4
b. Alcoholic Beverages	1,512	6.5	1,137	6.0	1,196	7.0	1,286	6.1	1,462	6.9	1,553	4.9	1,727	7.1
c. Soft Drinks	863	3.7	861	4.6	947	5.5	1,248	5.9	1,567	7.4	1,758	6.3	NA	NA
Miscellaneous food and kindred products *	1,085	4.7	906	4.8	608	3.6	819	3.9	754	3.6	1,102	4.0		

* Does not include wine.

* Excluding canned seafood after 1972.

NA—Not available.

(D)—Withheld to avoid disclosing figures reported by individual companies.

Sources: U.S. Bureau of the Census, Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures, 1958, 1963, 1967, and 1972. (Washington, D.C.: Government Printing Office.)
Puerto Rico, Department of Labor, Census of Manufacturing Industries.

Table 6.—Labor Income as a Percentage of Total Group Net Income

	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Food and kindred products (SIC-20)											
Manufacturing sector percentage	61.9	62.8	63.4	62.6	62.0	58.5	54.6	49.5	49.7	43.1	40.7
Food and kindred products percentage	68.0	65.4	66.7	68.4	66.8	72.5	73.8	69.5	66.7	62.5	69.4
Rank of SIC-20 out of 25 industry groups	11	14	15	14	13	12	10	10	10	11	8

Source: Puerto Rico Planning Board, *Income and Product Accounts* (unpublished worksheet data).

as of 1977 it was the manufacturing sector's second largest employer after apparel and third largest contributor to sector net income after chemicals and allied products and electrical machinery. The historic dominance of the sugar industry has given way to the now larger and growing beverage and seafood industries. These three industry subgroups accounted for over 75 percent of the major groups exports to the United States in 1976.

Linkages

The portion of industry group shipments which went to onisland customers during the period from 1963 to 1972, as presented in table 7, remained relatively constant at about 60 percent, with total onisland sales in 1963 of about \$323.5 million, increasing to \$548.5 million in 1972. However, the Puerto Rican share of the Puerto Rican market declined somewhat in this time period from 62 percent of the value of total local sales in 1963 to about 53 percent in 1972.

Food industry shipments to other Puerto Rican manufacturers remained relatively constant at 10 percent of the group's Puerto Rican shipments, increasing from \$32.9 million in 1963 to over \$54.7 million in 1972.

Some notable changes in onisland shipment occurred in the beverage industry. Onisland sales as a percentage of the value of shipments decreased from a high of 69.4 percent (\$125.6 million) in 1967 to 54.3 percent (\$152.3 million) in 1972. Soft drink onisland sales decreased from 94.2 percent of the value of shipments in 1967 to 68.3 percent in 1972. By customer class, beverage sales had shifted from an almost equal division between wholesalers and retailers in 1967 to a dominance in 1972 by retailers (61.7 percent of the subgroups' onisland shipments) followed by wholesalers (26.3 percent). Beverage shipments in Puerto Rico to other manufacturing enterprises increased significantly from one-tenth of one percent in 1963 to 10.2 percent in 1972.

Onisland sales from the sugar industry in 1963 and 1967 accounted for about 30 percent of the value of this subgroup's shipments. Cane sugar refining industry shipments to Puerto Rico almost doubled both as an amount and as a percentage of all shipments. In 1963, cane sugar refining onisland shipments amounted to about \$17.4 million or 38.7

percent of the value of all shipments, by 1972 they had increased to about \$33.3 million or 70.2 percent of all shipments.

As has been seen in table 7, virtually all bakery products (about 90 percent) are sold locally, while virtually all seafood products (mostly tuna) are exported.

Environmental Demands

The food processing industry's consumption of fuels and electricity is a small percentage of the total cost of materials for the industry, relative to such costs for the manufacturing sector as a whole. Between 1967 and 1972, fuels and electricity costs rose from over \$6.6 million to about \$9.6 million, but as a percentage of total materials cost, they remain constant at about 1.7 percent. The manufacturing sector's fuels and electricity costs rose from \$34.8 million to \$77.6 million, an increase of over 120 percent. These costs as a percentage of total materials cost increased from 2.8 percent in 1967 to 3.7 percent in 1972. The industry's biggest consumers by value of fuels and electricity are sugar, beverages, and dairy products. In 1967, these three subgroups accounted for 81 percent of the cost of fuels in the food processing industry with sugar alone accounting for over half. In the same year, the cost of the electricity they consumed was 63 percent of that for the industry as a whole. In 1972, the latest year for which such information is available, the beverage and dairy products industries consumed by value about 26.3 percent of the fuels and 36.3 percent of the electricity of the food processing industry as a whole. Information for the sugar industry is not available.

EARNINGS, COSTS, AND COMPETITIVE POSITION (PRODUCTIVITY AND PROFITABILITY)

The productivity and profitability of the food processing industry as a whole has been variable over time. The rate of return on equity of Fomento assisted firms filing income tax returns in the years in question increased significantly from 4.3 percent in 1960 to 26.8 percent in 1968. In the 1970's, the rate fell. It was lowest in 1974 at 7.4 percent, rising back

Table 7.—Food Processing Onisland Linkages
(In thousands of dollars)

Products shipped and contract receipts in Puerto Rico--												
Value of shipments	Total	On-island sales as a percentage of value	Wholesale shipments	As a percentage of Puerto Rican shipments	Retailers	As a percentage of Puerto Rican shipments	Domestic consumers	As a percentage of Puerto Rican shipments	Other manufacturing enterprises	As a percentage of Puerto Rican shipments	Others including government	As a percentage of Puerto Rican shipments
1963												
Food and kindred products (SIC-20)												
Sugar	\$541,709	\$323,537	59.7	\$123,268	38.1	\$124,075	38.3	\$33,153	\$32,938	10.3	\$10,102	3.1
a. Cane sugar refining	195,824	56,792	29.0	27,082	47.7	329	.6	107	28,982	2	292	.5
Beverages	44,853	17,339	38.7	14,795	85.3	49	.3	—	2,321	13.3	174	1.0
a. Distilled liquor except brandy	120,942	96,328	63.1	28,564	29.7	65,311	67.8	821	78	.1	1,554	1.6
b. Soft drinks	54,056	31,653	58.6	14,695	46.4	15,801	49.9	—	78	.3	1,079	3.4
Bakery products	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Seafood, canned and cured	19,957	18,025	90.3	6,855	38.0	6,646	36.9	2,655	687	14.7	1,182	6.6
	40,888	732	1.8	92	12.6	30	4.2	3	459	.4	146	20.0
1967												
Food and kindred products (SIC-20)												
Sugar	658,567	415,218	63.1	172,524	41.6	130,904	31.5	34,370	40,961	8.3	36,522	8.8
Beverages	156,606	52,674	33.6	21,108	40.1	(D)	—	(D)	(D)	—	(D)	—
a. Distilled liquor except brandy	181,113	125,636	69.4	61,756	49.2	62,206	49.5	(D)	483	.4	(D)	—
b. Soft drinks	81,059	44,131	54.4	24,070	54.5	18,525	42.0	(D)	(D)	—	(D)	—
Bakery products	28,134	26,309	94.2	(D)	(D)	25,802	97.3	(D)	(D)	—	(D)	—
Seafood, canned and cured	24,876	22,910	92.1	9,616	42.0	6,931	30.3	(D)	(D)	—	(D)	—
	70,701	(D)	—	2,741	—	—	—	—	(D)	—	(D)	—
1972												
Food and kindred products (SIC-20)												
Sugar (cane sugar refining only)	958,127	548,476	57.2	191,926	35.0	233,930	42.7	54,323	54,756	9.8	13,541	2.5
Beverages	47,395	33,277	70.2	28,277	85.0	—	—	—	5,000	10.0	—	—
a. Distilled liquor except brandy	280,351	152,329	54.3	40,104	26.3	93,941	61.7	2,604	15,492	1.7	188	0.1
b. Soft drinks	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bakery products	97,691	66,768	68.3	3,964	5.9	49,771	74.5	2,593	10,329	3.9	111	.2
Seafood, canned and cured	31,214	27,980	89.6	10,580	37.8	15,420	55.1	1,901	11	6.8	68	.2
	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

¹ Less than one-tenth of one percent.

NA—not available.

(D)—Withheld to avoid disclosing figures reported by individual companies.

Source: U.S. Bureau of the Census, Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures, 1963, 1967, and 1972. (Washington, D.C.: Government Printing Office.)

Table 8.—Rates of Return

Item	1960	1963	1967	1968	1970	1972	1973	1974	1975	1977
Return on equity (Fomento firms filing income tax returns)	4.3	26.4	23.0	26.8	15.7	13.0	13.5	7.4	17.2	—
Return on sales (Fomento firms filing income tax returns) .....	.7	5.2	8.9	12.1	12.6	21.3	12.9	6.0	7.8	—
Return on sales (all SIC-20 firms)	NA	NA	5.5	6.7	5.4	5.9	5.5	6.6	7.7	6.7
Return on sales—beverages	NA	NA	8.1	10.5	9.6	11.2	9.2	11.3	12.2	13.7
Return on sales (entire manufacturing sector)	NA	NA	11.7	11.7	11.0	12.5	13.7	13.3	12.6	17.2

NA—not available.

Sources: Unpublished data provided by Fomento. U.S. rates calculated from the U.S. Federal Trade Commission, *Quarterly Financial Report for Manufacturing, Mining, and Trade Corporations*, various years. U.S. rates are for profits after taxes. Puerto Rican rates are for corporations receiving tax exemptions.

to 17.2 percent in 1975. Data on return to equity is not available in later years.

Profits on sales from such firms rose from 0.7 percent in 1960 to 21.3 percent in 1972 and then fell to 7.8 percent in 1975. The rate of profits to sales for the entire food processing industry (Fomento-promoted and nonpromoted), a rate which is likely to be lower than for Fomento firms filing income tax returns, increased slightly from a low of 5.5 percent in 1967 to 6.7 percent in 1977.

Return on sales for the beverage industry has consistently been higher than for the industry as a whole, rising from a low of 8.1 percent in 1967 to a high of 13.7 percent in 1977. The rates of profits by years are shown in table 8 below.

The slightly improving ratio of profits to sales suggests some increase in productivity in the industry paralleling that of the entire manufacturing sector. A similar trend, as shown in table 9, in the relation of profits to total costs indicates that total costs were increasing at the same or at a somewhat faster rate as selling prices.

Table 9.—Profit as a Percentage of Total Costs

	1968	1970	1972	1974	1975	1976	1977
Percentage	7.2	5.7	6.3	7.1	8.3	9.0	7.1

Source: Puerto Rico Planning Board, *Income and Product Accounts* (unpublished worksheet data).

Wage costs as an element of total costs, have changed as follows:

Table 10.—Wages and Benefits as a Percentage of Total Costs

	1968	1970	1972	1974	1975	1976	1977
Percentage	14.1	14.1	17.0	15.5	15.6	14.6	14.0

Source: Puerto Rico, Planning Board, *Income and Product Accounts* (unpublished worksheet data).

No trend in wage rates as a portion of total costs is clearly evident.

Output per worker in 1967 was \$31,870 as com-

pared with \$28,972 in 1974 and \$32,909 in 1976, in constant prices.²

Average wages and benefits per employee in the food processing industry in 1967 were \$4,162, by 1976 they had increased to an average of \$7,837. In 1972, the food processing industry's average wage of \$5,139 per employee was only slightly higher than the average wage per employee of \$5,017 for the manufacturing sector as a whole. By 1976, the average wage per employee of \$7,837 was slightly lower than the average wage per employee of \$7,992 for the manufacturing sector as a whole.

In 1972, value added per employee in the industry as a whole was \$12,381. This compares with \$12,791 for the Puerto Rican manufacturing sector as a whole and with \$22,265 for the food processing group on the mainland.

The differential between value added per employee in the food processing industry on Puerto Rico versus the mainland was narrowing between 1958 and 1967, shifting from a value in 1958 that was only 54 percent of that for the United States to a 1967 value added per Puerto Rican worker that was over 75 percent of the U.S. figure. However, by 1972, the differential had returned to the 1958 figures. (See table 11.)

Table 11.—Food Processing Industry Productivity

Year	Output per employee		Value added per employee	
	Puerto Rico	United States	Puerto Rico	United States
1958	\$17,634	\$34,776	\$5,598	\$10,303
1963	26,187	41,661	8,972	13,281
1967	31,870	50,906	12,264	16,138
1972	34,990	73,314	12,381	22,695

Sources: U.S. Bureau of the Census, *Census of Manufactures-Industry Statistics* (various years). (Washington, D.C.: Government Printing Office.)

U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures* (various years). (Washington, D.C.: Government Printing Office.)

A similar, but less dramatic trend occurred in the U.S./Puerto Rico differential in output per employee.

² The U.S. Department of Labor Wholesale Price Index for processed foods and feeds was used to deflate 1974 and 1976 sales prices to constant dollars.

Two indicators of productivity for three of the most important food processing industry subgroups, namely sugar and confectionery, beverages, and canned and cured seafood, are presented in tables 12, 13, and 14, respectively. The decline of the sugar industry becomes apparent, most notably between 1967 and 1972 when shipments per employee declined 54.4 percent from \$27,202 to \$12,397 and value added per employee fell 49.3 percent from \$9,729 to \$4,928. (See table 12.)

Table 12.—Sugar and Confectionery Productivity

Year	Output per employee		Value added per employee	
	Puerto Rico	United States	Puerto Rico	United States
1958	\$19,366	\$30,292	\$4,888	\$10,030
1963	25,058	39,785	7,332	14,075
1967	27,202	43,854	9,729	16,667
1972	12,397	61,812	4,928	23,090

Sources: U.S. Bureau of the Census, *Census of Manufacture-Industry Statistics* (various years). (Washington, D.C.: Government Printing Office.)

U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures* (various years). (Washington, D.C.: Government Printing Office.)

Productivity in the beverage industry, as measured by output (shipments) and value added per employee, increased rapidly between 1958 and 1972, more rapidly than in both the Puerto Rican food processing industry as a whole and in the U.S. beverage industry. Output per employee increased over 200 percent, rising from \$16,998 in 1958 to \$52,510 in 1972. In the United States, output per employee increased only 149 percent. Value added per employee in 1972 was \$28,994, an increase of 188 percent over the 1958 figure of \$10,051. In the same time period, value added per employee in the United States increased only 128 percent from \$13,804 in 1958 to \$31,507. Puerto Rican value added per employee in the beverage industry in 1972 was 92 percent of the figure for the United States. (See table 13.)

Table 13.—Beverages Industry Productivity

Year	Output per employee		Value added per employee	
	Puerto Rico	United States	Puerto Rico	United States
1958	\$16,998	\$26,190	\$10,051	\$13,804
1963	30,829	33,715	18,244	18,205
1967	39,636	41,245	26,175	21,704
1972	52,510	65,329	28,994	31,507

Sources: U.S. Bureau of the Census, *Census of Manufacture-Industry Statistics* (various years). (Washington, D.C.: Government Printing Office.)

U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures* (various years). (Washington, D.C.: Government Printing Office.)

Output per employee in the seafood subgroup increased most rapidly between 1967 and 1972, grow-

ing from \$29,706 per employee to \$40,010, an increase of over 88 percent. However, output per worker in Puerto Rico was still only about 80 percent of that per worker in the United States. Value added per employee increased 78 percent between 1967 and 1972 from \$4,702 to \$8,377. In the United States, the corresponding increase was only 26 percent, rising from \$11,456 to \$14,463. (See table 14.)

Table 14.—Cured and Canned Seafood Productivity

Year	Output per employee		Value added per employee	
	Puerto Rico	United States	Puerto Rico	United States
1958	(D)	\$22,725	(D)	\$7,637
1963	\$21,252	26,156	\$7,056	10,092
1967	29,706	33,108	4,702	11,456
1972	40,010	50,613	8,377	14,463

D—data unavailable.

Sources: U.S. Bureau of the Census, *Census of Manufacture-Industry Statistics* (various years). (Washington, D.C.: Government Printing Office.)

U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures* (various years). (Washington, D.C.: Government Printing Office.)

DEMAND AND PROSPECTS FOR LOCAL AND EXPORT MARKET

The evidence suggests that the market for foods processed in Puerto Rico is increasing. The increase in sales from \$675.2 million in 1967 to \$1,631.6 million in 1977 is indicative of this fact; as is the estimated 114 percent increase in exports from \$216.3 million in 1967 to \$463 million in 1976. However, the Puerto Rican share of the Puerto Rican market decreased from 62 percent in 1963 to 59.5 percent in 1967 to 53.1 percent in 1972.

Both local and export demand for processed foods increased as indicated in table 15.

Table 15.—Local and Export Markets for Processed Food Products

[In millions of dollars]

	1963	1967	1972	1976
Onisland sales from local production	\$323.5	\$415.3	\$548.5	NA
Imports	199.5	282.9	484.7	806.0
Total local demand	523.0	698.2	1,033.2	NA
Exports	178.3	216.3	280.4	463.0
Total demand	701.3	914.5	1,313.6	NA

NA—not available.

Sources: U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures*, 1963, 1967, and 1972. (Washington, D.C.: Government Printing Office.)

U.S. Bureau of the Census, *U.S. Trade with Puerto Rico and U.S. Possessions*, FT 300/ 1963, 1967, 1972, and 1976 annuals. (Washington, D.C.: Government Printing Office.)

Meat products have dominated Puerto Rican food imports since 1967, accounting for over 25 percent of the value of food product shipments from the

United States. The composition of Puerto Rican exports to the United States has changed in the past 10 years, shifting from a market dominated by sugar (79.5 percent of the value of shipments in 1967) to one dominated by tuna (55.3 percent of 1976 shipments by value). Rum, as an export item to the United States, has increased its value almost five times (from \$10.9 million in 1967 to \$53.5 million in 1976) and almost doubled its percentage contribution to the value of shipments (from 6.1 percent to 11.6 percent). Together, tuna (\$256.1 million), rum (\$53.5 million), and sugar (\$50.3 million) accounted for over 77 percent of the \$463 million worth of exports to the United States in 1976.

THE FUTURE OF THE FOOD PROCESSING INDUSTRY IN PUERTO RICO

The food industry has experienced good growth recently with consumer demand for food and kindred products increasing at an average annual rate of 13 percent compounded during the last 5 years.

Scheduled to start operations during 1978, are eight new local and stateside food firms. Also some established firms are planning to expand their present facilities to meet both local and export demand. The potential jobs that will be created by these new operations and expansions is estimated at well over 1,400 with a planned investment of over \$23 million.

Fomento plans to assist the industry by providing

a new incentive whereby it would pay up to \$10,000 or 50 percent of the cost of installing quality control systems for food manufacturing operations.

One factor which could slow down the industry potential growth is the increased cost of labor, which, as of January 1978, is paid at the new minimum wage rate of \$2.65 an hour. Another factor that threatens one major sector of the industry is the National Marine Fisheries Service quota for porpoise kills. (The schools of tuna and porpoises intermingle and the porpoises caught often drown in the process of netting tuna.) The quota for 1978 is 52,000. However, the quota gets smaller every year, declining to 41,610 in 1979 and 31,150 in 1980.

Although most industry spokesmen say that they can live within these limitations, there has been some indication of concern over such Federal regulations. Out of a total of 49 tunaboats registered in Puerto Rico, five have already transferred to foreign registries and six more are in the process of receiving approval from the Federal Maritime Administration. (*Caribbean Business*, Jan. 12, 1978, p. 3.) Also, it has been rumored that one of the larger packers, employing almost one-half of the workers, is giving serious consideration to relocating elsewhere, possibly Mexico.

It should be noted, however, that any vessel, even under another nation's flag, must put up bond and agree to abide by U.S. regulations when fishing in U.S. waters. Nevertheless, the Federal Government will face difficulty obtaining adherence to the regulations among its own tunaboats.

The Stone, Clay, and Glass Products Industry (Except Some Manufacturers' Mining, Quarrying, and Preparation Activities) in Puerto Rico

INDUSTRY DEFINITION

This major SIC group includes establishments engaged in manufacturing flat glass and other glass products, cement, structural clay products, pottery, concrete, and gypsum products, cut stone, abrasive and asbestos products, etc., from materials mined principally from the earth in the form of stone, clay, and sand.¹

For U.S. Bureau of the Census reporting purposes, this industry group comprises the following subgroups:

- a. SIC-321: Flat glass.
- b. SIC-322: Glass and glassware, pressed or blown.
- c. SIC-323: Glass products, made of purchased glass.
- d. SIC-324: Cement, hydraulic.
- e. SIC-325: Structural clay products.
- f. SIC-326: Pottery and related products.
- g. SIC-327: Concrete, gypsum, and plaster products.
- h. SIC-328: Cut stone and stone products.
- i. SIC-329: Abrasive, asbestos, and miscellaneous nonmetallic mineral products.

Since 1954, all of the above subgroups, with the exception of SIC-321 which manufactures flat glass,

¹ U.S. Executive Office of the President, Office of Management and Budget, Statistical Policy Division, *Standard Industrial Classification Manual*, at 137 (1972). (Hereinafter, 1972 SIC Manual.)

have been represented in the Puerto Rican manufacturing sector.

SIZE AND GROWTH

This group's net income grew steadily from \$3.3 million in 1947 to \$76.8 million by 1974, declining over the next 3 years to \$72.7 million. Its net income above of Puerto Rico's total manufacturing net income grew unevenly from 3.6 percent in 1947 to 7.3 percent of total manufacturing net income by 1960, declining over the next 17 years to 2.6 percent, as the figures in table 1 below indicate. It ranked sixth among all industry groups in 1977, as far as the size of its net income contribution as shown is concerned.

Total sales between 1967 and 1974 increased from \$109 million to \$264.6 million—or by 143 percent, a trend which in part reflects the effects of inflation. In real terms (1954) total sales increased only 78 percent from \$75.5 million in 1967 to \$134.7 million in 1974 (implicit price deflator—gross product 1975). Sales declined thereafter by 8.2 percent, to \$242.9 million in 1977. Sales of stone, clay, and glass products declined from 4.8 percent in 1967 to 2.4 percent in 1977 as a percentage of total manufacturing sales. (See table 2.)

In 1977, total sales of this industry ranged 12th of those for the manufacturing sector's 20 industries. The data suggests that the years 1975-76, and

Table 1.—Net Income from Stone, Clay, and Glass Products as a Percentage of Manufacturing Sector Net Income

	1947	1950	1955	1960	1965	1970	1972	1974	1977
Net income _____ (millions of dollars) _____	3.3	4.8	11.1	21.0	32.2	49.1	66.0	76.8	72.7
Total manufacturing net income _____	92.5	88.6	109.1	288.7	552.5	859.5	1,282.7	1,869.1	2,844.9
Percentage (1) of (2) _____	3.6	5.4	6.6	7.3	5.8	5.7	5.1	4.1	2.6

Source: Puerto Rico Planning Board, *Income and Product Accounts*.

Table 2.—Selected Economic Data on the Puerto Rican Stone, Clay, and Glass Products Industry (SIC-32) Selected Years

	1954	1958	1963	1967	1972	1973	1975	1976	1977
1. Number of establishments	132	171	228	235	189	251	217	199	—
2. Total number of employees	3,127	4,131	5,263	6,211	6,250	7,239	6,169	5,333	—
3. Employment as a percentage of sector employment	4.5	5.8	5.3	5.1	4.2	4.7	4.5	3.7	—
4. Sales	—	37.8	68.7	109.0	130.5	219.9	240.7	254.5	242.9
5. Sales as a percentage of sector sales	—	4.9	4.6	4.8	3.2	4.3	3.1	2.9	2.4
6. Net income	8.4	15.2	30.5	41.0	66.0	72.5	71.9	62.9	72.7
7. Net income as a percentage of sector net income	5.4	6.8	6.7	6.1	5.1	4.7	3.7	2.6	2.6
8. Value-added by manufacturer	9,245	19,251	37,561	58,580	73,059	—	—	—	—

Sources: U.S. Bureau of the Census, Economic Censuses of Outlying Areas, *Puerto Rico: Census of Manufacturers*, 1963, 1967, and 1972. (Washington, D.C.: Government Printing Office.)
 Puerto Rico, Department of Labor, *Census of Manufacturing Industries of Puerto Rico* (various years).
 Puerto Rico, Planning Board, *Puerto Rico Income and Product Accounts* (unpublished data).

1977 were unusual in the industry. In 1975, sales fell sharply (from \$264.6 million in 1974 to \$240.7 million), labor income remained virtually constant, and profits almost disappeared. In 1976, sales rose to \$254.5 million, labor income fell by 12 percent, and profits were even less than in 1975. In 1977, sales fell again to almost their 1975 level, labor income continued to decline, but profits were higher than in any other of the 11 years for which we have data. Employment declined from 6,169 to 5,333 between 1975 and 1976.

It is not clear without further analysis just what happened (the sharp decline in the construction sector must have been a factor in the fall in sales and profits) and obviously the very low level of profits in 1975 and 1976 produced abnormally high ratios of labor income to net income for those years. However, even if the relationship which existed for 1977 is a portent of the future, the ratio of labor income to net income for the industry would still be markedly higher than that for the sector as a whole and the industry would still rank 9th out of 25 industry groups in that regard. (See table 3.)

Between 1949 and 1974, nonconcrete manufacturing stone, clay, and glass employment rose from 2,562 to a maximum of 7,200, an increase of 181.03 percent. By 1976, however, this number declined to 5,333, apparently in response to a shrinking demand by the construction trades for stone, clay, and glass products. Employees in concrete products manufacturing, however, increased by over ten times in number from 366 in 1949 to 4,202 in 1972. In 1949, their percentage of stone, clay, and glass group employment stood at 14.3 percent. By 1972,

this grew to 67.2 percent, a reflection of the increasing pace of construction throughout Puerto Rico during the Fomento years.

The concrete, gypsum, and plaster products subgroup SIC-327 has grown quickly since 1949 to become the leading subgroup in this industry. As of 1972, this subgroup employed over two-thirds of the industry's workers, accounted for over two-thirds of its sales, and produced about one-third of its contribution to sector net income. (See table 4.)

Table 4.—Importance of Concrete, Gypsum, and Plaster Products, Subgroup SIC-327

	1949	1958	1963	1967	1972
Total number of employees	397	2,003	2,990	3,407	4,202
Employment as a percentage of SIC-32	15.5	48.5	56.8	54.9	67.2
Sales	2.0	15.7	34.0	59.4	85.9
Sales as a percentage of SIC-32	15.9	41.6	49.4	54.5	65.8
Net income	NA	NA	NA	15.4	21.1
Net income as a percentage of SIC-32	NA	NA	NA	37.3	30.3

Sources: U.S. Bureau of the Census, Economic Census of Outlying Areas, *Puerto Rico: Census of Manufacturers* (various years) (Washington, D.C.: Government Printing Office.)
 Puerto Rico Planning Board, *Income and Product Accounts*.

Between 1967 and 1975, the proportion of concrete-related net income to its stone, glass, and clay counterpart declined from 37.3 percent to 26.3 percent, reflecting in part overbuilding in condominiums and a slowdown in commercial building on the island. In other words, absolute net-income growth from concrete production occurred at a slower rate over this period than did that of the stone, clay, and glass industrial group as a whole.

Table 3.—Labor Income as a Percentage of Total Group Net Income

	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Labor income	28,596	26,924	35,467	39,217	42,865	48,968	57,614	59,640	60,299	53,104	49,964
Total net income	41,015	43,811	45,917	49,138	58,764	65,956	72,491	76,773	71,897	62,854	72,709
SIC-32 labor income as a percentage of net income	69.7	61.4	77.2	79.8	72.9	74.2	79.4	77.6	83.8	84.4	68.7
Manufacturing labor income as a percentage of manufacturing net income	61.9	62.8	63.4	62.6	52.0	58.6	54.6	49.5	49.7	43.1	40.7
Rank of SIC-32 out of 25 industry groups	10	16	8	6	9	10	6	5	4	4	9

Source: Puerto Rico Planning Board, *Income and Product Accounts* (unpublished worksheet data).

Concrete-related net income actually declined (from \$24.5 million to \$22.1 million between 1974 and 1975), possibly indicating a combination in the frequency of construction starts.

Respective ratios of equity investment, which includes capital stock, retained earnings, capital surplus, and surplus reserves, to profits for 1954, 1974, and 1975 were 15.6 percent, 25.7 percent, and 2.4 percent. These widely fluctuating values are apparently a reflection of sharply varying response/sample sizes.² In 1975, stone, clay, and glass products industries collectively ranked 9th in equity investment (\$36,916,000) and 19th (along with major SIC-Group 33: primary metal industries) in the percentage of profit to equity, 2.4 percent, as stated above.³ The table below details equity investment figures and profit-to-equity ratios of wholly exempted Fomento plants which filed income tax returns in 1967, 1972, and 1975. Data for 1975 differentiate among stone, clay, and glass plants in general and concrete plants in particular.

Equity Investment (thousands of dollars) and Profit to Equity Ratios (percentage) Fomento Wholly Exempted Plants Which Filed Income Tax Returns for Selected Years

	1967	1972	1975 (stone, clay, and glass)	1975 (con- crete)
Equity ——— (thousands of dollars) ...	14,132	24,655	36,916	7,940
Profit to equity ——— (percentage) —	6.5	17.1	2.4	6.2
Firms reporting ———	40	16	21	8

ENVIRONMENTAL EFFECTS

An industry's demand for scarce resources can, for the most part, be measured by determining its requirements for land, air, water, and production related materials. An intangible demand is also made on environmental esthetics. With the exception of concrete products manufacturing, stone, clay, and glass manufacturing operations in Puerto Rico can be undertaken in relatively compact buildings, requiring no more than nominal amounts of land. Puerto Rican concrete products manufacturers' (SIC-327) plants are numerous, however, and these *do* require additional space for the storage of both raw and semiprocessed materials, as well as finished products (concrete block and brick for the most part). Air and water requirements of manufacturing industries tend to correlate positively with their energy intensity. According to an energy-labor ratio

employed by Ruiz and Zalacain,⁴ the energy-labor ratio of Puerto Rico's stone, clay, and glass industry placed it third of 30 in respect to this criterion.

Between 1967 and 1972, the only 2 years for which U.S. Census Bureau data on the costs of fuels consumed and electricity are available, expenditures for both Puerto Rico's stone, clay, and glass industries decreased from \$7,176,000 to \$2,539,000, thereby dropping by 64.4 percent. Concrete product manufacturers (SIC-327) most strongly represented by U.S. Census Bureau data on consumption, increasingly favored electricity over fuel consumption between 1967 and 1972. During this period, concrete product manufacturers decreased their expenditures for fuels from \$730,000 to \$494,000, a 32.3 percent decrease. In the meantime, their expenditures for electricity rose from \$298,000 to \$389,000, a rise of 30.5 percent.⁵

Resources employed by Puerto Rico's stone, clay, and glass manufacturers are relatively standard, although imports of raw and semifinished materials from the U.S. mainland have increased in value above those provided locally to the industry.

LINKAGES

Raw materials essential for this industry's production activities—sand and limestone in particular—are in relative abundance on Puerto Rico and this fact alone would indicate that its reliance on local raw materials is higher than that of the island's entire manufacturing sector.

Between 1963 and 1967, a sharply decreasing portion of shipments of SIC-32 products went to other manufacturing enterprises. (See table 5 for this discussion and the remarks to follow.) In 1963, Puerto Rico's SIC-32 industries shipped from their plants a total of \$58,077,000 in semifinished and finished manufacture for sale in the local market. Of this amount, \$14,955,000 or 25.8 percent went to other manufacturing enterprises. Respective figures for 1967 were \$92,087,000 and \$8,176,000, indicating a proportional drop in such shipments to 8.88 percent. Favored during this period were shipments to customers not classified elsewhere, including governments. Their purchased shipments increased in value from \$16,626,000 to \$62,004,000, between 1963 and 1967—an increase proportionally to total shipments from 28.6 percent in 1963 to 67.3 percent in 1967.

This trend, however, reversed itself between 1967

² Figures compiled by Mrs. Carmen Tatin, Economic Development Administration, Commonwealth of Puerto Rico (1977).

³ Financial statistics for EDA wholly exempted plants by industry group (three digits) for firms which filed income tax returns as of 1975. (Anon., no date.)

⁴ A. Ruiz and F. Zalacain, *Energy and Economic Development In Puerto Rico: For Input-Output Approach* at table 6 (monograph no date).

⁵ U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures, 1967 and 1972*. (Washington, D.C.: Government Printing Office.)

Table 5.—Major SIC-32 Group Linkages in Puerto Rico, 1963-72 Products Shipped and Contract Receipts
[Thousands of dollars]

Major SIC-32 group	Total	Wholesalers	Retailers	Domestic consumers	Other manufacturing enterprises	Others, including government
1963						
32	58,077	2,974	10,920	12,602	14,955	16,626
327	30,935	2,800	1,378	11,670	213	14,872
1967						
32	92,087	4,984	3,757	13,166	8,176	62,004
325	(D)	(D)	—	3,076	—	(D)
327	54,435	4,343	2,654	9,571	2,816	35,051
328	(D)	(D)	—	—	(D)	484
329	551	(D)	(D)	459	(D)	(D)
1972						
32	110,211	11,339	5,667	23,710	32,496	36,999
327	77,105	10,429	4,817	22,944	7,650	31,265
328	2,106	566	452	20	608	460
329	4,666	—	—	710	31	3,925

(D)—Data withheld to avoid disclosure by individual firms.

Source: U.S. Bureau of the Census, Economic Census of Outlying Areas, *Puerto Rico: Census of Manufactures, 1963, 1967, and 1972*. (Washington, D.C.: Government Printing Office.)

and 1972. Over this period, shipments to others, including manufacturing enterprises, rose almost four times, from \$8,176,000 to \$32,496,000. In the meantime, those to others, including government, dropped by over one-third, from \$62,004,000 in 1967 to \$36,999,000 5 years later. Manufacturers of concrete, gypsum, and plaster products (SIC-327 industries) increasingly favored manufacturing enterprises as customers of their shipments. In 1963, manufacturers received only 0.7 percent of the value of total shipments from SIC-327 industries within Puerto Rico—\$213,000. By 1972, this amount had increased to \$7,650,000—almost a 36-fold rise—or 9.9 percent of total SIC-327 onisland shipments for 1972. Between 1967 and 1972 shipments by Puerto Rico's SIC-327 industries to the Government and other unspecified customers shrank from \$35,051,000 to \$31,265,000 thereby decreasing proportionately from 64.4 percent of all 1967 shipments to 40.5 percent of these 5 years later.

The rapid expansion in physical plants that Puerto Rico has experienced in the postwar years attests to this strategically important major industrial group's leadership in intra- and intersectoral linkage consolidation.

EARNINGS, COSTS, AND COMPETITIVE POSITION (PRODUCTIVITY AND PROFITABILITY)

The productivity and profitability of the stone, clay, and glass industry has been erratic over time, as can be seen in table 6. The ratio of return on equity of Fomento assisted firms filing income tax returns in the years in question decreased from 15.5 percent in 1960 to 3 percent in 1968, rose to a high of 25.7 percent in 1974, and plummeted in 1975 to 2.4 percent.

Profits on sales for such firms followed the same pattern. From 15.5 percent in 1960, they fell to 3.3 percent in 1968, rose to a high of 27.4 percent in 1974, and fell markedly to 2.5 percent in 1975. The rate of profits to sales for the entire stone, clay, and glass products industry (Fomento promoted and nonpromoted), a rate which is likely to be lower than for Fomento firms filing tax returns, fell from 10.4 percent in 1967 to 0.8 percent in 1975, but made a quick recovery in 1977 to 5.7 percent.

For firms which filed income tax returns in 1975, the concrete, gypsum, and plaster products subgroup

Table 6.—Rates of Return

Item	1960	1963	1967	1968	1970	1972	1973	1974	1975	1977
Return on equity (Fomento firms filing income tax returns)	15.5	12.1	6.5	3.0	12.7	17.1	23.5	25.7	2.4	—
Return of sales (Fomento firms filing income tax returns)	15.5	9.4	4.6	3.3	8.3	29.8	25.2	27.4	2.5	—
Return on sales (all SIC-32 firms):										
Puerto Rico	—	10.4	8.9	5.1	6.8	4.7	3.9	0.8	5.7	—
United States	—	—	—	—	4.1	4.6	2.7	1.9	6.4	—
Return of sales (entire manufacturing sector)	—	11.7	11.7	11.0	12.5	13.7	13.3	12.6	17.2	—

Sources: Unpublished data provided by Fomento. U.S. rate calculated from the U.S. Federal Trade Commission, *Quarterly Financial Report for Manufacturing, Mining, and Trade Corporations*, various years. U.S. rates are for profits after taxes. Puerto Rican rates are for corporations receiving tax exemptions.

(SIC-327) showed a 6.2 percent rate of return on equity (compared to 2.4 percent for all SIC-32 firms filing) and a 10.5 percent rate of return on sales (compared to 2.5 percent).

The varying rates of return for this industry group are closely related to activity in the construction industry, which showed a substantial downturn between 1973-77. With the recent upsurge in construction activity funded by Federal grants, mostly through the Federal Economic Development Administration (EDA) for public works of the Commonwealth, the municipalities, and public corporations, the stone, clay, and glass industry is likely to show a good return on investment for 1978.

Table 7 indicates that total costs may be increasing faster than selling prices.

Table 7.—Profit as a Percentage of Total Costs

	1968	1970	1972	1974	1975	1976	1977
Percentage	9.7	5.4	7.3	4.1	0.8	0.4	6.1

Source: Puerto Rico, Planning Board, *Income and Product Accounts* (unpublished worksheet data).

Wage costs have declined as an element of total costs. Their share in total costs has changed as follows:

^a The U.S. Department of Labor Wholesale Price Index for non-metallic mineral products was used to deflate 1974 and 1976 sales prices to constant dollars.

Table 8.—Wages and Benefits as a Percentage of Total Costs

	1968	1970	1972	1974	1975	1976	1977
Percentage	25.3	29.8	27.4	23.5	25.2	21.0	21.8

Source: Puerto Rico, Planning Board, *Income and Product Accounts* (unpublished worksheet data).

Output per worker in 1967 was \$17,550 as compared with \$23,686 in 1974 and \$25,616 in 1976, in constant 1967 prices.⁸

Average wages and benefits per employee in 1967 were \$4,604; by 1976 they had increased to an average of \$9,958. In 1972, the stone, clay, and glass industry's average wage of \$7,835 per employee was 56 percent higher than the average of \$5,017 for the manufacturing sector as a whole. This differential narrowed somewhat in 1976 to an average wage for the SIC-32 industry that was 40.2 percent higher than the average of \$7,101 for the manufacturing sector as a whole.

In 1972, value added per employee in the industry as a whole was \$11,689; this compares with \$12,791 for the Puerto Rican manufacturing sector as a whole and with \$20,197 for stone, clay, and glass products on the mainland. In real terms (1954) value added per employee increased from \$5,723 in 1963 to \$6,527 in 1972.

The Fabricated Metal Products Industry (Except Machinery and Transportation Equipment)

INDUSTRY DEFINITION

This industry group consists of establishments engaged in fabricating ferrous and nonferrous metal products such as metal cans, general hardware, non-electric heating apparatus, fabricated structural metal products, metal forgings, metal stampings, ordnance (except vehicles and guided missiles), and a variety of metal and miscellaneous products. For Bureau of Census reporting purposes, it is divided into the following subgroups:

- a. SIC-341: Metal cans and shipping containers.
- b. SIC-342: Cutlery, hand tools, and general hardware.
- c. SIC-343: Heating equipment, except electric and warm air; plumbing fixtures.
- d. SIC-344: Fabricated structural metal products.
- e. SIC-345: Screw machine products, bolts, nuts, screws, rivets, and washers.
- f. SIC-346: Metal forgings and stampings.
- g. SIC-347: Coating, engraving, and allied services.
- h. SIC-348: Ordnance and accessories, except vehicles and guided missiles.
- i. SIC-349: Miscellaneous fabricated metal products.

SIZE AND GROWTH

The fabricated metal products industry was of little importance during the early years of Puerto Rico's development program. In 1947, its contribution to net income was included along with that of primary metals, machinery, transportation equipment, and professional and scientific instruments which altogether provided less than 2 percent of the manufacturing sector contribution to net income. Employment in the industry is reported as having been 310 in 1949. Employment began to grow fairly

rapidly thereafter and amounted to 1,155 in 1954, 2,007 in 1958, and 2,611 in 1963. Its contribution to net income was not reported separately from the rest of the metals and machinery industry until 1965 when it is shown as being \$31.3 million, or 5.7 percent of net income produced by the manufacturing sector.

The industry continued to grow since that time. In 1973, it employed 5,470 persons. After 1974, employment declined, however, and was 4,724 as of October 1976. This amounted to 3.3 percent of sector employment. In 1976, there were 289 establishments operating in the industry, 137 of which were Fomento plants. The industry's contribution to net income was \$50.6 million in 1972, or 3.9 percent of manufacturing net income. In 1977, its contribution was \$71.7 million but only 2.5 percent of the total net income for the manufacturing sector. (See table 1.) The ratio of labor income to net income for the group (shown in table 3) is indicative of the trend of factor remuneration. In contrast to property income, the labor share is almost totally income to Puerto Rico.

Although fabricated metal sales have been increasing in absolute terms over time, as a percentage of total sector sales have been declining since 1972. In 1967, sales were \$77 million or 3.4 percent of total sector sales. By 1972, sales had more than doubled to \$156.8 million, which represented 3.8 percent of total sector sales. By 1977, fabricated metal sales were \$232.7 million, which was only 2.3 percent of manufacturing total sales for that year.

Fabricated structural metal products (SIC-344), metal cans and shipping containers (SIC-341) and miscellaneous fabricated metal products (SIC-349) are the most important groups within the industry. The relative positions of the subgroups is shown in table 2.

Of the 137 Fomento plants in the industry, 57 are in structural metal products and 22 are in miscel-

Table 1.—Selected Economic Data on the Puerto Rican Fabricated Metal Industry (SIC-34), Selected Years

	1954	1958	1963	1967	1972	1973	1975	1976	1977
1. Number of establishments	60	118	175	201	219	361	313	289	—
2. Total number of employees	1,155	2,007	2,611	3,531	5,247	5,470	4,610	4,724	—
3. Employment as a percentage of sector employment	1.7	2.8	2.6	2.9	3.5	3.6	3.4	3.3	—
4. Sales	—	25.4	49.2	77.0	156.8	153.7	215.6	223.3	232.7
5. Sales as a percentage of sector sales	—	3.3	3.3	3.4	3.8	3.0	2.8	2.6	2.3
6. Net income	—	—	—	20.3	50.6	55.5	70.3	70.3	71.7
7. Net income as a percentage of sector net income	—	—	—	3.0	3.9	3.6	3.6	3.0	2.5
8. Value added by manufacture	6,886	10,287	15,753	38,670	78,212	—	—	—	—

Sources: U.S. Bureau of the Census, Economic Censuses of Outlying Areas, *Puerto Rico: Census of Manufactures*, 1963, 1967, 1972. (Washington, D.C.: Government Printing Office.)
 Puerto Rico, Department of Labor, *Census of Manufacturing Industries of Puerto Rico*, various years.
 Puerto Rico, Planning Board, *Puerto Rico Income and Product Accounts* (unpublished data).

Table 2.—Subgroup Employment and Sales as a Percentage of the Major Group (SIC-34)

Subgroup	1954		1958		1963		1967		1972	
	Employment	Sales	Employment	Sales	Employment	Sales	Employment	Sales	Employment	Sales
SIC-341 ¹	NA	NA	NA	NA	NA	NA	12.1	28.9	17.3	34.0
SIC-342	NA	NA	7.4	4.9	3.0	(D)	4.9	3.7	7.1	4.0
SIC-344	66.1	NA	61.7	64.9	68.6	59.6	55.0	44.3	48.3	37.1
SIC-345	NA	NA	2.9	1.5	(D)	(D)	11.1	11.7	4.7	5.1
SIC-349	17.7	NA	8.3	4.4	(D)	(D)	NA	NA	12.1	10.8

¹ Figures for 1967 represent metal cans (SIC-3411) only.

NA—Not available.

(D)—Withheld to avoid disclosing figures reported by individual companies.

Source: U.S. Bureau of the Census, Economic Censuses of Outlying Areas, *Puerto Rico: Census of Manufactures* (various years). (Washington, D.C.: Government Printing Office.)

Table 3.—Labor Income as a Percentage of Industry Group 34 Contribution to Net Income

Item	1968	1970	1972	1974	1977
Net income	18.6	31.3	50.6	67.1	71.7
Labor income	16.0	21.9	29.7	36.1	37.0
Labor income as a percentage of net income	35.9	69.8	59.8	53.7	51.6
Manufacturing labor income as a percentage of manufacturing net income	62.8	62.6	58.6	49.5	40.7
Rank of SIC-34 out of 25 industry groups	1	12	18	17	15

Source: Puerto Rico Planning Board, *Income and Product Accounts* (unpublished worksheet data).

laneous fabricated products. The next largest number, 15, are in metal cans and shipping containers.

INDUSTRY TRENDS

The fabricated metals industry was of little importance to Puerto Rico's industrial sector in the early years of its development. The industry has grown since the early 1950's and reached its height in 1972 in terms of its contribution to sector sales and net income and its height in terms of sector employment in 1973. In recent years, the industry as a group has declined somewhat relative to other industries. Over time an increasing share of the

fabricated metals industry's total shipments has been sold to the local market.

Linkages

The portion of industry group shipments which went to onisland customers increased during the period from 1963 to 1972, from 67 percent of total shipments in 1963 to 73.6 percent in 1972, with total onisland sales increasing from \$30 million in 1963 to \$49.9 million in 1967 to \$110.6 million in 1972. Shipments to other Puerto Rican manufacturers increased from \$2.4 million in 1963 (8 percent of total onisland shipments) to \$24.3 million in 1967 (48.7 percent of onisland shipments) to \$51.1 million in 1972 (46.9 percent of total shipments to Puerto Rican customers). As can be seen in table 4, the metal cans and shipping containers subgroup (SIC-341), which represented 38.3 percent and 47.6 percent of total group shipments in Puerto Rico in 1967 and 1972 respectively, shipped almost 100 percent of their products to other manufacturing enterprises. The fabricated structural metal products subgroup (SIC-344) significantly increased their onisland shipments between 1963 and 1967 from \$15.2 million, or about 59 percent of the value of all their sales, to \$26.7 million, or 90.7 percent of all their sales.

Table 4.—Industry Linkages

[In thousands of dollars]

Products shipped and contract receipts in Puerto Rico to—													
Value of shipments			On-island sales as a percentage of value of shipments	Wholesalers	As a percentage of Puerto Rican shipments	Retailers	As a percentage of Puerto Rican shipments	Domestic consumers	As a percentage of Puerto Rican shipments	Other manufacturing enterprises	As a percentage of Puerto Rican shipments	Others, including government	As a percentage of Puerto Rican shipments
	Total												
1963													
SIC-34	44,714	29,945	67.0	7,853	26.2	2,026	6.8	2,188	7.3	2,398	8.0	15,480	51.7
SIC-344	25,899	15,241	58.8	7,315	48.0	1,986	13.0	2,006	13.2	477	3.1	3,456	22.7
1967													
SIC-34	70,960	49,913	70.3	11,307	22.7	5,945	11.9	2,895	5.8	24,309	48.7	5,457	10.9
SIC-3411	22,220	19,096	85.9							19,096	100.0		
SIC-344	29,386	26,657	90.7	10,925	41.0	5,733	21.5	2,640	9.8	2,224	8.3	5,135	19.4
1972													
SIC-34	150,326	110,606	73.6	17,571	15.8	13,446	12.2	6,773	6.1	51,835	46.9	20,981	19.0
SIC-341	53,276	52,646	98.8	692	1.3					44,398	84.3	7,556	14.4
SIC-344	54,049	47,126	87.2	12,835	27.2	12,687	26.9	6,205	13.2	2,696	5.7	12,703	27.0

Source: U.S. Bureau of the Census, Economic Census of Outlying Areas, Puerto Rico: *Census of Manufactures*, 1963, 1967, and 1972. (Washington, D.C.: Government Printing Office.)

Shipments to retailers and domestic consumers increased, as a percentage of onisland sales, from 14.1 percent in 1963 (\$4.2 million) to 28.5 percent in 1967 (\$14.2 million). Between 1967 and 1972, sales to these customer groups decreased to 18.3 percent of total local shipments (\$20.2 million). Shipments to wholesalers and others, including government decreased significantly from \$23.3 million, which represented 77.9 percent of the group's onisland sales, to \$38.6 million or only 34.9 percent of sales in 1972.

Environmental Demands

The metal products industries, both primary and fabricated, are estimated as being middle range consumers of energy when ranked among all industry groups in Puerto Rico. Between 1967 and 1972, the fabricated metals industry's fuels and electricity costs rose an estimated 44.2 percent, from \$1.3 million to \$1.8 million. Most of this increase can be attributed to the rise in the cost of fuels consumed, which increased over 200 percent from \$349,000 in 1967 to about \$1.1 million in 1972. However, similar and greater fuel cost expenditures were experienced by the manufacturing sector as a whole; where fuel costs increased more than 157 percent from \$14.4 million in 1967 to about \$37.1 million in 1972. The manufacturing sector's electricity costs rose almost 100 percent from \$20.3 million in 1967 to somewhat less than \$40.6 million in 1972. The fabricated metal industry experienced electricity cost increases of a far lesser degree, with a rise of only 14 percent from \$928,000 in 1967 to less than \$1.1 million in 1972.

EARNINGS, COSTS, AND COMPETITIVE POSITION (PRODUCTIVITY AND PROFITABILITY)

The productivity and profitability of the fabricated metal industry as a whole has been improving over time. The ratio of return on equity of Fomento assisted firms filing income tax returns in the years in question increased from 18.1 percent in 1960 to 24.7 percent in 1972. The recession following 1972 led to declines thereafter to a low of a rate of 15.4 percent for 1975. Data on return to equity are not available for later years.

Profit on sales for such firms rose from 11.1 percent in 1960 to 23.8 percent in 1974 and then fell to 16.6 percent in 1975. The rate of profits to sales for the entire fabricated metal industry group (Fomento promoted and nonpromoted), a rate which is likely to be lower than for Fomento firms filing income tax returns, increased from a low of 3.2 percent in 1968 to 16.9 percent in 1977. The rates of profits by years are shown in table 5 below.

For firms which filed income tax returns in 1975, metal containers (SIC-341) showed a 16.3 percent rate of return on equity and 15.3 percent rate of return on sales. The rates for fabricated structural products (SIC-344) were 15.8 percent and 12.7 percent and for miscellaneous fabricated metal products (SIC-349) 36.0 percent and 19.0 percent, respectively.

The steadily improving ratio of profits to sales suggests increasing productivity in the industry paralleling that of the entire manufacturing sector.

Table 5.—Rates of Return

Item	1960	1963	1967	1968	1970	1972	1973	1974	1975	1977
Return on equity (Fomento firms filing income tax returns) _____	18.1	13.8	19.3	20.5	18.0	24.7	21.9	22.4	15.4	—
Return on sales (Fomento firms filing income tax returns) _____	11.1	8.6	17.2	11.3	10.6	18.9	18.2	23.8	16.6	—
Return on sales (all SIC-34 firms) _____	NA	NA	10.4	3.2	9.2	13.6	14.4	16.4	14.6	16.9
Return on sales (entire manufacturing sector) _____	—	—	11.7	11.7	11.0	12.5	13.7	13.3	12.6	17.2

NA—Not available.

Sources: Unpublished data provided by Fomento. U.S. rates calculated from the U.S. Federal Trade Commission, *Quarterly Financial Report for Manufacturing, Mining, and Trade Corporations*, various years. U.S. rates are for profits after taxes. Puerto Rican rates are for corporations receiving tax exemptions.

A similar trend, as shown in table 6, in the relation of profits to total costs indicates that at least total costs were not increasing as fast as selling prices.

Table 6.—Profit as a Percentage of Total Costs

	1968	1970	1972	1974	1975	1976	1977
Percentage _____	3.3	10.1	15.8	19.6	17.1	—	20.4

Source: Puerto Rico Planning Board, *Income and Product Accounts* (unpublished worksheet data).

Wage costs have declined as an element of total costs. Their share in total costs has changed as follows:

Table 7.—Wages and Benefits as a Percentage of Total Costs

	1968	1970	1972	1974	1975	1976	1977
Percentage _____	25.0	24.6	23.7	22.7	20.9	20.2	19.1

Source: Puerto Rico Planning Board, *Income and Product Accounts* (unpublished worksheet data).

A downward trend in wage rates as a portion of total costs is clearly evident.

Output per work in 1967 was \$21,807 as compared with \$19,671 in 1974 and \$24,129 in 1976, in constant 1967 prices.¹

Average wages and benefits per employee in 1967 were \$3,829, by 1976 they had increased to an average of \$8,101. In 1972, the fabricated metal industry's average wage of \$5,761 per employee was 15 percent higher than the average of \$5,017 for the manufacturing sector as a whole. This differential was the same in 1976.

For one of the three most significant subgroups, namely SIC-344, average weekly earnings (not including benefits increased from \$58.67 in 1967, to \$78.95 in 1972, to \$90.68 in 1974, and to \$93.08 in 1976.

In 1972, value added per employee in the industry as a whole was \$14,906, this compares with \$12,791 for the Puerto Rican manufacturing sector

¹ The U.S. Department of Labor Wholesale Price Index for metal and metal products was used to deflate 1974 and 1976 sales prices to constant dollars.

as a whole and with \$17,570 for the fabricated metals group on the mainland. In real terms (1954 dollars) value added per employee increased from about \$5,145 in 1963 to \$8,028 in 1972.

For two of the important subgroups, SIC-344 (fabricated structural metal products) and SIC-349 (miscellaneous fabricated metal products), output per employee (as measured by sales) and value added per employee are presented in tables 8 and 9 below.

Table 8.—Subgroup SIC-344 Productivity

Year	Output per employee		Value added per employee	
	Puerto Rico	United States	Puerto Rico	United States
1958 _____	\$13,338	\$19,376	\$4,968	\$8,694
1963 _____	16,336	21,720	5,286	9,892
1967 _____	17,561	26,938	7,878	12,721
1972 _____	22,967	35,916	10,849	17,079

Sources: U.S. Bureau of the Census, *Census of Manufactures-Industry Statistics* (various years). (Washington, D.C.: Government Printing Office.)

U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures* (various years). (Washington, D.C.: Government Printing Office.)

Table 9.—Subgroup SIC-349 Productivity

Year	Output per employee		Value added per employee	
	Puerto Rico	United States	Puerto Rico	United States
1958 _____	\$6,705	\$17,981	\$4,054	\$9,487
1963 _____	(D)	22,362	(D)	11,444
1967 _____	(D)	25,207	(D)	13,731
1972 _____	26,546	31,866	18,561	17,532

(D)—Data unavailable.

Sources: U.S. Bureau of the Census, *Census of Manufactures-Industry Statistics* (various years). (Washington, D.C.: Government Printing Office.)

U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures* (various years). (Washington, D.C.: Government Printing Office.)

As of January 1975, the wage rate for the metal, machinery, and transportation equipment industry in Puerto Rico was already up to the FLSA state-side minimum of \$2 an hour. It has been kept in parity ever since and as of January 1978 the minimum wage for the fabricated metal products industry was \$2.65 an hour.

DEMAND AND PROSPECTS FOR PRODUCTION FOR LOCAL AND EXPORT MARKETS

The evidence suggests that the market for Puerto Rican production of fabricated metal products is increasing. The increase in sales from \$77 million in 1967 to \$232.7 million in 1977 is indicative of this fact. Likewise is the increase in the Puerto Rican share of the local market which has almost doubled from 32 percent in 1963 to 60 percent in 1972.

Both local and export demand to the continental United States for fabricated metal products increased as indicated in table 10.

Table 10.—Local and Export Markets for SIC-34 Products

[In millions of dollars]

	1963	1967	1972	1976
Onisland sales from local production	29.9	49.9	110.6	NA
Imports ¹	63.5	63.6	73.6	145.3
Total local demand	93.4	112.5	184.2	NA
Exports ¹	12.1	10.2	33.5	34.6
Total demand	105.5	122.7	217.7	NA

¹ All exports and imports figures are estimates because of the difficulty in separating commodity items into SIC groups. In addition, they represent shipments to and from the United States only.

NA—Not available.

Sources: U.S. Bureau of the Census, Economic Census of Outlying Areas, *Puerto Rico: Census of Manufactures*, 1963, 1967, and 1972. (Washington, D.C.: Government Printing Office.)

U.S. Bureau of the Census, *U.S. Trade with Puerto Rico and U.S. Possessions*, FT 800/1963, 1967, 1972, and 1976 Annuals. (Washington, D.C.: Government Printing Office.)

Local and export demand for metal cans and shipping containers (SIC-341) and for fabricated structure metal products have also increased as indicated by tables 11 and 12, respectively. In both these subgroups total local demand increased between 1967 and 1972 and onisland sales rose to meet it. In the case of metal cans and shipping containers, the Puerto Rican share of the local market increased from about 81 percent in 1967 to over 88 percent in 1972. Exports of this subgroup made up a very small share of the value of shipments.

In the case of fabricated structural metal products, the Puerto Rican share of the local market increased slightly from 62.4 percent in 1967 to 64.1 percent

Table 11.—Local and Export Markets for Metals Cans and Shipping Containers (SIC-341)

[In millions of dollars]

	1967	1972	1976
Onisland sales from local production	119.1	52.7	NA
Imports	4.5	6.9	NA
Total local demand	23.6	59.6	NA
Exports .....	.04	.65	NA
Total demand	23.64	60.25	NA

¹ Metal cans only.

NA—Not available.

Sources: U.S. Bureau of the Census, Economic Census of Outlying Areas, *Puerto Rico: Census of Manufactures*, 1963, 1967, and 1972. (Washington, D.C.: Government Printing Office.)

U.S. Bureau of the Census, *U.S. Trade with Puerto Rico and U.S. Possessions*, FT 800/1963, 1967, 1972, and 1976 Annuals. (Washington, D.C.: Government Printing Office.)

Table 12.—Local and Export Markets for Fabricated Structural Metal Products (SIC-344)

[In millions of dollars]

	1967	1972	1976
Onisland sales from local production	31.3	47.1	NA
Imports	18.9	26.4	NA
Total local demand	50.2	73.5	NA
Exports .....	.6	2.1	NA
Total demand	50.8	75.6	NA

NA—Not available.

Sources: U.S. Bureau of the Census, Economic Census of Outlying Areas, *Puerto Rico: Census of Manufactures*, 1963, 1967, and 1972. (Washington, D.C.: Government Printing Office.)

U.S. Bureau of the Census, *U.S. Trade with Puerto Rico and U.S. Possessions*, FT 800/1963, 1967, 1972, and 1976 Annuals. (Washington, D.C.: Government Printing Office.)

in 1972. Exports of this subgroup made up a relatively small share of the value of shipments, 3.9 percent in 1972 decreasing to an estimated 1.6 percent in 1976. Puerto Rico's share of the U.S. import market decreased about 15 percent from 4.4 percent in 1972 to an estimated 3.8 percent in 1976.

As indicated in table 13, it appears that economies of scale in the U.S. metal cans and shipping containers industry exist for firms with total assets ranging from \$500,000 to \$5 million, which display a net profit before tax ranging from 7.9 percent of net sales to 8 percent. There appear to exist some diseconomies of scale for firms with assets ranging over \$5 million, which display a net-profit to net-

Table 13.—Metal Cans and Shipping Containers Industry Economies of Scale

Item description for accounting period 7/73 through 6/74	Total for entire industry	Asset values (in thousands of dollars)										
		Under 100	100-250	250-500	500-1,000	1,000-5,000	5,000-10,000	10,000-25,000	25,000-50,000	50,000-100,000	100,000-250,000	250,000 and over
Average receipts per unit (millions of dollars)....	45.26	—	0.79	0.47	2.43	5.58	15.4	43.7	66.6	—	—	1,193.8
Net profit before tax as a percentage of sales	3.3	—	(¹)	4.7	7.9	8.0	4.2	4.6	4.9	—	—	3.0

¹ Indicates returns with or without income, a loss before tax in an industry or asset size within an industry.

Note: Puerto Rican market share (imports and local sales)—1972=\$61 million.

Source: The *Almanac of Business and Financial Ratios*, from which this data is derived, deals with all corporate returns.

Table 14.—Fabricated Structural Metal Products Industry Economies of Scale

Item description for accounting period 7/73 through 6/74	Total for entire industry	Asset values (in thousands of dollars)										
		Under 100	100- 250	250- 500	500- 1,000	1,000- 5,000	5,000- 10,000	10,000- 25,000	25,000- 50,000	50,000- 100,000	100,000- 250,000	250,000 and over
Average receipts per unit (millions of dollars).....	1.83	0.13	0.43	0.87	1.6	4.2	11.8	23.4	43.6	98.8	197.0	521.5
Net profit before tax as a percentage of sales	3.5	3.9	2.8	4.3	3.8	4.5	2.8	5.0	4.8	4.6	3.4	(¹)

¹ Indicates returns with or without income, a loss before tax in an industry or asset size within an industry.

Note: Puerto Rican market share (imports and local sales)—1972=\$73.5 million.

Source: The *Almanac of Business and Financial Ratios*, from which this data is derived, deals with all corporate returns.

sales ratio which is about one-third to one-half of that for the earlier range.

The market share of firms with assets between \$500,000 and \$5 million is between 4 and 9½

percent of the market share that existed in Puerto Rico in 1972. It would appear that a number of firms in these asset ranges could profitably service the Puerto Rican market.

The Primary Metal Industries (SIC-33)

DEFINITION

This profile presents an overview of the primary metal industries in Puerto Rico. This major group includes establishments engaged in the smelting and refining of ferrous and nonferrous metals from ore, pig or scrap; in the rolling, drawing and alloying of ferrous and nonferrous metals; in the manufacture of castings and other basic products of ferrous and nonferrous metals; and in the manufacture of nails, spikes, and insulated wire and cable. This major group also includes the production of coke.¹

Major group 33 (hereinafter SIC-33) comprises these 3-digit groups:²

- a. SIC-331: Blast furnaces, steelworks, rolling and finishing mills.
- b. SIC-332: Iron and steel foundries.
- c. SIC-333: Primary smelting and refining of nonferrous metals.
- d. SIC-334: Secondary smelting, refining of nonferrous metals.
- e. SIC-335: Rolling, drawing and extruding of nonferrous metals.
- f. SIC-336: Nonferrous foundries (castings).
- g. SIC-339: Miscellaneous primary metal products.

¹ U.S. Executive Office of the President, Office of Management and Budget, Statistical Policy Division, *Standard Industrial Classification Manual*, at 145 (1972). (Hereinafter, 1972 SIC Manual.)

² *Op. Cit.*, at 145-152.

SIZE AND GROWTH

The primary metal industries are and have been a relatively minor industrial group in Puerto Rico. At any one time, they have accounted for not more than 0.8 percent of sector employment (1973), 1.3 percent of sector sales (1973), and 1.6 percent of sector net income (1967). (See table 1.) They are represented by fewer than 25 establishments, which can be divided almost equally between locally owned plants and subsidiaries of U.S. firms. The Fomento-promoted plants, which are predominantly the U.S. subsidiaries, employ most of the workers in the industry.

Employment in the primary metal industries in Puerto Rico has always been very small and has been decreasing in both absolute and relative terms in recent years. Employment in this industry group reached its heights in 1973 with 1,204 workers employed. Employment in the primary metal industries in the United States represents over 6 percent of all employees in the manufacturing sector. However, the trend is similar to that in Puerto Rico, with a decline in employment of more than 12 percent in 1975 and a smaller decline in 1976 as the economy moved toward recovery.

Group sales also reached their height in 1973 when they accounted for 1.3 percent of manufacturing sector sales. In 1977, primary metal industries sales had declined to only 0.6 percent of sector sales. The industry's contribution to sector net in-

Table 1.—Selected Economic Data on the Puerto Rican Primary Metal Industry (SIC-33), Selected Years

	1954	1958	1963	1967	1972	1973	1975	1976	1977
Number of establishments	10	14	15	17	16	21	21	23	
Total number of employees	81	426	664	838	956	1,204	987	994	
Employment as a percentage of sector employment	.1	.6	.7	.7	.6	.8	.7	.7	
Sales (millions of dollars)		5.1	11.9	26.0	33.1	66.9	78.1	63.6	58.7
Sales as a percentage of sector sales		.66	.8	1.1	.8	1.3	1.0	.7	.6
Net Income (millions of dollars)				11.0	13.0	15.5	21.1	15.1	12.2
Net income as a percentage of sector net income				1.6	1.0	1.0	1.1	.6	.4
Value added by manufacture (thousands of dollars)	422	1,908	5,788	9,089	14,310				

Source: U.S. Bureau of the Census, Economic Censuses of Outlying Areas, *Puerto Rico: Census of Manufactures*, 1963, 1967, 1972. (Washington, D.C.: Government Printing Office.)

Puerto Rico Department of Labor, *Census of Manufacturing Industries of Puerto Rico*, various years.

Puerto Rico Planning Board, *Puerto Rico Income and Product Accounts* (unpublished data).

Table 2.—Labor Income as a Percentage of Total Group Net Income

Primary metal products, (SIC-33)	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Manufacturing sector percentage	61.9	62.8	63.4	62.6	52.0	58.6	54.6	49.5	49.7	43.1	40.7
Primary metal products percentage	55.3	66.8	79.8	79.9	79.8	76.8	70.7	52.9	58.9	117.6	97.0
Rank of SIC-33 out of 25 industry groups	18	13	4	5	6	8	11	18	14	2	1

Source: Puerto Rico Planning Board, *Income and Product Accounts* (unpublished worksheet data).

come decreased even more rapidly from a high of 1.6 percent in 1967 to the 1977 level of 0.4 percent, a 400-percent decline.

As can be seen in table 2, of the net income that accrues to the primary metal industries, an average of 69 percent remains in Puerto Rico as income to labor. The ratio of labor income to net income in the primary metal group was higher than the average for the manufacturing sector as a whole for 10 of the 11 years of the 1967-77 period. However, its rank relative to all industry groups has varied erratically from the upper half to the lower half of the 25 groups.

INDUSTRY TRENDS

This industry is dependent upon the importation of all of its raw materials and produces a product predominantly for local consumption. The proportion of this industry group's product that is sold locally has increased over time from 77.2 percent of the industry's shipments by value in 1963 to 85 percent in 1972. However, in the same time, the Puerto Rican share of the local market has been decreasing slowly.

Major Products

As indicated in table 3, the nonferrous rolling, drawing and extruding industry (SIC-335) is the most important primary metal industry's subgroup in Puerto Rico, accounting in recent years for over half of the group's employment, almost half of its value added, and two-thirds of its sales. It is believed that it is in this aspect of primary metal processing that Puerto Rico has the greatest competitive advantage. This is because of the greater

number of man-hours it requires to reroll and finish a primary metal product relative to the time it takes to produce it. Puerto Rico's lower wage rates (an average hourly wage of \$3.17 in 1976), about 50 percent of the rate in the United States, gives a cost advantage to the island in such processing.

Productivity

Per-employee wages in Puerto Rico's primary metal industries, although only about 50 percent of those in mainland counterpart industries, are 73 percent higher than the per-employee wage for Puerto Rico's manufacturing sector as a whole. Between 1958 and 1972, value added per employee in this industry group more than tripled from \$4,479 in 1958 to \$14,969 in 1972. This compared favorably with the value added per employee in this industry group in the United States, which, during the same time period, almost doubled from \$10,571 in 1958 to \$20,352 in 1972. Still, value added per employee in Puerto Rico in 1972 was only about 75 percent of that in the United States.

Sales per employee in Puerto Rico's primary metal industries followed a similar trend, but accelerated more quickly than value added, increasing from \$11,972 in 1958 to \$63,984 in 1976, an increase of almost 5½ times. In the United States, sales per employee increased less than three times in the same time period, from \$25,024 in 1958 to \$72,491 in 1976.

While the ratio of value added by manufacture to production worker's wages varied between 1958 and 1972, by 1972 it had become almost equal to that for Puerto Rico's entire manufacturing sector itself, and higher than the corresponding figure for SIC-33 industries on the U.S. mainland. A comparison of these last two figures reveals that the

Table 3.—Nonferrous Rolling and Drawing Subgroup 335

	1958	1963	1967	1972
Number of establishments	4	4	7	7
Total employees	112	217	476	519
335 employment as a percentage of SIC-33 employment	26.3	32.7	56.8	54.3
Value of shipments	2.1	5.8	18.7	22.2
Value of shipments as a percentage of SIC-33 shipments	42.0	49.0	71.3	67.1
Value added by manufacture .....	.67	2.2	5.9	6.9
Value added as a percentage of SIC-33 value added	35.0	37.3	65.1	48.2

Source: U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures* (various years). (Washington, D.C.: Government Printing Office.)

Table 4.—Selected Operating Ratios (SIC-33) 1957-75

	1957	1963	1967	1972	1973	1974	1975
Profits as a percentage of sales:							
Puerto Rico	3.2	3.9	14.4	14.3	10.8	15.9	3.2
United States	—	—	—	3.3	4.6	6.6	4.4
Profits as a percentage of equity:							
Puerto Rico	5.9	8.5	23.1	10.9	46.3	19.9	2.4
United States	—	—	—	5.8	10.4	15.7	8.5

Source: Unpublished data provided by Fomento. U.S. rates calculated from the U.S. Federal Trade Commission, *Quarterly Financial Report for Manufacturing, Mining and Trade Corporations*, (various years). U.S. rates are for profits after taxes. Puerto Rican rates are for corporations receiving tax exemptions.

primary metals industry in Puerto Rico is less labor-intensive than is its U.S. mainland counterpart.

The picture that emerges from these data is of a moderately labor-intensive industry, but one less so than its mainland counterpart. Significantly, its expenses for plant and equipment are higher than for both the island's manufacturing industry as a whole and its U.S. mainland counterpart.

Sample data taken for selected years from 1957 to 1975 on the respective percentages of profits to sales and equity do not show consistent trend lines for responding Puerto Rican SIC-33 industries. (See table 4.) Due to widely varying sample sizes (in 1975 less than one-third of the primary metal establishments replied to the Fomento financial survey), the data presented is meant to only be suggestive of industry trends concerning return on investment relative to the United States. It would seem that return on investment in Puerto Rico in general was greater than in the United States with the exception of 1975. Return on investment was higher for the nonferrous rolling and drawing subgroup (SIC-335) than for the primary metal group as a whole. In 1975, profits to equity for this subgroup were 13 percent compared to 2.4 percent for the group and profits to sales were 9.1 compared to 3.2 percent.

LINKAGES

As previously mentioned, an increasing proportion of the primary metal industries group sales are being made locally. About 85 percent of the in-

dustry shipments are to Puerto Rican customers, mostly to other manufacturing firms and to others including government. As can be seen in table 5, a decreasing portion of shipments are going to wholesalers. In 1963, wholesalers received 53.5 percent of the group's Puerto Rican shipments. By 1972, they received only 9.6 percent. The greatest part of this decrease can be accounted for by the increase in shipments to others including government. In 1972, this latter group received 34.3 percent of the SIC-33's Puerto Rican shipments, whereas, in 1963 they received only 0.5 percent.

CONCLUSION

The primary metal industry has historically been a relatively minor industrial group within Puerto Rico. In 1975, A. D. Little, Inc.³ concluded that Puerto Rico could have a cost advantage in the rerolling and finishing operations of a primary metal industry, if it could have access to sufficient supplies of semifinished steel at attractive prices (U.S. producer costs). Under this assumption, the transportation cost, U.S. market access and other local as well as fiscal advantages indigenous to Puerto Rico might well justify such an investment, particularly for a foreign steel company or joint venture.

³ The purpose of A. D. Little's analysis was to consider Puerto Rico in the context of flat rolled products that could establish Puerto Rico as a location for consumer durable goods manufacturing including automobiles. A. D. Little concluded from a cost of production standpoint on an internationally competitive basis that the case for large-scale manufacturing of semifinished steel in Puerto Rico is not strong in comparison to other parts of the world, the principal reason being that Puerto Rico must import 100 percent of all raw materials and energy.

Table 5.—Major SIC-33 Group Linkages in Puerto Rico, 1963-72

(In thousands of dollars)

Products shipped and contract receipts in Puerto Rico to—							
Major SIC-33 group	Total shipments	Total	Wholesalers	Retailers	Domestic consumers	Other manufacturing enterprises	Others including government
1963	11,830	9,130	4,888	29	—	4,169	45
1967	25,824	20,537	9,828	(D)	(D)	9,105	(D)
1972	32,134	27,204	2,613	3,781	1,169	10,309	9,332

(D)—Data unavailable.

Source: U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures* (various years). (Washington, D.C.: Government Printing Office.)

Through such a project, a foreign enterprise could restore or establish a cost competitive position in the U.S. marketplace at a higher profit level than the U.S. mainland producer, in addition to serving the local market.

In addition, it was concluded that Puerto Rico could sustain a small, integrated, direct reduction-oriented steel plant to serve its own internal needs, and possibly markets in the Caribbean and east Florida coast for hot-rolled bars and rods.

Paper and Printing Products

DEFINITION

The paper and printing products group consists of two 2-digit SIC industries:

1. Paper and paper products (SIC-26): The manufacture of pulp from wood, rags, waste paper, bagasse and other fibers; the conversion of such pulp into paper and paperboard; and the manufacture of paper and paperboard into converted products, such as paper coated off the paper machine, paper bags, boxes and envelopes.

2. Printing and publishing (SIC-27): The printing performed on the foregoing products; the printing or publishing of newspapers, books, periodicals, maps and music; and the services performed for the printing trade, such as bookbinding, typesetting, engraving and electrotyping. The printing and finishing of textile and leather products are not included in this group.

INDUSTRY CHARACTERISTICS

General

Paper and printing are relatively less important industries, in terms of income and employment generated for Puerto Rico. According to the Puerto Rico Bureau of Labor Statistics, in 1976, the two industries together employed 4,364 workers, or 3 percent of the total island employment. The employment growth rate averaged 2.5 percent per year for the 1967-76 period, slightly higher than the 2-percent rate of the manufacturing sector as a whole.¹ The above levels of employment by the Puerto Rican paper and printing industries may have been underestimated. In 1972, the Puerto Rico Bureau of Labor Statistics recorded that the industries employed 4,062 people, while the U.S. Bureau of the Census counted 4,535 workers employed in the same industrial activities. (See table 1.) However, it is less certain whether the measured employment growth rates of these industries relative to those of the manufacturing sector as a whole would contain a large margin of error.

¹ Commonwealth of Puerto Rico, Department of Labor, Bureau of Labor Statistics, *Census of Manufacturing Industries of Puerto Rico*, October series.

Table 1.—Employment in Paper and Printing Products (SIC-26, SIC-27)

Year	U.S. Bureau of the Census	Puerto Rico Bureau of Labor Statistics
1958	2,151	
1963	3,171	
1966		3,397
1967	3,769	3,643
1968		3,813
1969		3,846
1970		3,950
1971		
1972	4,535	4,062
1973		4,259
1974		4,195
1975		3,812
1976		4,364

Sources: U.S. Department of Commerce, 1972 *Economic Census of Outlying Areas, Puerto Rico*.
Commonwealth of Puerto Rico, Bureau of Labor Statistics, *Census of Manufacturing Industries of Puerto Rico*, October series.

On the other hand, outputs seem to increase substantially faster than employment (more than 10 percent per annum from 1967 to 1976). Nevertheless, this moderate output growth has been insufficient to meet Puerto Rico's increasing demands. The island's import of paper and printing products had quadrupled in this period. In 1976, the total imports of these products amounted to \$203 million, which made up 5.5 percent of the total of U.S. shipments to Puerto Rico, and 2.7 percent of the Commonwealth's GNP.

The trend of the printing and paper industries in the past decade is summarized in table 2:

Table 2.—Annual Growth Rate of Selected Economic Variables of Printing Products, Paper Products, and All Manufacturing Products, 1967-77

[In percentages]

	Printing	Paper	Manufacturing sector	
			All	Excluding chemicals and petroleum
Employment ¹	2.6	2.3	2.0	1.2
Labor income ²	10.5	8.0	11.0	9.7
Contribution to NNI	10.0	8.9	16.0	12.0
Sales	13.8	8.7	17.0	12.0

¹ For the 1966-76 period.

² Wage or salary plus compensation.

Source: Planning Board, unpublished data and Puerto Rico Bureau of Labor Statistics, *Census of Manufacturers*, October series.

The following paragraphs will further expand the market demand, employment, output, and supply/cost positions of the printing and products, and the paper and products industries.

Printing and Publishing

The 1976 data shows 119 establishments in Puerto Rico engaged in printing and publishing activities. These establishments employed 2,885 workers, which amounted to two-thirds of the total employment of the printing and paper group. From 1967 to 1976, employment in printing and publishing industries experienced an average compounded rate of 2.6 percent per annum, with increases in labor income of 10.5 percent and industry output (sales) of 13.8 percent per year. Such a high growth rate has put the industry in the bracket of highest growing manufacturing industries in Puerto Rico, although in absolute terms, paper and printing activities are still of minor importance to the island's economy.

Most of the establishments are locally owned, and the outputs are primarily produced to meet the local demand. Fomento, which promoted or assisted one-third of the existing printing and publishing plants, reported that 78 percent of the plants are locally owned. The 1972 U.S. Census of Manufactures revealed that nearly 80 percent of the printing and publishing outputs are shipped to destinations within Puerto Rico. The census also showed that only 28 percent of all establishments had more than 10 employees, indicating the majority of the printing and publishing plants are of small size.

Printing and publishing activities can be divided into three categories: (a) printing and publishing of newspapers, periodicals, etc.; (b) commercial printing; and (c) industries allied to printing. Out of these three categories, newspaper and periodical printing was most important a decade ago. However, commercial printing has experienced a very rapid growth rate and has become a leading employer since 1975. (See table 3.)

Table 3.—Employment in Printing and Publishing Group

Year	Total	Newspapers, periodicals, and miscellaneous	Commercial printing	Others
1966	2,223	1,181	903	139
1967	2,398	1,272	1,000	126
1968	2,517	1,320	1,079	118
1969	2,450	1,249	1,032	169
1970	2,558	1,348	1,067	143
1971	2,863	1,621	1,063	179
1972	2,897	1,545	1,173	179
1973	3,030	1,554	1,262	214
1974	2,570	1,045	1,267	258
1975	2,885	1,307	1,332	246

Source: Puerto Rico Bureau of Labor Statistics. *Census of Manufacturing Industries of Puerto Rico*, October series.

External Trade.—Puerto Rico's import of products classified under printing, publishing, and allied industries has grown at an average annual compounded rate of 5.2 percent for the 1971-76 period, and stood at \$36.5 million in 1976. Of this amount, \$27.8 million was from the United States and \$8.7 million was from foreign countries. The value of shipments from the United States was about equally divided between manifold business forms (\$5 million); paper and paperboard labels (\$4.7 million); books of various types (\$4.8 million) and other items. On the contrary, imports from foreign countries are highly concentrated, with books accounting for more than four-fifths of the total.

Puerto Rican exports of publishing and printing products are well below the import level. In FY 1976, the island exported \$7.5 million, of which \$5.3 million was to the United States. The excess of imports over exports has tended to widen since the early 1970's.

Competitive Position.—Although the external trade deficit has tended to widen in dollar value in the 1970's, Puerto Rico's printing and publishing industries are competing well in the local market. (See table 4.)

Table 4.—Growth Rates of Factors Related to the Printing and Publishing Industrial Group

[In percentages]

Annual growth rates, 1971-76	
Imports	4.4
Consumption ¹	9.0
Production (sales)	13.2

¹ Represented by the sum of two major items: (1) books and maps, and (2) magazine and newspaper printing.

Source: Fomento, "The Printing, Publishing and Allied Industries in Puerto Rico," and Planning Board's unpublished data on the Commonwealth's Income and Product Accounts.

The above table shows that the 9-percent annual growth of local demand for printing and publishing products (consumption) was met by a 4.4-percent growth of imports and a 13.2-percent growth of local production.² The rapidly growing production implies that local producers have been taking a larger share of the Puerto Rican market, and imports have experienced a decrease in relative importance.

A principal reason for the apparent increase in Puerto Rico's competitive advantage on the printing and publishing products is its relatively low wage rates. Latest data available (table 5) show that the average earnings of workers in this industry group have been far below those of U.S. workers, and the differential has been widening in recent years.

² Export values were small, hence excluded from the discussion for simplicity. The inclusion of export would not change our conclusions.

Table 5.—Hourly Earnings of U.S. and Puerto Rican Workers in Printing and Publishing

Year	Puerto Rico	United States	Differential
1971	\$2.38	\$4.26	\$1.88
1972	2.70	4.55	1.85
1973	2.99	4.74	1.75
1974	3.10	5.09	1.99
1975	3.07	5.49	2.42
1976	3.44	5.76	2.32

Source: Fomento, "The Printing, Publishing and Allied Industries in Puerto Rico, 1977."

The second reason for the increase in the market share of Puerto Rican industries as the demand grows is the special characteristics of the printing and publishing industries. Except for some books and magazines, printing products cannot be produced in large quantity for export as in the case of, for example, apparel goods, electrical equipment, etc. Printing, in most cases, is a type of service where printers fill specific orders from customers; e.g., printing of labels, reports, books written by local authors. In addition, most of the Puerto Rican materials are printed in Spanish. Such a market condition provides a very unfavorable environment for off-island producers, and U.S. producers in particular.

Paper and Paper Products

Puerto Rico uses a large and increasing quantity of paper products, for household consumption (e.g., paper towels, wrapping paper, etc.); for business and government consumption (e.g., news printing, reports, letters, etc.); and to support industrial products (e.g., packaging paper, cardboard, etc.). Only a small portion of the various types of paper consumed is produced onisland, the remainder being imported, primarily from the United States.

The consumption of paper and paper products by Puerto Rico's household sector increased from \$4.4 million in 1960 to \$9.9 million in 1967. In the past 10 years, that amount has nearly quadrupled, to the level of \$35.7 million in 1977. Most of this increase, in percentage as well as in dollar value, is attributable to households' utility paper. (See table 6.) Official data on the demand for paper and paper products by the government and business sectors are not available; however, its total is estimated as high as 400 percent of the household demand.

The Puerto Rican paper and paper products industry in 1976 included 40 establishments, employing 1,479 workers. These represented a 33-percent increase in the number of establishments and a 26-percent increase in employment from 1966. The average number of employees per establishment reduced from 39 to 37 in the 2 respective years.³

³ Puerto Rico Bureau of Labor Statistics, *Census of Manufacturing Industries of Puerto Rico*, October series.

Table 6.—Consumer Expenditures of Paper and Paper Products in Puerto Rico

[In thousands of dollars]

Fiscal year	Total	Stationery and writing supplies	Household paper and miscellaneous products
1960	4,381	1,167	3,214
1967	9,987	1,489	8,498
1968	13,666	1,566	12,100
1969	13,660	1,604	12,056
1970	15,755	1,630	14,125
1971	17,446	1,685	15,761
1972	19,705	1,714	17,991
1973	22,852	1,761	21,091
1974	21,865	1,776	20,089
1975	31,276	1,777	24,499
1976	33,295	1,800	31,495
1977	35,744	1,841	33,403

Source: Derived from unpublished data provided by the Puerto Rico Planning Board.

The industry's output (sales) increased from \$27 million in 1967 to \$68 million in 1977. In real terms, it rose at a compounded rate of 2.4 percent per year,⁴ compared with the employment growth rate of 2.3 percent. The net income accrued to labor as a percentage of total net income originating from the industries fluctuated between 59 percent and 85 percent, and averaged about 70 percent for the 1967-77 period.

External Trade.—Puerto Rico's external trade of paper and paper products is primarily with the United States. The total value of paper products shipped to Puerto Rico from the United States tripled in the 1958-67 period, and again from 1967 to 1976. In 1976, it reached the level of \$178.7 million. The latter period's increase was made up by \$1.3 million increase in pulpmill products—imported primarily for the production of paper products—and \$126.1 million in final paper products of various types used by businesses and consumers. (Table 7.)

⁴ Income data is from the Puerto Rico Planning Board's "Puerto Rican Income and Products Accounts" (unpublished), price indices are approximated from Puerto Rico Minimum Wage Board, "La Industria De Papel, Productos De Papel, Impresos y Publicaciones," May 1976.

Table 7.—Shipments of Paper and Paper Products from the United States to Puerto Rico

[In thousands of dollars]

Year	Pulpmill products	Paper products	Total
1958			17,372
1963			29,119
1967	270	51,041	51,311
1972	890	77,561	78,451
1973	610	95,773	96,403
1974	1,273	132,462	133,735
1975	967	149,746	150,713
1976	1,570	177,175	178,745

Source: U.S. Department of Commerce, Bureau of the Census, *U.S. Trade with Puerto Rico and U.S. Possessions/FT 800*, (various years) Annuals. (Washington, D.C.: Government Printing Office).

Table 8.—Shipments of Paper and Paper Products Between United States and Puerto Rico—CY 1976

Schedule B ¹	Description	From United States to Puerto Rico	From Puerto Rico to United States
251.5	Pulp, except woodpulp	\$1,112,111	
251.6	Woodpulp—chemical, dissolving grades	106,307	
251.7	Woodpulp—sulphate	316,162	
251.8	Woodpulp—sulphite	35,529	
641.1	Standard newsprint paper	335,150	
641.2	Printing and writing paper, N.E.C.	15,160,205	
641.3	Kraft paper and paperboard in rolls, etc.	18,032,220	
641.4	Cigarette paper in bulk, rolls, sheets	10,719	
641.5	Paper and paperboard, machine made, etc.	9,397,256	\$39,611,902
641.6	Building boards—wood pulp or vegetable fiber	1,964,319	
641.7	Papers—handmade	130,233	
641.9	Paper and paperboard—coated, impregnated, etc.	14,013,820	
642.1	Paper bags, paperboard, boxes, containers	43,924,895	
642.2	Paper stationery, N.E.C. for correspondence	6,890,287	
642.3	Paper stationery, except correspondence	9,131,592	
642.9	Art of paper pulp, paper, or paperboard	58,185,481	
Total		178,751,286	9,611,902

¹ Schedule B codes corresponding to SIC code 26 (paper and paper products), are taken from U.S. Department of Commerce, Bureau of the Census, *Classification and Cross Classifications, 1974*.

² Schedule P Nos. 64104, 64107, 64108, 64200.

Source: U.S. Department of Commerce, Bureau of the Census, *U.S. Trade With Puerto Rico and U.S. Possessions, FY 800, 1976 Annual* (Washington, D.C.: Government Printing Office.)

As shown in table 8, the largest paper products group (4-digit Schedule B code) purchased by Puerto Rico was the "Art of Paper Pulp, Paper, or Paperboard," which amounted to \$58 million. The "Paper Bags, Boxes, and Containers" group was the second largest with \$44 million purchased. By comparison, the import value of households' utility paper is of little significance.

On the export side, the Planning Board's data show that from 1968 to 1975, Puerto Rico's export of paper and paper products to the United States was small, both in terms of dollar values and the rate of growth. Although the island's export to foreign countries increased substantially in the period (253 percent), its impact on the trade balance is insignificant because of its relatively small value, and the comparable increase in foreign imports (214 percent).

As a result, the large increase in the island's imports, from the United States, and—to a lesser ex-

tent—from foreign countries, has caused the Puerto Rican trade deficit on paper products to widen. For the 1968–75 period, the deficit increased at a compounded rate of 16 percent per year. (Table 9.)

Whether or not Puerto Rico can capitalize on the increasing United States, and especially local, demand for paper products would depend on its ability to produce quality paper at competitive costs. Past census data show that, except in 1963, the local industry's ratio of value added to payroll is comparable to that of the U.S. mainland. (Table 10.)

Table 10.—Value Added Per Dollar of Payroll, Paper and Allied Products Industry

Year	Puerto Rico	United States
1958	\$2.07	\$2.05
1963	1.82	2.11
1967	2.29	2.19
1972	2.17	2.18

Source: U.S. Department of Commerce, Bureau of the Census: *Census of Manufactures—Industry Statistics*.

Table 9.—Puerto Rican Import and Export of Paper Products, FY 1968 and FY 1975

[In thousands of dollars]

	1968	1975	Percentage increase 1968–75
Imports:			
From United States	54,879	155,601	183
From foreign countries	4,024	12,635	214
Total imports	58,903	168,236	186
Exports:			
To United States	890	969	9
To foreign countries	4,929	17,411	253
Total exports	5,819	18,380	216
External trade deficit	53,084	149,856	182

Source: Commonwealth of Puerto Rico Planning Board *External Trade Statistics, 1968 and 1975*.

The period following 1972 witnessed a worldwide recession and skyrocketing costs of energy. Most industries in Puerto Rico and in the United States experienced a reduction in the growth rates and in the actual number of people employed. The U.S. paper industry was particularly hard hit because of its high energy consumption. However, the Puerto Rican paper industry had maintained a respectable 46 percent sales increase and an 8.5 percent increase in employment in the 1973–76 period. This employment growth is the fourth highest rate among all 2-digit SIC industries in Puerto Rico.

The lack of production, cost, and output data on Puerto Rico's paper and allied products industries

precludes any conclusive analysis at this time. However, the industry was able to grow at such a rapid rate in the difficult recession years; barring any phenomenal change in the market condition, the industry will continue to expand in the future.

Competitive Position and the Industry's Outlook.

—The local market demand for paper and paper products will continue to grow in the foreseeable future for the following reasons:

1. The Puerto Rican demand for printing products is expected to rise. With the expansion of the printing industry more newsprint paper, book paper and similar paper products will be needed.

2. As Puerto Rico's per capita income increases, there will be higher per capita consumption of household paper, such as wrapping paper, paper towels, bags, etc.

3. The growth of local manufacturing and business sectors will also require additional paper for packaging and shipping. It is not clear, however, whether the changing structure of the economy toward the production of more capital intensive items would significantly affect the industrial demand for paper products.

On the national market, the demand for packaging materials has already experienced a sharp upturn in the first part of 1978 after several years of slow growth. The American Paper Industry attributes this increase to the recovery of nondurable goods industries following the recession. It is predicted that the Nation's consumption of paper products will grow at least 4 percent to 4.5 percent this year.⁵ International Paper Company, the Nation's largest paper manufacturer, which suffered a severe decline in the first half of 1977, reported a 33 percent rise in profits in the last quarter. Georgia-Pacific Corporation,

whose paper products accounted for about 78 percent of the total sales, also reported gains.⁶

CONCLUSION

The paper and printing product group is a relatively minor industrial group in Puerto Rico. The group's combined employment amounted to only 3 percent of the manufacturing sector total in 1976. Net income generated by this group accounted for 2.3 percent of all manufacturing incomes in the same year. However, both components of the group—printing and publishing, and paper and paper products—have been experiencing a steady and above average growth in the past years. This occurred despite a decline in the growth rate as well as the dollar value of sales experienced by U.S. paper industries.

The demand for printing and publishing products is expected to increase faster than the rate of population growth. The reason is that the increasing Puerto Rican per capita income will afford more educational opportunities for the populace. This conclusion is derived from a logical extrapolation of the past trend. For example, from 1970 to 1975, the number of college and university students in Puerto Rico increased 65 percent. In per annual terms, the compounded rate is 10.6 percent, substantially higher than the population growth rate of 2.8 percent.

The rise in demand for printing and publishing products will result in an increase in a certain type of paper products. Other factors such as Puerto Rico's income and the growth of local industries will add to the demand for local paper products. In addition, the upturn of the U.S. paper market is an indicator of the favorable outlook of the local paper and paper products industry in Puerto Rico.

⁵ *New York Times*, March 16, 1978.

⁶ *New York Times*, January 18, 1978.

Transportation Equipment

DEFINITION

This industry group is classified under code SIC-37. It includes establishments engaged in manufacturing equipment for transportation of passengers and cargo by land, air, and water except manufacturing of mobile homes.

CHARACTERISTICS

Transportation equipment is the least significant industry group among all major Puerto Rican industries classified at the 2-digit SIC level. Only a few important features of this industry will be outlined in this brief profile.

1. In the past decade, the industry's employment averaged less than one-half of one percent of the total manufacturing labor. Furthermore, the employment level is decreasing. In 1976, Puerto Rico's Bureau of Labor Statistics identified only 14 small establishments engaging in the production of transportation equipment in Puerto Rico. These establishments employed a total of 355 workers or 0.25 percent of employment in the manufacturing sector (table 1).

2. The average wage rate of production workers doubled in a 10-year span from \$1.55 per hour in 1966 to \$3.13 per hour in 1976. The average Puerto Rican manufacturing sector wages increased from

Table 1.—Puerto Rico's Transportation Equipment Industry, 1966–76

Year	Number of establishments	Employment		Average producing worker's wages	Labor income/net income (ratio)
		Number	Percentage of sector		
1966	21	650	0.55	\$1.55	—
1967	20	670	.53	1.71	71.2
1968	19	717	.52	1.94	72.6
1969	21	548	.40	2.12	99.2
1970	21	545	.40	2.22	78.0
1971	—	—	—	—	80.2
1972	19	423	.29	2.35	¹ 100.4
1973	20	592	.39	2.63	79.0
1974	20	453	.30	2.87	81.7
1975	17	414	.30	2.87	87.4
1976	14	355	.25	3.13	77.0

¹ Implies negative net profit.

Source: Puerto Rico Bureau of Labor Statistics, *Census of Manufacturing Industries in Puerto Rico*, and Planning Board's unpublished data on National Income Accounts.

\$1.31 per hour to \$2.86 per hour during the same period. Because of the industry's high average wage, its competitive position is expected to be less negatively affected by the increasing statutory minimum wage than other industries in Puerto Rico.¹

3. The 1972 U.S. Department of Commerce Census shows that 75 percent of employment in the Puerto Rican transportation equipment industry was from motor vehicle and equipment plants. The entire industry's value of shipments was \$12.6 million, \$6.8 million of which was value added by manufacture.

OUTLOOK

Although there is considerable uncertainty involved, Puerto Rico's transportation industry is expected to change substantially in the next decade. The new developments include:

1. The initiation of the production of the AR-404 airplane in Puerto Rico by Ahrens Aircraft. The company's initial investment was reported at \$3 million. If this AR-404 model is successful in competing with the DC-3 and expanding rapidly in the world market, economic activities at the former Ramey Air Force Base complex—the planned factory site—will increase significantly.

2. The development and expansion of shipbuilding and repair facilities. The U.S. Department of Transportation describes the current business at Puerto Rico Drydock and Marine Terminals, Inc. as "only fair," and that "the yard's facilities are underutilized."² Although the management has expressed optimism regarding future business, there are no plans to expand the company's current emergency repair services and to enter the boatbuilding and shipbuilding market. At San Juan Shipyard, Inc., business is considerably better, but the lack of capital has imposed a major obstacle to plans for expansion of building and yard facilities.

Currently, Ocean and Island Waterways Corporation is considering the construction of a shipyard at

¹ Assuming the entire industry's wage structure does not increase as fast as the minimum wage which is scheduled to reach \$3.10 per hour in 1980. The lack of data does not allow a prediction of the industry's competitive position relative to that of the U.S. mainland.

² U.S. Department of Labor "Transportation Sector Study" of the Interagency Study on Puerto Rican Economy.

Guanica. This operation would involve primarily shipbuilding activities, and is expected to employ 200 workers at the start. The total employment may reach 800 workers in the future, if market conditions are favorable and the company is willing to invest \$15 million in the project. At present, however, the actual construction date has not been determined.

CONCLUSION

In summary, the transportation equipment industry of Puerto Rico has been a minor and declining industry. New ambitious expansion plans, if realized, are expected to change the face of this industry entirely.

Major Industrial Group SIC-21

Tobacco Manufacturers

DEFINITION

This major SIC group includes establishments engaged in manufacturing cigarettes, cigars, smoking and chewing tobacco and snuff, and in stemming and redrying tobacco. The following 3-digit industrial subgroups are included: SIC-211, cigarettes; SIC-212, cigars; SIC-213, tobacco (chewing and smoking) and snuff; SIC-214; tobacco stemming and redrying.¹

The considerable diversification of the tobacco industry in Puerto Rico is illustrated by the variety of manufacturing operations conducted on the island. Tobacco manufacturing operations in Puerto Rico include:

1. Cigarette manufacturing.
2. Cigar manufacturing.
3. Wrapping of leaf tobacco.
4. Warehousing, processing and redrying tobacco.
5. Threshing of filler tobacco.
6. Curing and sorting of tobacco.
7. Manufacturing of chewing and pipe smoking tobacco.

SIZE AND GROWTH

Tobacco growing and processing was once one of the major industries in Puerto Rico, going back hundreds of years. Although this major industrial group still employs nearly 4,000 persons, its importance to Puerto Rico's economy has been declining in recent years.² Tobacco acreage declined from 37,000 cuerdas in 1950-51 to less than 5,000 annually in the 1970's. To slow the decline in tobacco acreage the Puerto Rican Government offered special incentives to growers in recent years of about 23 cents per pound, and to processors of about 8 cents per pound. Despite these incentives and wage sub-

sidies, the tobacco industry has become increasingly unprofitable over time and is not expected to recover as suitable land becomes depleted.

Employment

As can be seen from table 1, the tobacco industry has been declining for almost two decades, but most rapidly since the late 1960's. Employment has declined both in absolute terms and as a percentage of sector employment. In 1954, employment in the industry was at its highest with 9,758 workers, representing 14.1 percent of manufacturing employment. By 1976, the industry employed only 4,531 workers, who accounted for 3.1 percent of sector employment. The most notable declines came between 1954 and 1958, when employment fell more than 45 percent, and between 1967 and 1972, when it fell more than 50 percent. The two factors that have contributed to decreasing industry employment are decreased production and increased mechanization. The employment decline of 9 percent from 4,980 workers in 1974 to 4,531 workers in 1976 resulted mostly from employment decreases of workers in wrapper tobacco processing, a phase in tobacco manufacturing which at one time was completed by hand. Tobacco industry employment on the U.S. mainland has also declined at a compound annual rate of 1 percent between 1967 and 1976. This decline was most marked in the cigar (SIC-212) and chewing and smoking tobacco (SIC-213) industries.

In general, Puerto Rico's SIC-21 industries have become decreasingly labor intensive over the 1954-72 period, a trend apparently linked to technological capitalization and a declining work force size. Even in 1972, however, tobacco manufacturing was more labor intensive than both Puerto Rico's manufacturing sector as a whole and the island industry's SIC-21 counterpart in the U.S.³

Certain sectors of the U.S. Labor Department's sevenfold classification of SIC-21 industries—

¹ U.S. Executive Office of the President, Office of Management and Budget, Statistical Policy Division, *Standard Industrial Classification Manual* at 133 (1972). (Herrington, 1972 *SIC Manual*.)

² U.S. Department of Labor, Employment Standards Administration, Wage and Labor Division, *Tobacco Manufacturing Industry in Puerto Rico*, at 1, 2, 35 (1976). (Herrington, *Tobacco Report*.)

³ U.S. Department of Commerce, Domestic and International Business Administration, *U.S. Industrial Outlook: 1977*, at 264.

Table 1.—Selected Economic Data on the Puerto Rican Tobacco Industry (SIC-211) Selected Years

	1954	1958	1963	1967	1972	1973	1975	1976	1977
Number of establishments	259	142	83	44	28	47	42	35	
Total number of employees	9,758	4,509	6,062	6,899	4,508	5,569	4,980	4,531	
Employment as a percentage of sector employment	14.1	6.3	6.2	5.7	3.0	3.6	3.6	3.1	
Sales		29.9	60.0	88.3	111.4	156.4	176.9	187.6	193.4
Sales as a percentage of sector sales		3.9	4.1	3.9	2.7	3.1	2.3	2.1	1.9
Net income		9.0	21.0	35.2	35.2	37.2	49.3	54.0	55.1
Net income as a percentage of sector net income		5.8	4.1	5.3	2.7	2.4	2.5	2.3	1.9
Value added by manufacture	10,224	10,119	23,847	40,952	46,414				

Sources: U.S. Bureau of the Census, Economic Censuses of Outlying Areas, *Puerto Rico: Census of Manufacturers*, 1963, 1967, 1972. (Washington, D.C.: Government Printing Office.)
 Puerto Rico, Department of Labor, *Census of Manufacturing Industries of Puerto Rico*, various years.
 Puerto Rico Planning Board, *Puerto Rico Income and Product Accounts* (unpublished data).

namely filler tobacco processing, wrapper type tobacco processing, machine threshing and other operations, and other products and activities—have yet to reach wage parity with U.S. mainland statutory levels.

The wage levels of tobacco manufacturing employees in 1976 were below the average for Puerto Rico's manufacturing sector as a whole during that year, and considerably below ratios of compensation for similar employment on the U.S. mainland. This results, partly, from the concentration in Puerto Rico on the production of cigars which tends to be a labor-intensive industry. In 1976, the average wage per hour in the Puerto Rican tobacco industry was \$2.41 compared to a manufacturing hourly wage of \$2.86 and a U.S. wage of \$4.91.

The average hourly wage per employee in the tobacco industry in Puerto Rico in 1976 was \$2.41. This is slightly less than 50 percent of the U.S. average hourly wage of \$4.91 in this industry group for the same year. SIC-21's average wage per hour of \$2.41 in 1976 was below the present minimum wage of \$2.65 an hour. As this industry is characterized by above-average labor utilization, it could be somewhat adversely affected in meeting the 1980 minimum wage rate of \$3.10 an hour.

Assuming the 1975 cost structure for the industry is essentially unchanged except for application of the 1980 minimum rate, the following calculations are illustrative of the impact of the minimum wage rate on the industry:

- 1975 total costs would increase by 7.3 percent.
- 1975 wage bill would increase by \$11.35 million to \$39.5 million.
- Profit would fall by \$11.35 million to \$11.14 million.

—Profit-to-equity would fall from 0.3 percent to 0.15 percent.

—Profit-to-sales would fall from 12.7 percent to 6.3 percent.

—Profit-to-total costs would fall from 14.6 percent to 7.2 percent.

Thus, the industry's labor costs would increase 40.3 percent. These calculations would seem to indicate that the tobacco products industry is relatively sensitive to wage rate increase when compared to such industries as electrical machinery, instruments, and pharmaceuticals. The rates of return would decrease in all of the above cases by more than 50 percent and total costs would increase slightly over 7 percent. Federal minimum wage applications to the products industry could possibly make this industry group marginally profitable, and make it difficult for industries to maintain a competitive location in Puerto Rico.

Net Income and Sales

Both net income generated by the tobacco industry and value of shipments have increased in absolute terms. However, industry output (as measured by contribution to net income) has declined from 5.8 percent of that of the manufacturing sector in 1954 to 1.9 percent in 1977, a fall of over 300 percent. As seen in foregoing table 1, tobacco sales as a percentage of sector sales have declined from a high of 4.1 percent in 1963 to 1.9 percent in 1977. This is one indication of the relatively minor and declining contribution this industry has made and can be expected to make to the Puerto Rican economy.

As can be seen in table 2, of the net income that accrues to the tobacco industry an average of about

Table 2.—Labor Income as a Percentage of Total Group Net Income

Tobacco products (SIC-21)	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Manufacturing sector percentage	61.9	62.8	63.4	62.6	52.0	58.6	54.6	49.5	49.7	43.1	40.7
Tobacco products percentage	53.0	56.7	61.9	57.9	54.2	64.1	63.2	73.9	57.0	53.8	51.1
Rank of SIC-21 out of 25 industry groups	19	17	16	18	19	15	14	8	16	15	17

Source: Puerto Rico Planning Board, *Income and Product Accounts* (unpublished worksheet data).

60 percent remains in Puerto Rico as income to labor. The ratio of labor income to net income in the tobacco industry was higher than the average for the manufacturing sector as a whole for the last 7 years of the 1967 through 1977 period. However, the tobacco industry has ranked almost consistently in the lower third when compared to all industries. Based on this criteria alone, it would seem to be an industry group in which nonresident investment produces relatively small returns in terms of Puerto Rican income as compared with such investment in most other industries.

INDUSTRY TRENDS

The tobacco industry is predominantly mainland-owned and geared to the production of a finished product for export to the mainland. In 1958, 81 percent of Puerto Rico's tobacco products by value were exported to the United States. By 1976, exports to the United States as a percentage of industry shipments had declined to about 62 percent. Local sales consume about 17 to 20 percent of industry shipments with the remaining 18 to 21 percent of industry shipments being exported to countries other than the United States. Industry investment, as measured by expenditures per employee for plant and equipment in the tobacco industry increased most rapidly between 1967 and 1972. Expenditure outlays increased from \$62 an employee in 1967 to about \$580 in 1972.

Major Products

Cigar production and tobacco stemming and re-drying are by far the most important subgroups in the SIC-21 major group. Together these two subgroups accounted for over 95 percent of the value of exports to the United States in 1976. Cigars alone accounted for \$98.9 million or 85.3 percent of industry exports to the United States in that year. The remaining production is concentrated in the processing of cigar wrappers from leaf tobacco grown in the United States, advanced in Puerto Rico, and resold in the United States. Virtually all of Puerto Rico's SIC-31 manufactures proceed in their finished forms to the mainland. Cigar shipments to the mainland declined to 1.1 billion cigars in 1974, remaining at that level in 1975 after peaking at 1.4 billion in 1972. The value for 1975 cigar shipments stood at \$96.5 million, slightly more than 1974's figure. The shipment value of cigars for the first 5 months of 1976 was \$39 million, up from \$36 million from the same period of 1975. In 1975, tobacco shipments increased to \$21.3 million, up from \$20.1 million in 1974, although volumes dropped somewhat. However, the value of tobacco shipments for the first 5

months of 1976 stood at \$5.5 million, down 38 percent from the same period of 1975. Cigar wrapper leaf volume of \$18 million comprised 84 percent of the \$21.3 million shipped in 1975. These volumes were generally less than those for previous years. Cigar wrapper leaf shipments rose to 2.9 million pounds in 1975, 40 percent over 1974 and 7 percent over 1973 volumes. Both quantity and value of wrapper leaf shipments for the first 5 months of 1976 were down sharply from those during the first 5 months of 1975. Noncigar wrapper tobacco leaf shipments rose to 119,000 pounds in 1975 from 1974's 81,000 pounds, reaching a valuation of \$310,000. Of that total, 53,000 pounds of tobacco leaf were grown in Puerto Rico during 1975. Tobacco not elsewhere classified accounted for 5.5 million pounds in shipment, nearly 65 percent of total 1975 shipments from Puerto Rico, or \$3 million (14 percent of the total value).⁴

Productivity

Between 1954 and 1972, value added by manufacture increased for Puerto Rico's tobacco manufacturing industries by almost 4½ times. Value added per employee in 1972 was about \$10,296, about 80.4 percent of the manufacturing sector's figure for that year. However, the value of shipment per employee increased much more rapidly, increasing more than 6 times between 1958 and 1976 from \$6,631 to \$41,404. This compared very favorably with the U.S. tobacco industry, where sales per employee increased only 1.7 times in the same time period. Yet, even with this rate of increase, sales per employee in the United States were still almost twice as great as sales per employee in Puerto Rico for 1976. Only for cigars, Puerto Rico's dominant tobacco product, did sales per employee in Puerto Rico exceed those on the mainland.

The data above suggests that increases between 1954 and 1972 in both value added and the value of shipments per employee among tobacco manufacturers in Puerto Rico vastly outstripped per-employee wage and salary increases across the same period. Therefore, this major industrial group can well afford to expand its labor force, while stemming further sections in its labor-intensity ratio. In addition, since 1971, its ratio of profits to sales has remained in excess of 10 percent as has its profits to equity record. (See table 3.)⁵ Such a profits to equity ratio is able to provide for present dividends and funds for future growth.

⁴ *Tobacco Report*, *supra*, note 2 at 35.

⁵ In its 1976 report on Puerto Rican tobacco manufacturing, the Labor Department failed to identify the three sectors which have already achieved parity. Moreover, its 7-sector classification is not comparable with its 3-digit SIC counterpart. See *Tobacco Report*, *supra*, note 2 at 2.

Table 3.—Selected Operating Ratios (SIC-21), 1954-75

	1954	1958	1963	1967	1972	1973	1974	1975
Profits as percentage of sales	5.3	17.0	21.0	5.9	25.7	10.5	28.6	12.4
Profits as percentage of equity	22.1	47.6	23.9	11.2	28.1	26.3	31.9	16.0

Source: Unpublished data provided by Fomento.

LINKAGES WITH DOMESTIC, U.S. AND FOREIGN MARKETS

Domestic Trends

Between 1963 and 1972 the Puerto Rican share of the total local market for tobacco products varied between 10 and 20 percent. The recovery in 1972 from the low of a 10-percent market share in 1967 can, in part, be attributed to the establishment of a cigarette plan by R. J. Reynolds in 1970. The distribution of shipments of cigarettes received at Puerto Rico's ports by manufacturers indicated that in 1974 R. J. Reynolds Tobacco shipments accounted for 14 percent of total shipments. In 1975, R. J. Reynolds sold 90 percent of its production in Puerto Rico and so aided in the doubling of Puerto Rico's share of the local market for tobacco products.

Interindustry linkages have also fluctuated greatly in recent years. Between 1963 and 1972, the proportion of shipments to other manufacturing enterprises declined as a percentage of all shipments within Puerto Rico. In 1963, 89.9 percent of all such shipments went to other manufacturing enterprises. By 1967, this increased slightly to 90.4 percent, but 5 years later dropped to 27.4 percent, to the benefit of shipments to wholesalers, retailers and others, including government. These trends also indicate a weakening of linkages between tobacco manufacturers and those in other major industrial groups on the island. (See table 4).

Import/Export Trends

From 1954 to 1972, imports into Puerto Rico from the U.S. mainland of products either manufactured or potentially manufacturable on the island increased by over 6 times, from \$9.1 million to \$57.5

million. Unmanufactured tobacco, imported either for advancement in production and export as leaf tobacco or for blending in final products sold locally or exported, made up between about 55 percent to 70 percent of imports from 1967 to 1976. (See table 5.) Since 1972 the importation of chewing and smoking tobacco and snuff has exceeded cigarette imports. In 1976, the respective values were \$15.4 million and \$10.2 million. This shift could be the function of both changes in consumer tastes and increasing local production of cigarettes.

Table 5.—Value of Tobacco Shipments to and from the United States

[Millions of dollars]

Year	Exports			Imports		
	Total SIC-21	Cigars	Cigars as a percentage of total SIC-21 exports	Total SIC-21	Tobacco-unmanufactured tobacco (Commodity Code 121.0)	Unmanufactured tobacco as a percentage SIC-21
1954	22.0	3.2	14.5	9.1		
1958	24.3	11.3	46.5	21.4		
1963	77.3	38.6	49.9	40.3		
1967	136.0	95.0	69.8	70.7	49.3	69.7
1970	129.0	100.7	78.0	76.9	51.9	67.5
1971	124.9	96.2	77.0	62.9	42.2	67.4
1972	137.6	104.6	76.0	60.4		
1973	129.9	103.3	79.5	57.1	38.4	67.3
1974	114.2	94.1	82.4	56.8	36.7	64.6
1975	118.0	96.5	82.0	55.9	37.1	66.3
1976	115.9	98.9	85.3	57.5	30.7	53.4

Source: U.S. Bureau of the Census, *U.S. Trade with Puerto Rico and U.S. Possessions*, FT 800/ (various years) Annuals. (Washington, D.C.: Government Printing Office.)

Exports of tobacco products from Puerto Rico to the United States increased almost as rapidly as imports, from \$22 million in 1954 to \$115.9 million in 1976. A positive trade balance of slightly more than 2-to-1 has been maintained over time.

Over the years, an increasing percentage of total tobacco manufacturer's exports have represented

Table 4.—Major Group SIC-21 Linkages in Puerto Rico

1963-73—Products shipped and contract receipts (in thousands of dollars) in Puerto Rico to—

Total Puerto Rico-United States-Foreign	Total	Wholesalers	Retailers	Domestic customers	Other manufacturing enterprises	Others including government
1963	59,662	10,192	638	317	63	9,160
1967	87,667	7,968	(D)	(D)	(D)	7,201
1972	111,161	16,629	1,812	9,374	—	4,560
						883

(D)—Data unavailable.

Source: U.S. Bureau of Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures 1963, 1967 and 1972*. (Washington, D.C.: Government Printing Office.)

cigars, cheroots, and cigarillos. In 1954, cigars comprised only 14.5 percent of industry shipments to the United States. By 1976, this figure had grown to 85.3 percent. Although Puerto Rico's tobacco manufacturers have succeeded in maintaining a vigorous level of exports over the years, they could do more to shore up weakening linkages between themselves and their counterparts in other major manufacturing groups.

Reliance on Transportation and Associated Costs

Cigar shipments to the U.S. mainland declined to a volume 1.2 billion in 1974 and remained at that level in 1975, after peaking at 1.4 billion cigars in 1972. The value of 1975 cigar shipments was \$96.5 million, slightly more than 1974's figure.⁶ In 1975, Puerto Rico manufacturers shipped nearly \$21.3 million worth of tobacco to the mainland. This was slightly more than the \$20.1 million in 1974, but less than the previous years. Quantity of tobacco was nearly 8.6 million pounds, which was slightly less than 1974. The value of tobacco shipments for the first 5 months of 1976 was at \$5.5 million, down 38 percent from the similar span in 1975.⁷

Cigar wrapper leaf accounted for nearly \$18 million of the \$21.3 million worth of tobacco shipped in 1975, or nearly 84 percent. The value of shipments was more than 1974 but less than the previous years. Quantity of shipments of cigar wrapper leaf rose to 2.9 million pounds in 1975, 40 percent over 1974 and 7 percent over 1973. Of the 2.9 million pounds, about 2.5 million pounds (worth \$17.8 million) were wrapper leaf grown in the United States and shipped to Puerto Rico for processing and sold to the United States. For the first 5 months of 1976, the quantity and value of cigar wrapper leaf shipments were down sharply from 1975.⁸

Shipments of tobacco leaf other than cigar wrapper in 1975 were at 119,000 pounds, up from 81,000 in 1974, and were valued at \$310,000. Of the total, 53,000 pounds of tobacco leaf were grown in Puerto Rico in 1975.⁹

Tobacco, not elsewhere classified, accounted for 5.5 million pounds in shipment, which represented nearly 65 percent of total 1975 shipments from Puerto Rico. However, in value of shipments, this category represented \$3 million or 14 percent of the total value.¹⁰

Raw materials and finished products are transported to and from the U.S. mainland by ocean freight. The May 1976 ocean shipping rates charged

by the Puerto Rico Maritime Shipping Authority for tobacco and related products between New York and San Juan are shown in table 6.¹¹

Table 6.—Prevailing Oceanic Freight Rates Between Puerto Rico and New York—for Selected SIC-21 Products

Direction of shipment and commodity	Unit of measure	Rate of May 1976	Rate of June 1977
<i>Puerto Rico to the mainland:</i>			
Cigars and cigarettes, in cases or cartons	Cu. ft.	LTL \$0.60 TL \$0.46	\$0.35
Leaf tobacco, in barrels, cases or crates	do.		.54 .37
Leaf tobacco, in bales, or in bales packed in cartons not exceeding 180 pounds	Each	3.77	3.64 2.52
Tobacco, unmanufactured, cuttings, scraps, stems, or sweepings:		5.59	
TL Min. 14,000 lbs.			2.80 NA
TL Min. 23,000 lbs.			1.90 NA
Tobacco, not elsewhere specified	Cu. ft.	.44	.41 .25
<i>Mainland to Puerto Rico:</i>			
Cigars	Cu. ft.	.91	.84 .55
Cigars	100 lbs.	2.74	— 1.43
Cigar bands	Cu. ft.	.94	.86 .49
Cigar bands	100 lbs.	2.40	2.21 1.25
Cigar boxes setup	Cu. ft.	.86	.55 1.35
Leaf tobacco	do.	.86	.71 .43
Leaf tobacco	100 lbs.	2.10	— 1.10
Scrap tobacco, baled or in cartons	Per trailer	—	— 375.00
Scrap tobacco	Cu. ft.	—	— .40
Scrap tobacco	100 lbs.	6.50	5.59 1.10
Tobacco, not elsewhere specified	Cu. ft.	1.05	.97 .55
Tobacco, not elsewhere specified	100 lbs.	2.74	2.53 1.43

¹¹ Rate per trailer load; the rate for less than trailer load is 45 cents per cubic foot.

Source: Federal Maritime Commission files.

Ocean freight rates increased greatly between June 1971 and May 1976, with the southbound rates rising more rapidly. For the southbound mainland to Puerto Rico, most rates advanced from 50 percent to more than double the previous rates, while the northbound rates increased by 30 percent to 65 percent.¹²

Environmental Demands

Puerto Rico's tobacco manufacturing industry characterizes an energy-labor ratio relatively low in comparison with that of other major manufacturing groups. The industry averages energy costs somewhat less than 1 percent of the cost of all materials. Ruiz and Zalacain computed the ratio of 1 to 187.2, which contrasts with their determination of 1 to 10,064.2 for petroleum and coal products (SIC-29) and 1 to 141.6 for agriculture.¹³

Between 1967 and 1972, the only 2 years for which ratios on cost of fuels consumed and elec-

⁶ Tobacco Report, *supra*, note 2 at 35.

⁷ Loc. Cit.

⁸ Loc. Cit.

⁹ Loc. Cit.

¹⁰ Loc. Cit.

¹¹ Op. Cit., at 40.

¹² Loc. Cit.

¹³ A. Ruiz and F. Zalacain, *Energy and Economic Development in Puerto Rico*, at table 6 (Monograph=no date).

tricity are available, expenditures for both rose from at least \$386,000 to \$658,000, an increase of almost 75 percent. This trend is in line with that for the Puerto Rican manufacturing sector as a whole, with energy-related expenditures of \$34.7 million in 1967 and \$77.6 million in 1972, an increase of about 125 percent.

CONCLUSION

Between 1954 and 1972, labor intensity within Puerto Rico's tobacco manufacturing major industrial group declined. Moreover, as export and internal-shipment ratios indicate, the manufacture of cigars, cheroots and cigarillos (SIC-211 and SIC-212) have become important.

This major industrial group's profits-to-sales ratio, in excess of 10 percent, since 1971, indicates relatively profitable return on production. This equally favorable potential for future investment lies in a

profit-equity ratio also in excess of 10 percent, since 1971.

This major industrial group's exports have grown vigorously over the 18-year, 1954-72 period, remaining at high levels in the last few years. Yet, imports of similar products from the U.S. mainland indicate a need for efforts to serve the local market more effectively. The fact that the major industrial group's sales to other manufacturing enterprises have fallen off dramatically since 1963 highlights the need for this type of effort once again.

Future adjustments to industrial incentive programs should reflect the need to increase the diversity of this major group's manufacturers, thereby serving the local market more extensively, as imports are now doing in sales of chewing and smoking tobacco and snuff (imports worth \$15.4 million in 1976) and in sales of cigarettes (\$10.2 million imported in 1976). Thus, tax-exemption incentives could be accorded new industries by type of manufacture, as well as location.

Major Industrial Group SIC-31

Leather and Leather Products

DEFINITION

At the 2-digit level, this major group includes establishments engaged in tanning, currying and finishing hides and skins, and establishments manufacturing finished leather and artificial leather products. Also included are some similar products made of other materials. Leather converters are included as well.¹

Major group SIC-31 comprises these 3-digit groups.²

- a. SIC-311: Leather tanning and finishing.
- b. SIC-313: Boot and shoe cut stock and findings.
- c. SIC-314: Footwear, except rubber.
- d. SIC-315: Leather gloves and mittens.
- e. SIC-316: Luggage.
- f. SIC-317: Handbags and other personal leather goods.
- g. SIC-319: Leather goods, not elsewhere classified.

Leather tanning and finishing establishments are primarily engaged in tanning, currying and finishing hides and skins into leather. This industry also includes leather converters, who buy hides and skins and have them processed into leather on a contract basis by others. Nonrubber footwear establishments variously manufacture house slippers, men's nonathletic footwear, women's nonathletic footwear, and other nonrubber footwear not elsewhere classified. Leather gloves and mittens establishments, in turn, manufacture dress, semidress, and work gloves exclusively of leather or leather with lining of other material. Luggage establishments are primarily engaged in manufacturing luggage of leather or other materials. Those manufacturing handbags and other personal leather goods produce both handbags and purses of leather and other materials, except precious metals. Personal leather goods include small

articles such as billfolds, key cases, and coin purses of leather or other materials, except precious metals. Leather goods, not otherwise classified, include saddlery, harnesses and whips, embossed leather goods, leather desk sets, razor strops and leather belting.³

SIZE AND GROWTH OF THE INDUSTRY IN PUERTO RICO

The leather products industry was of little significance in the early years of Puerto Rico's development program. In 1950, its output (as measured by contribution to net income) was only 2.5 percent of that of the manufacturing sector. It was the same in 1960. By 1965, it had grown to 6.4 percent. By 1967, it had declined to 4.6 percent and in 1977 was only 1.2 percent.

The leather and leather products industry's contribution to employment has also been relatively small but somewhat greater, proportionally, than its contribution in output. It employed 1,675 people in 1954, 2.4 percent of sector employment, but by 1967, employment was 10,312 or 8.5 percent of the total for the sector. However, by October 1977, employment had fallen to 5,500, 3.8 percent of sector employment. (See table 1.) The ratio of labor income to net income for the group (shown in table 4) is indicative of the trend of factor remuneration. In contrast to property income, the labor share is almost totally income to Puerto Rico.

Footwear (primarily women's shoes) and purses and personal leather goods (mostly the latter) have been by far the most important industries in the group. This is shown by any measure used. Their dominance is shown by table 2 below.

According to data obtained by Puerto Rico's Economic Development Administration (Fomento) from the Puerto Rico Department of Labor annual Census of Manufacturing Industries, there existed in October 1971, 33 *nonfootwear* leather and leather products plants employing 3,587 workers. Of

¹ U.S. Executive Office of the President, Office of Management and Budget, Statistical Policy Office, *Standard Industrial Classification Manual* at 133 (1972). (Hereinafter 1972 SIC Manual.)

² *Op. Cit.* at 133-135.

³ 1972 SIC Manual, *supra*, note 1 at 133-135.

Table 1.—SIC Major Group 31 Contribution to the Puerto Rican Economy, Selected Years

	1954	1958 ¹	1963	1967	1972	1973	1975	1976	1977
1. Number of establishments	28	32	56	78	57	55	52	40	
2. Total number of employees	1,675	2,620	5,997	10,312	6,611	6,655	5,161	4,990	5,500
3. Employment as a percentage of sector employment	2.4	3.7	6.1	8.5	4.4	4.4	3.8	3.4	3.8
4. Sales (millions of dollars)		16.5	42.7	92.0	78.6	80.6	89.0	88.9	93.9
5. Sales as a percentage of sector sales		2.1	2.9	4.1	1.9	1.6	1.1	1.0	.93
6. Net income (millions of dollars) ²				30.8	29.9	31.8	33.2	33.0	33.1
7. Net income as a percentage of sector net income				4.6	2.3	2.1	1.7	1.4	1.2
8. Value added by manufacture (thousands of dollars)	3,315	6,673	20,587	46,630	39,348				

¹ Figures as revised in 1963.

² 1954-63 from income and product tables; sale net income 1967-77 from new tables.

Sources: U.S. Bureau of the Census, Economic Censuses of Outlying Areas, *Puerto Rico: Census of Manufacturers*, 1963, 1967, and 1972. (Washington, D.C.: Government Printing Office.)

Puerto Rico, Department of Labor, *Census of Manufacturing Industries of Puerto Rico*, various years.

Puerto Rico Planning Board, *Puerto Rico Income and Product Accounts* (unpublished data).

Table 2.—Size of Industry and Industry Subgroups

ITEM	1963	1967	1972	1974
1. Number of plants				
Industry total	56	78	57	53
Footwear	20	41	31	24
Handbags and personal leather goods	14	18	15	21
Gloves and mittens	5	5	3	5
Luggage	5	3	4	
Cutstock and findings	4	3	2	
Tanning and finishing	NA	7	2	3
2. Employment				
Industry total	5,997	10,312	6,611	6,148
Footwear	2,868	6,074	3,562	3,881
Handbags and personal leather goods	1,409	2,476	1,685	1,661
Gloves and mittens	433	667	NA	542
Luggage	277	177	125	
Cutstock and findings	409	NA	NA	
Tanning and finishing	NA	NA	NA	64
3. Value added (thousands of dollars)				
Industry total	20,587	46,630	39,348	
Footwear	10,456	28,912	20,839	
Handbags and personal leather goods	3,818	3,481	10,269	
Gloves and mittens	872	2,520	5,139	
Luggage	1,056	904	976	
Cutstock and findings	880	NA	NA	
Tanning and finishing	NA	NA	NA	
4. Shipments (thousands of dollars)				
Industry total	42,707	92,035	78,609	91,794
Footwear	19,276	53,733	43,081	45,200
Handbags and personal leather goods	9,712	19,132	18,051	
Gloves and mittens	1,743	3,959	NA	
Luggage	2,086	1,199	1,376	
Cutstock and findings	2,365	NA	NA	
Tanning and finishing	NA	NA	NA	

NA: Not available.

Sources: U.S. Bureau of the Census, Economic Census of Outlying Areas, *Puerto Rico: Census of Manufactures*, 1963, 1967 and 1972. (Washington, D.C.: Government Printing Office.)

Puerto Rico, Department of Labor, *Census of Manufacturing Industries*, 1974.

this total, 30 had been promoted by the Economic Development Administration.

In 1973, 33 Fomento plants were in operation; none in the process of establishment. Table 3 below classifies these as 4-digit SIC industries indicating as well their ownership by origin.

In addition, 6 U.S. mainland firms operated more than 2 plants each in Puerto Rico during 1973, involving a total of 18. At that time, no foreign firms

Table 3.—Industry Composition of Fomento Plants
Leather and Leather Products Industry

Industry number	Description	Total Fomento plants operating
3111	Leather tanning and finishing	2
3121	Industrial leather belting and packing	—
3131	Boot and shoe cutstock and findings	7
3151	Leather gloves and mittens	2
3161	Luggage	4
3171	Women's handbags and purses	—
3172	Personal leather goods, except women's handbags and purses	18
3199	Leather goods, not elsewhere classified	—
	Combined Total	33
Ownership by origin		
Geographic origin		Number Percent
Mainland	29	88
Local	4	12
Foreign	—	—
Total	33	100

operated plants in Puerto Rico's *nonfootwear* leather and leather products industry.⁴

According to the Wage and Hour Division Employment Standards Administration of the U.S. Department of Labor, there existed in 1977, 28 establishments employing 1,906 covered workers in Puerto Rico's leather and leather products industry (footwear excluded).⁵ Of the 28, 10 produced gloves and mittens, 13 manufactured small leather goods such as wallets, billfolds, clutch purses, and leather purses. Five others produced belts, one of which also produced small leather goods. Another of the 28 engaged in hide curing.⁶

Of the plants above, 21 establishments were affiliated with mainland companies; 8 of these were gloves and mittens manufacturers. Their total em-

⁴ Puerto Rico, Economic Development Administration, Department of Economics and Planning, *The Leather and Leather Products Industry in Puerto Rico*, at p. 3 (1973). Hereinafter, *Leather Industry Profile*, 1973.

⁵ The definition employed by the U.S. Bureau of Labor Statistics for "establishment" is used here. Thus, an establishment may operate one or more manufacturing plants, again in one or more physical locations.

⁶ U.S. Department of Labor, Employment Standards Administration, Wage and Hour Division, *Gloves and Mittens Industry in Puerto Rico*, at p. 6, 1977 and *Leather, Leather Goods, and Related Products Industry in Puerto Rico*, at p. 7, 1977. Hereinafter, respectively, *Gloves and Mittens Report* and *Leather Goods and Products Report*.

ployment in 1977 was 1,840 or 94 percent of the industry's total.⁷ The number of plants coincides with that of establishments, at 28.⁸

The leather footwear industry, one of two important subgroups, consists of 26 Fomento plants distributed as follows:

Industry number	Description	Total Fomento plants operating
	Combined total	26
3141	Leather footwear	16
3142	House slippers	6
3143	Men's footwear	3
3149	Footwear, except rubber, not elsewhere classified	1

Seventy-nine percent of the Fomento manufacturing plants in the leather footwear industry in Puerto Rico are subsidiaries of U.S. firms. The remaining 21 percent of the plants are locally owned.

The following firms have more than one plant in operation in Puerto Rico.

U.S. Shoe Corporation	2
Wellco Enterprises, Inc.	3

⁷ *Gloves and Mittens Report*, p. 7; *Leather Goods and Products Report*, p. 9, *supra*, note 6.

⁸ *Gloves and Mittens Report*, pp. 32-34; *Leather Goods and Products Report*, p. 7, *supra*, note 6.

Table 4.—Labor Income as a Percentage of Industry Group SIC-31 Contribution to Net Income

	1968	1970	1972	1974	1977
Net income (millions of dollars)....	36.6	35.1	29.9	34.9	33.1
Labor Income - (millions of dollars)....	28.4	29.0	24.5	26.3	24.5
Labor income as a percentage of net income	77.6	82.6	81.8	75.3	74.0
Manufacturing labor income as a percentage of manufacturing net income....	62.8	62.6	58.6	49.5	40.7
Rank of SIC-31 out of 25 industry groups	6	2	6	7	6

Source: Puerto Rico Planning Board, *Income and Product Accounts* (unpublished worksheet data).

Table 5.—Industry Linkages

[In thousands of dollars]

Products shipped and Contract Receipts In Puerto Rico to---													
Value of shipments		Total	Onisland sales as a percent- age of value of shipments	Whole- sales	As a per- centage of Puerto Rican shipments	Retailers	As a per- centage of Puerto Rican shipments	Domestic consumers	As a per- centage of Puerto Rican shipments	Other manu- facturing enter- prises	As a per- centage of Puerto Rican shipments	Others including govern- ment	As a per- centage of Puerto Rican shipments
1963													
SIC-31	42,645	5,118	12.0	615	12.0	842	16.5	-----	-----	3,538	69.1	122	2.4
SIC-314	19,276	1,294	6.7	587	45.4	702	54.2	-----	-----	-----	-----	5	0.4
SIC-315	1,743	33	1.9	-----	-----	-----	-----	-----	-----	33	100.0	-----	-----
SIC-316	2,086	509	24.4	10	2.0	40	7.9	-----	-----	440	86.4	19	3.7
SIC-317	9,712	609	6.3	18	3.0	100	16.4	-----	-----	392	64.4	98	16.2
1972													
SIC-31	78,347	12,366	15.8	15	0.1	3,057	24.7	-----	-----	9,294	75.2	-----	-----
SIC-314	24,203	1,936	8.0	-----	-----	1,908	98.6	-----	-----	28	1.4	-----	-----

¹ Excludes SIC-3149 Footwear, except rubber, not elsewhere classified.

Source: U.S. Bureau of the Census, Economic Census of Outlying Areas, *Puerto Rico: Census of Manufactures, 1963 and 1972*. (Washington, D.C.: Government Printing Office.)

LINKAGES

In general, only about 15 percent of the leather industry's shipments by value are sold in Puerto Rico. Of this small amount, almost all, between 70 and 75 percent, is shipped to other manufacturing enterprises, with most of the remainder being shipped to retailers. (See table 5.)

In 1963, of the more than \$42.6 million in leather products shipped, only \$5.1 million, or 12 percent, was sold in the local Puerto Rican market. Of this \$5.1 million, about \$3.5 million, or over 69 percent, was shipped to other manufacturing enterprises, \$842,000 went to retailers, and \$615,000 to wholesalers.

EXPORT AND IMPORT TRENDS

The United States, by 1973, had become the largest market for products manufactured in Puerto Rico by SIC-31 industries. Declines in shipments to the United States immediately prior to 1973 reflected foreign import competition, together with other factors of consequence to industrial manufacturers. Nevertheless, shipments of SIC-31 products other than nonrubber footwear to foreign countries and the U.S. Virgin Islands have expanded nearly 9 times in the 5 years between 1967 and 1972, rising from \$114,309 to \$998,759. Nonrubber footwear products (from SIC-314 industries) also declined in their volumes of shipments to the United States between 1971 and 1976. Those to foreign countries and the U.S. Virgin Islands, however, rose during this period from \$1.021 million to \$1.87 million.⁹

⁹ Puerto Rico, *Economic Development Administration, The Footwear Industry in Puerto Rico*, p. 5 (1977). Hereinafter, *Footwear Industry Profile*.

On the other hand, almost all leather and leather products imported into Puerto Rico came from the United States by 1972, including 90 percent of the island's SIC-31 related imports, other than rubber footwear. Nevertheless, imports from the U.S. mainland, the U.S. Virgin Islands, and foreign countries of SIC-31 related products other than nonrubber footwear have declined in recent years. Imports to Puerto Rico of nonrubber footwear (SIC-314 related products) between 1969 to 1976 have declined less markedly. Table 6 summarizes the foregoing data.

When the data for imports and exports of SIC-31 products except nonrubber footwear are compared from 1967 to 1972, it becomes apparent that total exports declined more rapidly than total imports. In 1967, for example, the ratio of the former to the latter was 1 to 1.67. By 1972, this relationship had increased to 1 to 2.04. This shift took place despite an almost ninefold increase of exports from Puerto Rico to the Virgin Islands, and a sharp decrease in the level of imports from that source. A similar pattern of total export and import fluctuations also characterizes the movement in nonrubber footwear between 1971 and 1976. In 1971, for example, the value of total imports was smaller than that of total exports, giving a ratio of 1 to 1.68. By 1968, this figure had dropped to 1 to 0.85. At the same time, exports to the Virgin Islands increased more rapidly than the imports, but the volumes covered represented less than 5 percent of the totals for each of the 6 years concerned.

According to the 1977 edition of *U.S. Industrial*

Outlook, competition from abroad for the U.S. leather products market is growing among the developed Eastern European, and developing countries alike. Many developing countries with substantial domestic suppliers of raw hides and skins barred from exports by their governments will likely continue to compete vigorously for a share of the American market because of significantly lower labor and production costs.¹⁰ Lower labor costs, the instability of an adequate labor supply and other inducements from developing nations have attracted even some leather manufacturers from Puerto Rico to those foreign markets.¹¹

By 1977, all of Puerto Rico's gloves and mittens industries received a large portion of their raw materials from the mainland. In fact, all of their manufacturers were sent to the mainland.¹² Nevertheless, a sharp increase in imports from foreign countries to the United States occurred after 1974, when these constituted just over 20 percent of the total U.S. market. By 1975, its share rose to 39 percent or roughly two-fifths of the U.S. market. In the case of fabric and combination fabric and leather gloves, imports accounted for 46 percent, or close to half of all such gloves purchased by American consumers in 1975.¹³

¹⁰ *Leather Goods and Products Report*, p. 48, *supra*, note 6. Section 807 of the Tariff Regulations, enacted to assist developing nations, provides that articles assembled showed which countries' components manufactured in the United States are subject to the full value of the imported article less the cost or value of such products in the United States. In other words, the import duty is based primarily on the value issued by manufacturer. *Leather Goods and Products*, p. 48.

¹¹ *Loc. Cit.* The entire baseball and softball industry relocated from Puerto Rico to Haiti in a series of moves ending in mid-1975.

¹² *Gloves and Mittens Report*, *supra*, note 6.

¹³ *Op. Cit.*, p. 24.

Table 6.—SIC-31 Related Imports to and Exports from Puerto Rico 1967-76 (Partial Data)

a. Imports of SIC-31 products except nonrubber footwear items							b. Exports of SIC-31 products except nonrubber footwear items					
Fiscal year	Total	From United States	From foreign countries and Virgin Islands	Total	To United States	To foreign countries and Virgin Islands	Total	To United States	To foreign countries and Virgin Islands	Total	To United States	To foreign countries and Virgin Islands
1972	19,362,286	16,655,669	1,706,617	9,002,314	8,003,555	998,759						
1971	19,825,743	17,998,416	1,827,327	14,481,128	14,030,935	450,193						
1970	23,359,825	21,259,797	2,600,028	12,344,115	12,074,676	269,439						
1969	29,745,904	26,651,408	3,094,496	13,247,370	13,015,121	232,249						
1968	28,367,316	26,426,849	1,940,467	14,239,342	14,080,114	159,228						
1967	24,000,543	20,304,031	3,196,512	14,383,185	14,268,876	114,309						
c. Imports on nonrubber footwear items							d. Exports on nonrubber footwear items					
Fiscal Year	Total	From United States	From foreign countries and Virgin Islands	Total	To United States	To foreign countries and Virgin Islands	Total	To United States	To foreign countries and Virgin Islands	Total	To United States	To foreign countries and Virgin Islands
	Thou- sands of pairs	Thou- sands of dollars	Thou- sands of pairs	Thou- sands of dollars	Thou- sands of pairs	Thou- sands of dollars	Thou- sands of pairs	Thou- sands of dollars	Thou- sands of pairs	Thou- sands of dollars	Thou- sands of pairs	Thou- sands of dollars
1976	17,140	69,093	8,115	39,900	9,025	29,193	13,963	58,540	13,619	56,699	344	1,871
1975	13,315	48,870	6,458	25,481	6,857	23,389	20,004	66,254	19,574	64,364	430	1,890
1974	14,952	48,881	6,078	22,345	8,874	26,536	24,444	71,784	23,951	70,087	493	1,697
1973	16,253	51,230	6,818	23,340	9,435	27,890	23,315	61,522	23,017	60,619	298	903
1972	15,872	43,979	6,229	21,875	9,643	22,104	23,437	53,112	23,051	52,041	386	1,071
1971	15,251	42,187	6,053	21,534	9,198	20,653	26,774	70,699	26,415	69,678	309	1,021

Sources: a and c—P.R.E.D.A., *Leather and Leather Products Industry in Puerto Rico*, pp. 5, 6 (1973); b and d—P.R.E.D.A., *Footwear Industry of Puerto Rico*, pp. 5, 6 (1977).

RELIANCE ON TRANSPORTATION AND ASSOCIATED COSTS

Further, leather goods and related products with the exception of nonrubber footwear requires for their further processing and manufacture, reliance on procurement of raw materials in ocean freight.

Table 7 below sets out prevailing oceanic freight rates between Puerto Rico and Gulf and Atlantic U.S. mainland ports for differing classes of SIC-31 related products.

Table 7.—Prevailing Oceanic Freight Rates Between Puerto Rico and U.S. Mainland Ports for Selected SIC-31 Products

Commodity	April 1977 rates		June 1977 rates	
	Per cubic foot	Per 100 pounds	Per cubic foot	Per 100 pounds
Southbound:				
Leather or leather goods, artificial or natural, NOS:				
LTL _____	\$1.05	\$2.74	\$1.16	\$3.02
TL — (minimum 1,600 cu. ft. or 45,000 lbs.)—	.82	2.53	.91	2.79
Northbound:				
Leather goods, artificial or natural, NOS, in straight or mixed trailer load with other articles named in tariff:				
LTL _____	.74	1.90	.82	2.10
TL — (minimum 1,600 cu. ft.)—	.62	—	.68	—
Leather, artificial or leather, natural in the original tannery shape not cut to shape for final use:				
LTL _____	.74	1.95	.82	2.15
TL — (minimum 1,000 cu. ft.)—	.69	—	.76	—
July 1975 rates June 19, 1977 rates				
Southbound:				
Gloves, cotton, work:				
LTL _____	\$0.90	—	\$1.15	—
TL — (minimum 1,400 cu. ft.)—	.83	—	1.05	—
Gloves, NOS:				
LTL _____	1.09	2.68	1.38	3.40
TL — (minimum 1,200 cu. ft.)—	.83	—	1.05	—
Leather goods, artificial or natural:				
LTL _____	.91	2.38	1.16	3.02
TL — (minimum 1,600 cu. ft. or 45,000 lbs.)—	.71	2.20	.91	2.75
Northbound:				
Gloves, cotton work:				
LTL _____	.81	—	1.03	—
TL — (minimum 1,600 cu. ft.)—	.45	—	.57	—
Gloves or mittens, plastic, with or without fleeced lining:				
LTL _____	.64	1.63	.32	2.06
TL — (minimum 1,600 cu. ft.)—	.45	—	.57	—
Gloves, NOS:				
LTL _____	.97	2.40	1.24	3.05
TL — (minimum 1,600 cu. ft.)—	.45	—	.57	—

Table 7.—Prevailing Oceanic Freight Rates Between Puerto Rico and U.S. Mainland Ports for Selected SIC-31 Products—Con.

Commodity	Dec. 1973 rates		March 1976 rates	
	Per cubic foot	Per 100 pounds	Per cubic foot	Per 100 pounds
Southbound:				
Leather and leather goods per cubic foot:				
TL _____	\$0.70	—	\$0.32	—
LTL _____	NA	—	1.05	—
Leather and leather goods per 100 pounds:				
TL _____	1.88	—	2.53	—
LTL _____	NA	—	2.74	—
Leather, fiberboard:				
Per cubic foot _____	.63	—	NA	—
Per 100 pounds _____	1.60	—	3.68	—
Leather soles (per 100 lbs.):				
TL _____	2.62	—	3.62	—
LTL _____	NA	—	3.92	—
Shoe findings (per 1000 pounds)	1.92	—	3.68	—
Boots or shoes, NOS, per cubic foot:				
TL _____	.65	—	1.12	—
LTL _____	.70	—	1.21	—
Northbound:				
Shoes (per cubic foot):				
TL _____	.32	—	.38	—
LTL _____	.35	—	.41	—

Notes: LTL—Less than truckload; TL—truckload; NOS—Not otherwise specified.

Ports in Puerto Rico are: Mayaguez, Ponce, and San Juan.

Ports in U.S. Atlantic and Gulf are: Baltimore, Md.; Charleston, S.C.; Jacksonville, Fla.; New Orleans, La.; Philadelphia, Pa.; New York Harbor, N.Y.

Source: Federal Maritime Commission Reference Library. Puerto Rico Maritime Shipping Authority, Freight Tariff No. 1, quoted in *Gloves and Mittens Reports*, *supra*, note 9.

ENVIRONMENTAL DEMANDS

Puerto Rico's leather and leather products industry characterizes an energy-labor ratio relatively low in comparison with that of other major manufacturing groups. Ruiz and Zalacain computed the ration of 1 to 182.2, which contrasts with their determination of 1 to 10,064.2 for petroleum and coal products (SIC-29) and 1 to 167.0 for tobacco products (SIC-21).¹⁴

Between 1967 and 1972, the only 2 years for which data on costs of fuels consumed and electricity are available, expenditures for both dropped from \$1,548,000 to \$589,000, a decrease of 62 percent. This trend is at variance with that for Puerto Rico's manufacturing sector as a whole, which incurred expenditures of \$34,725,000 in 1967 and \$77,606,000 an increase of 123.5 percent.¹⁵ The closure of all leather forming industries in Puerto Rico has sharply reduced the existing overall industries needs for water.

¹⁴ A. Ruiz and F. Zalacain, *Energy and Economic Development in Puerto Rico*, at table 6 (monograph: no date).

¹⁵ U.S. Department of Commerce, Bureau of the Census, *Census of Manufacturers: Puerto Rico for 1967 and 1972*.

WAGE RATE IMPACT

The average hourly wage per employee in the leather and leather products industry in Puerto Rico in 1976 was \$2.18. SIC-31's average wage per hour of \$2.18 in 1976 was below the present minimum wage of \$2.65 an hour. As this industry is characterized by above average labor utilization, it could be adversely affected in meeting the 1980 minimum wage rate of \$3.10 an hour. As an indicator of this industry group's sensitivity to wage rates, the following calculations might be made, based on the leather and leather products industry's 1975 hourly wage of \$2.02. In meeting the 1980 minimum wage of \$3.10 an hour, the industry's labor costs would increase 53 percent. The following is indicative of the degree of impact:

—1975 Total costs would increase by 16.3 percent.

—1975 Wage bill would increase by \$13.05 million to \$37.68 million.

—Profit would fall by \$13.05 million to —\$4.22 million.

—Profit to equity would fall from 22.0 percent to —10.5 percent.

—Profit to sales would fall from 9.9 percent to —4.7 percent

—Profit to total costs would fall from 11.0 percent to —5.3 percent.

These calculations would seem to indicate that the leather and leather products industry is relatively sensitive to wage rate increase when compared to such industries as electrical machinery, instruments, and pharmaceuticals.

Federal minimum wage applications to the leather and leather products industry could possibly make this industry group marginally profitable, and make it difficult for industries to maintain a competitive location in Puerto Rico.

The Lumber and Woods Products (SIC-24) and Furniture and Fixtures (SIC-25) Industries

DEFINITION

This profile presents an overview of two major industrial groups; the lumber and wood products industry (which excludes furniture) (SIC-24), and the furniture and fixtures industry (SIC-25). The lumber and wood products industry includes logging camps engaged in cutting timber and pulpwood; merchant sawmills, lath mills, shingle mills, cooperage stock mills, planing mills, and plywood mills and veneer mills engaged in producing lumber and wood basic materials; and establishments engaged in manufacturing finished articles made entirely or mainly of wood or wood substitutes.

The furniture and fixtures industry group includes establishments engaged in manufacturing household, office, public building, and restaurant furniture; and office and store fixtures. This major group does include furniture and fixtures made from nonwood items, such as metal, rattan, and wicker.

SIZE AND GROWTH

The lumber and wood products and furniture and fixtures industries have been of minor significance since the early years of Puerto Rico's economic development. In both 1950 and 1955, their output (as measured by contributions to net income), was only 4.6 percent of that of the manufacturing sector. By 1963, the two industry groups began declining in terms of their contribution to manufacturing sector employment, sales, and net income. (See table 1.) To date the two industry groups are still declining, are losing their local raw material base and their share of the local market.

The need to rely on Puerto Rican source statistics for data after 1972 produces some inconsistencies in the analysis. For example, in 1972 the United States Bureau of the Census, Economic Census of Outlying Areas, shows 240 establishments employing 4,407 persons, while the Puerto Rico

Table 1.—The Lumber and Wood Products (SIC-24) and Furniture and Fixtures (SIC-25) Industries—
Size and Growth in Puerto Rico

	1958	1963	1967	1972	1973	1975	1977
Number of establishments	253	280	293	240	351	314	—
Total number of employees	3,327	4,298	4,505	4,407	4,895	3,891	—
Employment as a percentage of sector employment	4.7	4.4	3.7	2.9	3.2	2.8	—
Sales .....(millions of dollars)	20.5	34.5	51.4	72.0	90.9	87.3	79.7
Sales as a percentage of sector sales	2.7	2.3	2.3	1.7	1.8	1.1	.8
Net income .....(millions of dollars)	8.9	13.5	17.5	27.9	32.4	26.1	25.4
Net income as a percentage of sector net income	4.0	3.0	2.6	2.2	2.1	1.4	.9
Value added by manufacture .....(thousands of dollars)	9,950	17,878	25,431	37,816	—	—	—
WPI ¹ —Household furniture (United States) (1967=100)	88.4	92.6	100.0	117.3	123.0	146.3	—
WPI ¹ —Industrial commodities (United States)	93.6	94.7	100.0	117.9	125.9	—	—
WPI ¹ —Lumber and wood products	92.4	93.5	100.0	144.3	—	—	—

¹ Survey of Current Business, various years.

Sources: U.S. Bureau of the Census, Economic Censuses of Outlying Areas, *Puerto Rico: Census of Manufactures*, 1963, 1967, 1972. (Washington, D.C.: Government Printing Office.)

Puerto Rico Department of Labor, *Census of Manufacturing Industries of Puerto Rico*, various years.

Puerto Rico Planning Board, *Puerto Rico Income and Product Accounts* (unpublished data).

Bureau of Labor Statistics shows a total of 345 establishments with 5,049 persons employed. Nevertheless, the trend is clear. Employment in industries belonging to these categories expanded slightly in the early 1960's, reached its peak in 1969-70, then decreased from 1971 to date. (See table 2.)

Table 2.—Employment in Furniture, Fixtures, Lumber and Wood Products

Year	United States source	Puerto Rico source
1958	3,327	—
1963	4,298	—
1966	—	4,636
1967	4,505	4,512
1968	—	4,932
1969	—	4,934
1970	—	5,089
1971	—	5,086
1972	4,407	5,049
1973	—	4,895
1974	—	4,183
1975	—	3,891
1976	—	3,737

Sources: U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures* (various years). (Washington, D.C.: Government Printing Office.)

Puerto Rico, Department of Labor, *Census of Manufacturing Industries* (various years).

INDUSTRY TRENDS

The furniture and fixtures and lumber and wood products industries are predominantly locally owned (71 percent), according to a recent survey conducted by the United States Department of Labor Wage and Hour Division.¹ The vast majority of establishments obtain their raw materials from local sources. Some, however, receive materials from the U.S. mainland, and a few purchase from foreign sources, mainly rattan poles from the Philippines.² The bulk of the industries' products are sold in the local market with very few products being shipped

¹ U.S. Department of Labor, Wage and Hour Division, *Furniture and Fixtures and Lumber and Wood Products Industry in Puerto Rico 1977*.

² *Ibid.*

Table 3.—Lumber and Wood Products (SIC-24) and Furniture and Fixtures (SIC-25) Industry Trade with the United States

[In dollars]

	Shipments from the United States to Puerto Rico		Shipments from Puerto Rico to the United States		Exports to the United States as a percentage of SIC-24, SIC-25 sales
	Total	Furniture only	Total	Furniture only	
1958	9,860,247	3,308,411	953,276	—	4.7
1963	16,250,695	6,923,250	565,598	—	1.6
1967	46,625,810	33,920,313	396,115	185,577	.7
1972	67,412,640	46,127,242	583,569	501,776	.8
1973	75,935,781	49,135,496	787,276	216,675	.9
1974	82,680,000	51,927,986	1,146,227	702,004	1.2
1975	87,155,000	55,806,384	718,992	498,490	.8
1976	103,552,328	62,701,146	258,753	138,717	.3

Source: U.S. Bureau of the Census, *U.S. Trade with Puerto Rico and U.S. Possessions*, FT/800 (various years) Annuals. (Washington, D.C.: Government Printing Office.)

either to the mainland market or to foreign countries. This is demonstrated by the relatively small value that exports represent as a percentage of total industry sales. (See table 3.) The nature of the industries' chief product—furniture, which is a high weight item, bulky and easily damaged, with resulting high transportation costs—is such that the product is generally produced for local consumption.

Trends in these two industry groups in Puerto Rico are best demonstrated by the experience of the household furniture subgroup, (SIC-251), the major producing sector in Puerto Rico of these two industry groups. In 1972, household furniture accounted for almost half of the establishments in the SIC-24 and SIC-25 groups, and over two-thirds of the groups' employment and production (as measured in terms of "value of shipments"). (See profile in table 4.) As mentioned earlier, most of the furniture manufacturing done in Puerto Rico is sold locally; however, the Puerto Rican-made share of the market has been declining. In 1963, locally manufactured furniture represented about 78 percent of the total furniture sales in Puerto Rico, whereas in 1972, it had declined to 48 percent.

Table 4.—Household Furniture Subgroup 251

	1958	1963	1967	1972
Number of establishments	192	189	188	117
Total number of employees	2,774	3,563	3,269	2,910
Employment as a percentage of Group				
24-25 employment	83.4	83.0	72.6	66.0
Sales (millions of dollars)	16.8	27.9	35.8	48.2
Sales as a percentage of Group				
24-25 sales	82.0	81.0	70	67
Value added (thousands of dollars)	8,449	14,963	17,910	26,339
Value added as a percentage of Group				
24-25 value added	85	84	70	70
Imports as a percentage of apparent consumption	—	22.1	52.1	52.0

Sources: U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures* (various years). (Washington, D.C.: Government Printing Office.)

U.S. Bureau of the Census, *U.S. Trade with Puerto Rico and U.S. Possessions*, FT/800 (various years). (Washington, D.C.: Government Printing Office.)

Although production for the two industry groups has increased consistently, the productive capacity of Puerto Rican firms has not expanded as rapidly as has growth in the local market. For the 1958-76 period, while the value of commodities exported to the United States and foreign countries by the two industries continuously decreased, Puerto Rico's imports from the United States rose more than ten-fold, to the level of \$104 million in 1976. Sixty-two million dollars were for furniture, the single largest imported item in this industrial category (tables 1, 3, and 5).

Table 5.—Shipment Between the United States and Puerto Rico of Lumber, Wood Products, Furniture, and Fixtures Industry in 1976 (SIC-24 and SIC-25)

Commodity breakdown		
Description	Shipments from the United States to Puerto Rico	Shipments from Puerto Rico to the United States
Schedule B: ¹		
241.1 Fuel wood and wood waste	\$28,373	---
241.2 Wood charcoal	348,205	---
242.2 Logs and bolts in the rough-softwood	1,050,300	---
242.3 Logs and bolts in the rough-hardwood	956,078	---
242.8 Poles, pilings, posts, wood in rough, n.e.c.	1,736,911	---
243.1 Railway ties, excluding bridge and switch-wood	35,931	---
631.1 Veneers—wood	3,040	---
631.2 Plywood veneer and cellular wood panels	15,329,310	---
631.4 Wood—improved or reconstituted	2,371,463	---
631.8 Wood—simply shaped or worked, n.e.c.	263,254	---
632.1 Wood packing containers, except cooperage	421,539	---
632.2 Cooperage products	659,532	---
632.4 Builders, woodwork and prefabricated buildings	1,278,730	---
632.7 Wood manufacturers—domestic	---	---
632.8 Articles manufactured of wood, n.e.c.	3,491,082	---
632.8 Articles manufactured of wood, nec	3,491,082	---
633.0 Cork manufacturers, including agglomerated	260,413	---
821.0 Furniture	62,701,146	---
Schedule P:		
63000 Wood and cork manufacturers, exciding furniture	---	\$120,036
82110 } Furniture	---	138,717
82125 }	---	---
Total	103,552,328	258,753

¹ Schedule B codes corresponding to SIC codes 26 and 27 are taken from U.S. Department of Commerce, Bureau of the Census, *Classification and Cross Classification: 1974*.

Source: U.S. Department of Commerce, Bureau of the Census, *U.S. Trade With P.R. and U.S. Possessions, 1976*.

As a result of the rapid increase in imports, reduction of local producers' share of the island's market and the adoption of modern laborsaving technologies, employment in the furniture and fixtures, and lumber and wood products industry has decreased consistently. In 1976, it ranked last in employment among 15 major industries covered by

the Puerto Rican Bureau of Labor Statistics' Census of Manufacturing. The industry's value added in production was less than 2 percent of the manufacturer sector's total.²

COMPETITIVE POSITION

Puerto Rico's losing battle in competition with imports is often attributed to the highly paid low productivity of labor and the high cost of purchasing and shipping raw materials from the United States.

Raw materials have become increasingly unavailable locally, and the high transportation and storage costs add to the difficulties of competitive pricing. The productivity and wage issues are not easy to clarify. Census data compiled in 1958, 1963, 1967, and 1972 clearly support the low productivity hypothesis. The value added in production per employee (output/labor ratio) which measures the labor productivity of this industry in 1958 was \$2,991 for Puerto Rico, compared to \$5,969 for the United States.³ In 1972, the ratios were \$8,520 and \$14,230 per worker respectively. While productivity in Puerto Rico appeared to grow more rapidly in the 1958-72 period (184 percent vs. 138 percent), the absolute amount of output per Puerto Rican worker was still 60 percent that of the United States as of 1972, (table 6).

On the other hand, it is well known that the workers' wages and salaries in Puerto Rico were substantially below those in the United States. When the number of workers in the industry is converted to dollars of labor costs, it is revealed that the value of output per dollar spent on labor in Puerto Rico (value added/payrolls ratio) was slightly higher than that in the United States (table 6).⁵

³ U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico, 1972*.

⁴ Ideally, it would be desirable to measure total factor productivity rather than labor productivity alone. Given that data on capital stock are unavailable, changes in labor productivity would be a reasonably accurate measure of total factor productivity if relative prices between inputs are unchanged. This may not be true. In which case, our measure of labor productivity would be an overestimate of the total factor productivity if the price of labor has increased more rapidly than the price of capital, leading to the substitution of capital for labor. However, as long as the rates of substitution are not substantially different between the United States and Puerto Rico, our comparison is valid.

⁵ According to the Bureau of the Census, U.S. Dept. of Commerce, "payrolls includes the gross annual earnings of employees on the payroll." Respondents were told they could follow the definition of payrolls used for calculating the Federal withholding tax. This definition includes all forms of compensation such as salaries, wages, commissions, dismissal pay, bonuses, vacation and sick leave pay, and compensation in kind, prior to such deductions as employers' Social Security contributions, withholding taxes, group insurance, union dues, and savings bonds. The total includes salaries of officers of these establishments, if a corporation; it excludes payments to the proprietor or partners, if an unincorporated concern. Also excluded are payments to members of Armed Forces and pensioners carried on the active payroll.

The 1972 census definition of payrolls is identical to that recommended to all Federal statistical agencies by the Office of Management and Budget. This definition "does not include supplementary labor costs such as employer's Social Security contribution and other legally required expenditures or payments for voluntary programs."

Table 6.—Labor Productivity

	Lumber and wood products furniture and fixtures				Household furniture (251)			
	1958	1963	1967	1972	1958	1963	1967	1972
Value added per employee:								
Puerto Rico	\$2,991	\$4,160	\$5,227	\$ 8,520	\$3,046	\$4,194	\$5,479	\$9,050
United States	\$5,969	\$7,545	\$9,336	\$14,230	\$6,300	\$7,575	\$8,897	\$12,160
Ratio of payroll to value added:								
Puerto Rico .....	.508	.540	.505	.466	.496	.530	.516	.400
United States .....	.608	.573	.533	.496	.595	.562	.550	.520

Sources: U.S. Bureau of the Census, *Census of Manufactures-Industry Statistics* (various years). (Washington, D.C.: Government Printing Office.)

U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures* (various years). (Washington, D.C.: Government Printing Office.)

To say it differently, as of 1972, while average labor productivity in Puerto Rico was lower than in the United States, Puerto Rican workers' wages were so low that it was still profitable for the furniture and fixtures, and lumber and wood products industry to operate in Puerto Rico (to produce for local demands). The picture did not change substantially for the next 3 years. As a matter of fact, Puerto Rico's establishments reported their profit/equity ratio in 1975 was 21 percent, substantially higher than the average United States rate of 5.5 percent for wood and upholstered furniture (SIC-2511-12) and 8.6 percent for office and store fixtures (SIC-2541-42).

Puerto Rico's comparative advantage in low labor cost, however, declines because of the new statutory minimum wages. The 1974 Amendments to the Fair Labor Standard Act (FLSA) provided for automatic wage rates increase for Puerto Rican industries of \$.12 to \$.15 an hour on May 1 of each year, until the mainland minimum was reached. By April 1977 the island's furniture and fixtures and lumber and wood industry finally reached the targeted minimum wage of \$2.30 per hour. The final August 1976—April 1977 wage increase was estimated to affect 56 percent of this industry's workers and resulted in 4 percent increase in the hourly wage bill (benefits not included).

In 1977, the United States passed another amendment to establish the new minimum wage level of \$2.65 per hour, beginning January 1, 1978, increasing to \$3.35 per hour in 1981. This 1977 amendment was applied to all Puerto Rican industries which had reached the \$2.30 per hour level in 1977, and affected as many as 88 percent of all workers in the furniture and fixtures, lumber and wood industry.

The amendment had a disproportionately negative impact on Puerto Rico because the average wage per worker in the United States for these two industry groups was already well above the statutory level mandated for 1981.

CONCLUSION

Facing such a rapid increase in wages, it is imperative that Puerto Rican labor productivity be improved to enable the industry to compete with the mainland and foreign firms. This could be accomplished through organized training programs. In addition, market studies must be developed to identify the potential market sources for Puerto Rican products. This information is needed for interested businessmen to expand their investment horizon, and for government agencies to determine the appropriate policies to assist the industry's expansion. At present, it appears that the local furniture market is promising; Puerto Rico imports \$62 million or more worth of household and office furniture annually.

An advantage Puerto Rico has in competing against imported furniture is that it does not pay for the cost of transporting the finished products overseas. These items are often heavy, bulky, and easily damaged, resulting in a high transportation cost.

The two groups display a labor income to net income ratio that is notably higher than the average for the manufacturing sector as a whole in every year from 1967 through 1977. As can be seen from table 7, the two groups ranked in the upper 25 percent of all industries, with the exception of 1971. Based on this criterion alone, the lumber and wood products and furniture and fixtures industries seem to be the industry groups in which investment pro-

Table 7.—Labor Income as a Percentage of Total Group Net Income

Lumber and wood products and furniture fixtures	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Manufacturing sector percentage	61.9	62.8	63.4	62.6	52.0	58.6	54.6	49.5	49.7	43.1	40.7
SIC-24—SIC-25 percentage	83.0	82.1	81.2	80.1	79.0	84.4	80.7	88.5	87.8	88.4	82.0
Rank of SIC-24 and SIC-25 out of 25 industry groups...	3	2	4	4	7	4	5	2	2	3	4

Source: Puerto Rico, Planning Board, *Income Product Accounts* (unpublished worksheet data).

duces good return in terms of Puerto Rican income as compared with such investment. In other words, these two industry groups are able to generate a relatively large contribution of local benefits.

There exists a large and growing local market for the products of these two industry groups. However, the competitive edge that the two groups have rela-

tive to mainland production is decreasing over time as Puerto Rican wage rates rise toward parity with the mainland. If labor productivity can be raised, through the application of capital or through training programs, it may then be possible for local producers to operate profitably in meeting local market demand at present factor costs.

Petroleum Refining, Petrochemical, and Allied Products Industries

INTRODUCTION

In the 1960's and early 1970's the petroleum refining and petrochemical industries in Puerto Rico showed great potential as contributors to net income and to value added in manufacturing. However, since late 1973/early 1974, when the price of foreign oil increased relative to the price of American oil, Puerto Rico lost its competitive footing. While other oil importing companies, trapped in similar situations, were able to adapt themselves to the new pricing structure, CORCO (Commonwealth Oil Refining Co.), the major petroleum refiner and petrochemical firm for the Commonwealth, evidently was locked into long-term sales contracts which prevented it from raising prices to keep pace with the escalating costs of its raw materials. In mid-1974 worldwide recession and quadrupled foreign oil prices struck CORCO with higher prices for its raw materials and a slumping demand for its finished products. Its posted net profit of \$27.7 million for the first 6 months of 1974 was met by a reported loss of \$18.6 million for the second half of 1974.

CORCO suspended dividend payments on its common and preferred stock, and in October of 1977, trading in CORCO stock on the New York Stock Exchange was called off as the price plummeted. CORCO is now in bankruptcy.

In addition, the interim financing arrangements which have kept CORCO afloat for the past year expired on January 31, 1978.

The Federal Government Crude Oil Entitlements Program, a system that is designed to equalize the cost of buying oil for all U.S. refining companies (whether they use domestic or foreign crude oil), has greatly favored the Puerto Rican refiners. Maximum entitlements benefits are received by Puerto Rican importers of foreign crude oil and naphtha. CORCO alone has received a cumulative total of nearly \$345 million from its sale of entitlements for crude oil and naphtha.

With the favorable Federal Energy Administration ruling of December 7, 1977, which amended the Entitlements Program to compensate more accurately for the disadvantage of the petrochemical industry in Puerto Rico, CORCO exhausted its stock of requests for Federal favors. CORCO filed for bankruptcy under chapter 11 in May 1978.

The information in this section is based on data and laws applicable as of May 1978.

INDUSTRY HIGHLIGHTS

The petroleum refining and petrochemical complex's employment as a percentage of total manu-

Table 1.—Selected Economic Data on the Puerto Rican Petroleum Refining Petrochemical Complex 1967-76, Selected Years

	1967	1969	1971	1972	1973	1974	1975	1976
Number of establishments	24	24	36	39	41	47	51	47
Total number of employees	2,851	4,218	5,616	7,330	7,428	7,766	5,499	6,017
Payroll (salaries & wages) (millions of dollars)	20.0	31.1	47.8	56.7	67.3	72.1	76.1	74.8
Sales (millions of dollars)	292.7	402.6	650.3	864.6	1,197.6	2,547.2	2,716.4	2,904.4
Exports as a percentage of sales			35.03	34.37	37.67	34.62	32.15	34.33
Net income (millions of dollars)	57.1	58.1	85.3	88.5	147.2	245.0	137.4	222.6
Net income as percentage of manufacturing net income	8.55	6.76	7.94	6.90	9.54	13.16	7.08	9.35
Average hourly wage (October) United States			4.43	4.75	5.00	5.46	6.16	6.74
Average hourly wage (October) Puerto Rico ¹			3.12	3.49	3.94	4.08	5.04	5.63
Differential			1.31	1.26	1.06	1.38	1.12	1.11

¹ The prevailing wage in the industries covered by this profile exceed the minimum wage of \$2.30 per hour established under the Fair Standards Act.

Sources: U.S. Bureau of the Census, Economic Censuses of Outlying Areas, *Puerto Rico: Census of Manufactures*, 1963, 1967, 1972. (Washington, D.C.: Government Printing Office.)

Puerto Rico Department of Labor, *Census of Manufacturing Industries of Puerto Rico*, various years.

Puerto Rico Planning Board, *Puerto Rico Income and Product Accounts* (unpublished data).

facturing employment, fell from 5.2 percent in 1974 to 4.2 percent in 1976. This represents an almost 20-percent decline in this industry complex's contribution to total manufacturing employment. Likewise, between 1974 and 1977, this industry complex's contribution to manufacturing net income fell from 13.17 percent to 8.1 percent, a decrease of almost 40 percent. (See table 1, p. 229.)

Sixty percent of this industry complex's product is consumed internally, with major issues in the last 2 years being as residual fuel oil (for operation of electricity) and as gasoline (for transportation). The major users have been oil companies, the Puerto Rican Water Resources Authority (the sole public agency responsible for the production and distribution of nearly all electricity consumed on the island), petrochemical companies, and wholesalers of gasoline. (See table 2.)

Table 2.—Puerto Rico Petroleum Supply and Demand

	Millions of barrels	Percentage of the total
Imports:		
Crude oil	83.1	79.4
Naphtha ¹	20.0	19.1
Refinery gas	0.1	(2)
Residual fuel oil	0.1	(2)
Motor gasoline	0.8	(2)
Aviation fuel	1.1	1.1
Other	0.2	(2)
Total imports	^a 105.3	100
Stock changes	(0.7)	---
Total supply	104.6	---
Internal consumption:		
Refinery gas	5.4	8.7
Middle distillates	6.7	10.7
Residual fuel oil	24.2	39.1
Motor gasoline	15.1	24.4
Aviation fuel	1.8	2.9
Naphtha	4.7	7.6
Other	4.1	6.6
Total consumption	^a 61.9	100
Exports:		
Middle distillates	12.4	29.0
Residual fuel oil	6.8	15.8
Motor gasoline	14.0	32.8
Other	9.6	22.4
Total exports	^a 42.7	100
Total demand plus exports	104.6	---

¹ Includes adjustments in naphtha used by refineries as petrochemical feedstocks; excludes naphtha imported by the petrochemical sector.

² Percentage too small to calculate.

^a May not add to total.

Source: Federal Energy Administration, Interagency Study on the Puerto Rican Economy.

Forty percent of the product of this complex is exported (see table 2) with 90 percent going to the United States. The composition of these petroleum and petrochemical products exports to the United States in 1976 were largely (in decreasing order of value), organic chemicals (\$221.3 million), distilled fuel oils (\$194.7 million), mineral tars and crude chemicals from petroleum (\$188.1 million), gasoline (\$132.0 million), and ethyl alcohol (\$111.6 million). (See table 3.) Organic chemicals and mineral tars and crude chemicals from petroleum made up the bulk of the Puerto Rican exports to other nations as they comprised roughly 80 percent of the value both in 1973 and 1976. Puerto Rican imports and exports of petroleum and petroleum products were nearly in balance between 1971 through 1973. In 1973, exports exceeded imports by slightly more than \$30 million. The balance has shifted dramatically in the last 2 years (1975 and 1976), with imports exceeding exports by more than \$500 million. This trade imbalance is accounted for in total by import imbalances with foreign countries. (See table 4.)

Table 3.—Puerto Rican Petroleum Product Exports to the United States

Petroleum product	1973	1976
Gasoline	\$119,003,246	\$131,986,169
Distillate fuel oils	72,502,878	194,730,566
Ethyl alcohol	74,073,382	111,591,706
Organic chemicals	58,946,608	221,280,405
Mineral tar and crude chemicals from petroleum	39,665,295	188,091,890
All other products	17,557,757	20,738,481
Total	381,749,166	868,419,217

Source: Puerto Rico Planning Board, *External Trade Statistics*, May 1974 and May 1977.

COMPOSITION

This profile includes the petroleum refining and related industries (major group 29), the industrial inorganic chemicals (subgroup 281), the plastic materials and synthetics industry (subgroup 282) and industrial organic chemicals (subgroup 286).

The petroleum refining and related industries (major group 29) in Puerto Rico includes establish-

Table 4.—Puerto Rican Petroleum Product Imports and Exports, 1971–76

[Millions of current dollars]

Year	Imports from United States	Imports from others	Total imports	Exports to United States	Exports to others	Total exports
1971	57.1	212.1	296.2	181.6	46.1	227.7
1972	47.2	286.3	333.5	255.0	42.1	297.1
1973	64.9	331.5	396.4	381.7	45.4	427.1
1974	77.6	945.7	1,023.3	750.7	131.2	881.9
1975	109.3	1,315.5	1,424.8	799.9	73.4	873.3
1976	155.4	1,371.4	1,526.8	868.4	128.6	997.0

Source: Puerto Rico Planning Board, *External Trade Statistics*.

Table 5.—Subgroup Detailed Statistics, 1972

	Number of establishments	Total number of employees	Payroll salaries and wages	Cost of materials, etc.	Value of shipments	Value added by manufacture	Exports as a percentage of shipments
(281) Industrial inorganic chemicals	5	102	\$589,000	\$4,163,000	\$6,385,000	\$2,274,000	NA

Source: U.S. Bureau of the Census, Economic Census of Outlying Areas, *Puerto Rico: Census of Manufactures, 1972*. (Washington, D.C.: Government Printing Office.)

Table 6.—Subgroup Detailed Statistics, 1972

	Number of establishments	Total number of employees	Payroll salaries and wages	Cost of materials, etc.	Value of shipments	Value added by manufacture	Exports as a percentage of shipments
(286) Industrial organic chemicals	13	1,757	\$16,838,000	\$210,026,000	\$290,962,000	\$86,785,000	63.74

Source: U.S. Bureau of the Census, Economic Census of Outlying Areas, *Puerto Rico: Census of Manufactures, 1972*. (Washington, D.C.: Government Printing Office.)

ments primarily engaged in petroleum refining, manufacturing paving and roofing materials, and compounding lubricating oils and greases from purchased materials. (See tables 5 and 6.)

The industrial inorganic chemicals industry (subgroup 281) includes establishments engaged in manufacturing basic industrial inorganic (noncarbon based, being composed of matter other than plant or animal) chemicals such as chlor-alkalis, caustic soda, soda ash; and industrial gases (carbon dioxide, dry ice, nitrogen, hydrogen, etc.). (See table 7.)

The industrial organic chemicals industry (subgroup 286) includes establishments primarily engaged in manufacturing industrial organic chemicals. Industrial organic chemicals are manufactured largely from hydrocarbon "building blocks" obtained from petroleum products. About 80 percent of the industry's building blocks are petroleum derived, leading to the designation of organic chemicals as petrochemicals. Additional organic raw materials, i.e., hydrocarbon "building blocks" are obtained from coal, wood, fats and oils, and other agriculture products. (See table 8.)

Industrial organic chemicals include both cyclic compounds and acyclic and aliphatic compounds. Major cyclics include many intermediates, dyes, pigments, and coal tar crudes. Major cyclics include compounds made from olefins such as solvents, flavor and perfume materials, plasticizers, synthetic tanning agents, rubber processing chemicals, pesticides and other agricultural chemicals, chemical warfare gases, and chemical intermediates for further manufacture.

The plastic materials and synthetics industry (subgroup 282) includes chemical establishments primarily engaged in the manufacture of plastic materials and synthetic resins, synthetic rubbers, cellulose and manmade organic fibers, except glass. (No detailed statistics are available for this subgroup.)

Excluded from the coverage of this profile are drugs (subgroup 283); soap, detergents and cleaning preparations, perfumes, cosmetics, and other toilet preparations (subgroup 284); paints, varnishes, lacquers, enamels, and allied products (subgroup 285); agricultural chemicals (subgroup 287);

Table 7.—Subgroup Detailed Statistics, 1972

	Number of establishments	Total number of employees	Payroll salaries and wages	Cost of materials, etc.	Value of shipments	Value added by manufacture	Exports as a percentage of shipments
(29) Petroleum and coal products	16	2,181	\$20,659,000	\$379,782,000	\$469,113,000	\$91,691,000	34.56

Source: U.S. Bureau of the Census, Economic Census of Outlying Areas, *Puerto Rico: Census of Manufactures, 1972*. (Washington, D.C.: Government Printing Office.)

Table 8.—Subgroup Detailed Statistics, 1972

	Number of establishments	Total number of employees	Payroll salaries and wages	Cost of materials, etc.	Value of shipments	Value added by manufacture	Exports as a percentage of shipments
(2911) Petroleum refining	5	1,649	\$17,679,000	\$371,671,000	\$453,408,000	\$84,105,000	35.71

Source: U.S. Bureau of the Census, Economic Census of Outlying Areas, *Puerto Rico: Census of Manufactures, 1972*. (Washington, D.C.: Government Printing Office.)

and other miscellaneous chemical products (subgroup 289).

According to the Puerto Rican Department of Labor's annual Census of Manufacturing Industries, in October 1976 the number of establishments in the petroleum refining and petrochemical industry complex amounted to 47. These 47 establishments operated 56 plants, broken down as follows by Standard Industrial Classification (SIC) number:

Industry number	Description	Operating
	Combined total	56
SIC-281	Industrial inorganic chemicals	10
SIC-282	Plastic materials and synthetic resins, synthetic rubber, synthetic and other manmade fibers, except glass	4
SIC-286	Industrial organic chemicals	30
SIC-291	Petroleum refining and related	8
SIC-295	Paving and roofing materials	4

As shown below, 82 percent of the operating plants in these industries in Puerto Rico are subsidiaries of United States firms.

	Operating
Combined total	56
Mainland	46
Foreign	5
Puerto Rico	6

* Detailed figures do not add to total because one plant is jointly owned by U.S. and foreign companies.

Two U.S. firms, Union Carbide and CORCO, own all, or in part, 27 plants. In all, 8 firms have multi-plant operations, as follows:

Union Carbide Caribe, Inc.	13
CORCO	14
PPG Industries	6
Royal Dutch Shell Petroleum Co.	3
Gulf Oil Corporation	3
Occidental Petroleum Corporation	2
Hercules	2
W. R. Grace	2

Source: Puerto Rico, Economic Development Administration. Office Of Economic Research. Industry Profile Series. *The Petroleum Refining, Petrochemical and Allied Industries In Puerto Rico*. San Juan, May 1977, p. 5.

The judgment to make a joint analysis of petroleum refining and related industries and petrochemicals, even though they constitute two separate groups according to Standard Industrial Classification, is based upon four factors. First, industrial organic chemicals, or so-called "petrochemicals," are heavily

dependent upon petroleum or petroleum derivatives as both an energy source and as a raw material or "feedstock." Second, as a result of this dependence, the petrochemical industry is directly impacted upon by price and supply changes in the petroleum refining industry. Third, Federal regulations and programs affecting petroleum pricing, supply, and production process directly impact upon the petrochemical industry. And last, Puerto Rican Government statistics are aggregated for these two groups combined, as defined above.

Subgroups 284, 285, and 289 are excluded from this analysis as their contribution to both net income and employment within the chemical and allied products major group is in the first case small and in the second case declining. The drug industry has already been covered in an earlier section of the industrial profiles. These subgroups' contribution to net income in the chemical and allied products major group is small and has declined in the last 4 years from 3.63 percent in 1973 to 2.10 percent in 1977, a decline of over 40 percent. Employment has declined from 33.4 percent of total employment in the chemicals and allied products industry in 1972 to 17.0 percent in 1976, a decline of almost 50 percent. These subgroups of the chemical and allied products industry are declining in importance and have limited growth potential in Puerto Rico. However, if domestic U.S. prices increase relative to world petroleum prices, which is the import source for Puerto Rico, then Puerto Rico's relative disadvantage to the United States would be essentially removed.

DESCRIPTION

Petroleum consists of a closely related series of complex hydrocarbon compounds that range from a light gas, methane, to a series of heavy solids, such as asphalt. The various mixtures that comprise liquid petroleum or crude oil are separated by distillation under increasing temperatures. The components of the mixture, from light to heavy, are the gases, gasolines, kerosene, gas oil, lubricating oil, residual fuel oil, and finally, asphalt and paraffin.

The petrochemical industry comprises producers of chemicals and intermediates derived primarily from raw materials or "feedstocks" obtained from natural gas, natural gas liquids (ethane, propane, methane, etc.) and/or crude petroleum (naphtha, gas, oil). These "feedstocks," through chemical processing, are converted into chemical building blocks (which include benzene, toluene, xylenes, ethylene, propylene, and butadiene). Industrial organic chemicals are then produced from these. In the United States, about three-fourths of this industry's shipments by value are used as inputs to other chemical

sectors or to other industries. These include plastics and resins, synthetic rubber, manmade fibers, rubber and plastic products, household cleaning products, and toilet preparations, such as cosmetics.

"Industry estimates indicate that for 1975 crude oil and its various fractions accounted for 40 percent of petrochemical production, natural gas for 35 percent, and natural gas liquids for 25 percent."¹

INDUSTRY CHARACTERISTICS

The petroleum refining and petrochemical industries are characterized by large capital investment requirements and the need for high technological skills and knowledge to operate them efficiently. Another characteristic of these industries is the heavy dependence on petroleum and petroleum products as both fuel and energy and as raw material feedstock. The cost of raw material feedstocks can change rapidly in response to the energy supply and demand picture, as petrochemical usage of these products is limited in comparison to energy requirements.

In the United States, the chemical industry buys more energy, both as fuel and electrical power, than any other manufacturing industry. The most recent published data indicated that in 1974 energy purchases (including both fuels and electricity) by the chemical industry accounted for about 22 percent of all energy purchases of the manufacturing sector. In 1974, the U.S. chemical industry requirements for natural gas accounted for almost 10 percent of U.S. natural gas production.

In 1974 the U.S. petroleum and coal products industry (SIC-29) ranked third in energy purchases of the 5 leading industries, accounting for 11.58 percent of all energy purchases of the manufacturing sector. The 1972 data, which is the only readily available data on operating costs for the various industrial groups in Puerto Rico, displays the various industrial costs for materials and energy needs that the sectors of the petroleum refining, petrochemical industries incurred in Puerto Rico relative to the United States.

Since the 1974 OPEC price increases, the industrial sectors' cost per kilowatt hour has almost doubled.² Petroleum refiners and petrochemical manufacturers rank among the major users of electrical power on the island and in 1976 ranked second and third respectively as consumers of motor gasoline.³

These industries are also characterized by transportation costs which make it more practical for

¹ U.S. Department of Commerce, *U.S. Industrial Outlook, 1977* (Washington, D.C.: Government Printing Office), p. 100.

² Federal Energy Administration, *Draft Study for the Interagency Study on the Puerto Rican Economy*, p. 46.

³ FEA Draft, p. 42.

Industrial Costs for Materials and Energy Needs, 1972

[In percentages]

Industry Group	Materials	Fuel	Electricity
(286) Industrial organic chemicals:			
Puerto Rico	88.20	5.45	4.92
United States	82.60	6.74	3.10
(2911) Petroleum refining:			
Puerto Rico	93.94	3.50	1.80
United States	92.63	2.07	0.91

Source: U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures, 1972*. (Washington, D.C.: Government Printing Office.)

manufacturers to locate near areas of consumption rather than adjacent to oilfields, as the intermediate or finished products require *much more* tankage in terms of storage capacity than does crude oil.

The petroleum refining and petrochemicals group is its own best customer in addition to being a supplier of derived products to other industries and ultimately to final consumption. Of the 96,000 barrels of petroleum products which CORCO, the major petroleum refiner and petrochemical firm on the island, sold in Puerto Rico in 1976, about 41,000 (or approximately 43 percent) were sold to other oil companies, 26,000 (or approximately 27 percent) were sold to the Puerto Rico Water Resources Authority, about 22,500 (or approximately 23.5 percent) were intercorporate transfers to CORCO petrochemical operations, and the remainder went to third party customers (probably wholesalers of gasoline).⁴

Both the chemical and petroleum refining industries are characterized by high antipollution spending, both as a percentage of capital expenditure and as performers of antipollution research and development. Of the about \$10 billion U.S. business planned to invest in air, water, and solid waste pollution control in 1977, the chemical industry ranked in third place, having planned to spend \$867 million (or 11.8 percent of its planned capital expenditures for that year). The petroleum products industry ranked in fourth place, having planned to spend \$803 million (or 7.5 percent of planned capital spending).

⁴ FEA Report, p. 26.

1977 Planned Pollution Control Expenditures, Air, Water, and Solid Waste

[In millions of dollars]

Industry group	Air	Water	Solid waste
Chemicals	301	470	96
Petroleum	364	376	63

Source: McGraw-Hill Publication Company, *Economic Department, 10th Annual Survey of Pollution Control Expenditures* (New York, May 1977).

Capacity Shutdowns Due to Environmental and Safety Regulations

[Percentage of capacity]

Industry group	1976	1977
Chemicals	0.21	0
Petroleum .....	.49	.99

Source: McGraw-Hill Publications Company, Economic Department, *10th Annual Survey of Pollution Control Expenditures*, (New York, May 1977).

In terms of capacity shutdowns due to environmental and safety regulations, the chemicals industry ranked third in 1976 with a capacity shutdown of a little over $\frac{1}{5}$ of 1 percent. According to 1977 projections, the petroleum industry would have had the highest shutdowns in capacity, nearly 1 percent, due to such regulations.

THE STATE OF THE PETROLEUM REFINING AND PETROCHEMICALS INDUSTRY IN PUERTO RICO

History

The petroleum refining industry began operations in Puerto Rico in the years of 1955-56 with the establishment of Caribbean Gulf Refining Co. and the Commonwealth Oil Refining Co. In 1959, the Federal Government, through the Oil Import Administration of the Interior Department (the Mandatory Oil Import Program or MOIP, as it is now known) set import quotas for the mainland and the island. Presidential Proclamation 3693 of December 10, 1965, provided for the allocation of imports of crude petroleum and unfinished oils, such as naphtha into Puerto Rico for use as petrochemical feedstocks for already existing facilities and for expansion of existing plants. It had been judged by the Secretary of the Interior that this would provide substantial employment potentials in Puerto Rico. This marked the beginning of a series of special allocations to major oil refineries, which were continued under Presidential Proclamation 4210 of April 18, 1973. Presently, Presidential proclamations, along with Federal Energy Office and Federal Energy Administration rules and regulations continue to govern petroleum imports to the island. As of May 1, 1973, the quotas established under the Mandatory Oil Import Program were converted to a fee system of imports, some of which were fee-exempt and others fee-paid. Puerto Rican refiners can presently import crude oil and finished and unfinished products under a fee-free long-term allocation system, but the program for the four recipients of these allocations expires for CORCO in April 1978 (60,000 barrels per day), for Phillips Puerto Rico in January 1978 (50,000 barrels per day), for Union Carbide in Oc-

tober 1981 (33,000 barrels per day), and Puerto Rico Sun Oil Company in July 1981 (85,000 barrels per day).

The petrochemical industry⁵ was initially attracted to Puerto Rico in the 1960's as a result of this conscious policy undertaken by the Federal Government as well as by Puerto Rican incentive programs which also permitted the importation of lower costs foreign feedstocks. Puerto Rico refiners benefited from lower costs because crude oil and unfinished oils which were imported fee-free to Puerto Rico from foreign sources with special quotas, were cheaper than comparable petroleum products on the Gulf Coast. The drawing cards for the petroleum-petrochemical complex in Puerto Rico were cheaper than mainland petrochemical feedstocks, tax exemptions, and relatively cheap labor.

Petroleum Regulations

Petroleum refining and related industries in Puerto Rico are not only affected by Federal regulations, they are creatures of those regulations. Although exemption from Federal corporate income taxes provided one reason for the nearly \$2 billion investment in core petrochemical facilities over the last three decades in the Commonwealth,⁶ a much stronger attraction was supplied by special allowances under the U.S. quota system for the importation of cheap oil and feedstocks from foreign sources.⁷

Largely based on access to cheaper foreign petroleum, Puerto Rico was given a competition advantage over mainland refineries which partially used higher priced U.S. crude oil. As a result, petroleum refiners and petrochemical companies flocked to the island. By fiscal year 1974, these industries had 7,766 employees, \$2.5 billion in sales, and \$246 million in net income.⁸

The prospects for these companies were excellent until the foreign crude oil price increases following the international oil embargo in the fall of 1973 reversed the preexisting pricing pattern. Prices rose from \$3.05 per barrel in 1972 to \$14.06 in 1976.⁹

⁵ The basic petrochemical complex currently operating in Puerto Rico consists of an ethylene plant based on naphtha/gas oil cracking, which furnishes refined olefin and aromatic streams to downstream derivative plants. Derivative chemical plants produce low-density polyethylene, ethylene glycol via ethylene oxide, caustic-chlorine, vinyl chloride monomer, cumene, benzene from toluene, ortho- and para-xylene and 2-ethyl hexanol.

⁶ Separate petroleum marketing activities are maintained in Puerto Rico, the profits from which are not subject to U.S. tax law under the exemptions of Internal Revenue Code Sections 901 and 933. The primary vehicle for American companies doing business in Puerto Rico is a wholly owned subsidiary, which qualifies for tax exemption if it is a bona fide resident of the island for the tax year.

⁷ "The Struggle for Puerto Rico," *Environment* (June 1975) p. 34.
⁸ Puerto Rican Economic Development Administration, Industry Profile Series, *The Petroleum Refining, Petrochemical and Allied Products Industries in Puerto Rico*, (May 1977); Unpublished Planning Board Income and Product Tables.

⁹ U.S. Department of Energy, "Puerto Rican Energy Study: Impact of FEA Rules and Regulations," prepared for the Interagency Study of the Puerto Rican Economy, November 1977 Draft Copy, p. 12 (hereinafter referred to as the DOE Study Draft).

It has been estimated that OPEC policies resulted in a cost of more than \$450 million to Puerto Rican purchasers from October 1973 through early 1977.¹⁰

Despite a series of new Federal regulations designed to financially compensate users of foreign oil, Puerto Rican industries are now paying more for petroleum feedstocks than are its mainland competitors. The largest petroleum refinery and petrochemical producer (Commonwealth Oil Refining Company) filed under chapter XI of the Federal Bankruptcy Act in March 1978, and the profitability of many other companies is marginal.

This section reflects these changes and examines: (1) the Federal regulations which initially attracted these companies to Puerto Rico, (2) the regulations which softened the blow caused by increased OPEC prices, and (3) the future options for Puerto Rico in the face of changed and changing regulations.

KEY PETROLEUM REGULATIONS AFFECTING PUERTO RICO.

—In the early stages of petrochemical industry development on the island, the principal Federal incentives (the 1959 and 1965 special allowances for importing foreign oil and feedstocks) came through the Mandatory Oil Import Program (MOIP), administered by the Oil Import Administration of the U.S. Department of the Interior. It was only after the OPEC actions of 1973 and 1974 that other important Federal activities occurred, such as the mandatory petroleum allocation and pricing programs, and the entitlements program.

Mandatory Oil Import Program.—The Mandatory Oil Import Program was initiated in 1959, to limit imports of low-priced crude oil and provide protection for the development of high-priced U.S. production and refining capacity. The MOIP was designed to provide an added incentive to refiners and resellers to utilize domestic petroleum products and to encourage end-users to purchase domestic products.¹¹

Under the MOIP, purchasers of imported oil were regulated by a license system. Licenses could not be sold, but exchanges of tickets became common. Exchanges between major companies and independents allowed the independent refiners to use domestic crude produced by the majors, while the majors imported and refined the cheap foreign crude, using tickets acquired from the independents.¹²

OPEC price increases in 1973 altered the basis for

the MOIP system. Furthermore, there were devaluations of the American dollar, increased tanker shipping rates, and heavy demands for low-sulfur fuels such as those from Middle Eastern petroleum fields—all of which added to the price of foreign crude oil for the domestic purchaser. The American purchasers' problems were aggravated by a decline in U.S. crude oil production.

These factors resulted in the promulgation of Presidential Proclamation 4210 which was designed to meet the need for increased importation of foreign crude while simultaneously providing long-term stability and additional incentives for increased domestic exploration and production. Proclamation 4210 made sweeping changes in the MOIP by removing tariffs on the importation of crude oil and products, and by replacing the quota system (implemented through licenses) with a system of license fees.¹³

Under the provisions of the proclamation and implementing regulations, base fees were imposed on foreign products being imported: Regulation section 213.35(c) imposes fees of 63 cents for each barrel of residual fuel oil or other finished products imported into the United States and 21 cents for each barrel of imported crude oil. The fee system is designed to reduce the United States' dependence upon imported petroleum products by offsetting the cost advantages to the petroleum industry of locating refining operations abroad, and to provide an additional incentive for the development of domestic production and refinery capacity.

It was recognized that in particular circumstances the payment of such base fees by firms dependent on imports could create special economic difficulties. As a result, Proclamation 4210 *as amended* and the provisions of 10 CFR 205.50 (a)(2)(i) authorize the FEA to:

(D) Grant allocation of imports of crude oil, unfinished oils, and finished products to independent refiners or established independent marketers who are experiencing exceptional hardship, or in emergencies in order to assure, insofar as practicable, that adequate supplies are available;

(E) Grant refunds, in whole or in part, of license fees paid by persons to whom licenses were issued for imports which they subsequently became entitled to make on a fee-exempt basis.

Four refiners in Puerto Rico were partially exempted from the 21-cent and 63-cent fees. No fee exemptions are permanent, however, and phaseouts are being implemented. (See page 278.)¹⁴

These exemption phaseouts under CFR 213.20

¹⁰ Commonwealth of Puerto Rico, Office of the Governor, "Synopsis of the Energy Situation of Puerto Rico, 1976" (San Juan: Office of Petroleum Affairs, April 1977), p. 30.

¹¹ Commonwealth Oil Refining Company, 2 FEA ¶ 83,267 (August 29, 1975).

¹² These exchanges are specifically allowable under the Oil Import Regulations. Regulation Section 213.7 provides that no license issued under the section may be sold, assigned or transferred *except* in accordance with § 213.22. The latter section provides that licenses may be transferred under certain circumstances, including a petrochemical firm holding allocations made pursuant to section 5 of Proclamation 3279. In that section, certain allocations are provided for various firms operating in Puerto Rico.

¹³ Proclamation 4210 was issued on April 18, 1973 (38 Fed. Reg. 9645, April 19, 1973).

¹⁴ DOE Study.

will further raise costs for island producers. Other special exemptions are available.

CORCO currently has a fee-exempt allocation under 10 CFR 213.20 based on its historical imports of crude oil and unfinished oils authorizing it to import 34,523,890 barrels of crude oil and unfinished oils on a fee-exempt basis during the current allocation period. The firm has also received exception relief permitting it to import 3,483,202 barrels of naphtha on a fee-exempt basis during the period January 1 through April 30, 1978.¹⁵

Island refiners have benefited greatly from these fee exemptions.¹⁶ But even for CORCO, exemptions are diminishing and will eventually disappear.

The Commonwealth Government has also gained from the MOIP's new license fee system, sometimes at the expense of the oil companies. Since oil importers on the island are allowed a credit against license fees for any excise taxes paid to Puerto Rico, the Commonwealth Government decided to levy such taxes so that tax revenue would flow to the Puerto Rican Treasury rather than to the Federal Treasury.

In effect, the Federal license fees can be avoided because the excise taxes levied by Puerto Rico generally either equal or exceed the applicable Federal license fees. Thus, the license fee applicable to crude oil imports into the United States is 21 cents per barrel, but the excise taxes imposed on that same barrel by Puerto Rico total \$2.21. The credit eliminates the Federal fee obligation.¹⁷ A similar setoff eliminates the license fees on naphtha imported into Puerto Rico.

If the importers are exempted from the Federal license fees, they will be similarly exempted from the Puerto Rican tax.¹⁸ If CORCO has a Federal fee-exempt allocation to import 34,523,890 barrels of crude oil, which would otherwise be taxed at 21 cents per barrel, the company saves \$7,250,017 in Federal taxes. The Commonwealth Government does not tax these CORCO imports. On all oil imports on which the Federal fee is required, however, the Commonwealth Government imposes its offsetting tax. If importers do not have a Federal exemption, they end up paying additional taxes to Puerto Rico.

In addition to the base fees, supplemental Federal fees were imposed from June 1, 1975 through December 21, 1975: \$2 per barrel of imported crude oil and \$0.60 for imports of finished petroleum

products.¹⁹ Since Puerto Rico was authorized to reduce the \$2 fee on imports into the island by an amount equal to an excise tax or other levy imposed by the Commonwealth,²⁰ the Commonwealth Government proceeded to collect such a tax.²¹ When the Federal supplemental fee was abolished in December 1975, the Commonwealth Government elected to retain its tax. Reportedly, the \$2 Puerto Rican tax was to be terminated as of June 30, 1978, essentially because of the problems it created for island refiners.²² Removal of the \$2 per barrel tax is a condition for the lifting of the Federal import fees.

In summary, the MOIP license system has had a mixed effect on the island. Puerto Rican operations have benefited from long-term and other fee-free allocations.²³ To the extent that mainland firms are not exempted, Puerto Rican companies are advantaged with regard to these fee payments. During the long term, if the exemptions are reduced, the overall cost advantage already enjoyed by mainland firms will grow. If all Federal fee exemptions were to be abolished, the Commonwealth Government (with its offsetting taxes) would collect more revenue. The companies, conversely, would be injured. All of their petroleum imports would be taxed, while their mainland competitors would be partially using untaxed domestic crude.

In the changeable world of Federal petroleum regulations, the MOIP may soon be obsolete. But a continuance of the MOIP with decreasing fee exemptions will increasingly raise Puerto Rican-based companies' costs.²⁴

The earlier MOIP quota system provided the conditions under which the Puerto Rican petrochemical industrialization occurred. The current MOIP license fee system has a major impact on the present fortunes of those industries. There is, however, a newer and more important petroleum regulation to be considered.

Crude Oil Entitlements Program.—In response to the petroleum price increases following the OPEC oil embargo in the fall of 1973, the Federal Energy

¹⁵ Sec. Proc. 4210, as amended, sec. 3(a)(1)(i)-(iii). From February 1, 1975 through June 1, 1975 a similar supplemental fee of \$1 was in effect. [DOE Draft, p. 58.]

¹⁶ DOE Study Draft, p. 62.

¹⁷ Commonwealth Oil Refining Company, 3 FEA ¶ 83,265 (July 9, 1976), ¶ 84,074; Commonwealth Oil Refining Company, 5 FEA ¶ 80,539 (February 4, 1977), ¶ 80,683.

¹⁸ "Snuffing Oil-License Fee To Cost P.R. \$75 Million," *San Juan Star*, February 9, 1978, p. 6.

¹⁹ Special formulas have been established in the regulations for the award to Puerto Rican firms of fee-free allocations. Regulation section 213.20 deals with fee-free allocations for Puerto Rico of crude and unfinished oils and established special formulas for their computation. Allocation of finished products for Puerto Rico are similarly dealt with at Regulation section 213.21. In addition, Puerto Rico is one of several areas dealt with at Regulation sections 213.29 and 213.30, or reactivated refinery capacity. However, this section is of fairly wide application and probably would not operate to any special Puerto Rican benefit.

²⁰ Arthur D. Little, Inc. *Competitive Cost Position of the Puerto Rican Petrochemical Industry in 1977: A Report to the Puerto Rican Petrochemical Group* (October 1977), p. 5.

¹⁵ *Commonwealth Oil Refining Company*, case No. DES-0038 Decision and Order of the Department of Energy (March 3, 1978), p. 2.

¹⁶ A recent DOE ruling allows CORCO and Phillips to import crude oil and naphtha for a period of 1 year (May 1, 1978 through April 30, 1979) on a fee-exempt basis.

¹⁷ *Ibid.*

¹⁸ 10 CFR § 213.35(e)(1).

Administration (FEA) developed a two-tier pricing system for domestic crude oil.²⁵ Under the arrangement, "old" oil has a lower price than so-called "new" oil. Since the major petroleum companies have greater access to lower priced old oil, the two-tier system enabled them to undersell their independent competitors. The Entitlements Program grew out of the disparity.²⁶

The Entitlements Program is designed to equalize crude oil prices on a national basis. The program does not shift oil from one refiner to another, but it does shift the cost of oil. Every refiner reports monthly estimates of net receipts of price controlled "old" oil and its total refinery runs to stills. From these reports a national ratio of "old" oil receipts to refiner runs is calculated. Each barrel of old oil is then represented by what is called an "entitlement."²⁷ Each refiner is credited by the FEA with entitlements equal to the number of barrels resulting from the application of the national old oil ratio to its refinery runs, with an upward adjustment in the number of entitlements issued to those refiners who qualify for a "small refiner bias."²⁸ Refiners with more old oil than the national ratio are issued fewer entitlements, and they have to buy entitlements for each barrel of old oil run above the national ratio. Correspondingly, refiners with less old oil than the national ratio are issued more entitlements than the old oil they have. By selling the excess entitlements, these refiners can average down their crude oil costs and theoretically become more competitive.

Puerto Rican refiners have realized great benefits from the entitlements program. Through 1977, Puerto Rican benefits amounted to more than \$433.6 million, with CORCO obtaining \$372 million of this total.²⁹

Despite this funding though, CORCO and other small refiners argue that the entitlements issued should be based on certified refining capacity, rather than on the smaller actual crude oil runs to stills.³⁰ In this way, they maintain, entitlements would further equalize feedstock costs. The program does not completely eliminate the difference between

CORCO's weighted average crude oil price and that of other refiners. As noted by the FEA:

That was not the Program's primary goal . . . the primary objective underlying the Entitlements Program was to redistribute and equalize the benefits derived from access to old oil.

The FEA also observed that CORCO has gained mightily from the program:

The revenue which CORCO has already realized through the sale of entitlements is 87 percent of the firm's net earnings in 1973 and 296 percent of the net earnings it realized in 1974.

Although Puerto Rican importers of foreign crude oil receive full entitlement benefits, the program leaves domestic crude oil with a 21-cent per barrel advantage over foreign crude.³¹ Despite the benefits flowing from the Entitlements Program, the payments received do not result in Puerto Rican feedstock pricing parity with mainland producers which are not completely reliant on imported oil.³²

It must be noted also that the dollar benefits to Puerto Rico cited above are for *total* entitlements receipts, including both crude oil and naphtha entitlements. Naphtha is of special concern to Puerto Rico, as is made clear in the following subsection.

Naphtha Entitlements Program.—Naphtha was not included in the original entitlements program. This created a serious problem for the Puerto Rican petrochemical industry which is heavily dependent on naphtha as a feedstock.³³ The price of imported naphtha rose from 6 cents per gallon in early 1973 to 37 cents per gallon in early 1976, and the Puerto Ricans strongly urged the adoption of a naphtha entitlements program.³⁴

Such a program was put into effect in July 1976. In announcing the naphtha entitlements program, the FEA noted the role of Federal regulations in initiating the petrochemical industry in Puerto Rico:

In the 1960's the Federal Government encouraged the location and development of the refining and petrochemical industries in Puerto Rico. For the petrochemical industry, the program was premised on the availability of low cost foreign feedstock, particularly naphtha from Caribbean refineries, to

²⁵ For regulations dealing with the two-tier pricing, see 10 CFR §§ 212.71-74. In addition, the principal court case testing that system of pricing upheld the FEA's regulations, while providing a detailed discussion of the problem and the regulations.

²⁶ See 39 Fed. Reg. 42246 (December 4, 1974).

²⁷ CFR § 211.62 provides, in pertinent part: "entitlement means, for a particular month, the right of the refiner owning the entitlement to include one barrel of deemed oil . . . in its adjusted crude oil receipts in that month."

²⁸ CORCO's status as a small refiner is well established. Regulation section 211.51 defines small refiners as those refiners having less than 175,000 barrels per day capacity. CORCO's capacity is 161,000 barrels per day, as recited in every FEA decision concerning CORCO.

²⁹ DOE Study Draft, p. 82. The \$433.6 million in benefits was for CORCO, Phillips, and Union Carbide Corporation; the latter two benefited for naphtha entitlements only. Gulf does not report its earnings separately from its mainland parent's operations, and entitlements for in Puerto Rican refinery cannot be determined.

³⁰ CORCO also complains that special Rule No. 3 to 10 CFR 211.67 reduced the entitlement purchase obligations of small refiners for 4 months, and cost CORCO millions of dollars as a result.

³¹ This is no longer true as a result of the recent DOE ruling. The 21-cent reduction in entitlements decreed several years ago has been lifted for a period of 18 months. This decision means that CORCO alone will save about \$27,000 per day or \$10 million annually, on the current operating basis of 130,000 b/d throughput.

³² DOE Study Draft, p. 76.

³³ For an example of the dependence in Puerto Rico on naphtha as a feedstock, see Commonwealth Oil Refining Company, 5 FEA ¶ 83.132 (April 14, 1977). Also, the FEA's Preamble to its inclusion of naphtha in the entitlements program cited in the heavy dependence on naphtha as a feedstock by the Puerto Rican petrochemical industry. See 42 Fed. Reg. 30321-30322 (July 23, 1976).

³⁴ FEA Public Hearing on Allocations and Price Regulations in Puerto Rico, April 12-13, 1976, p. 13.

provide a feedstock cost advantage over mainland petrochemical producers, which was necessary to offset higher shipping and other costs (including necessary investments) associated with commencing operations in the relatively underdeveloped island economy. The Puerto Rican petrochemical industry has since grown to where it currently comprises an important segment of total domestic petrochemical capacity, (41 *Fed. Reg.* 30321-30322 (July 23, 1976)).

The FEA recognized both the previous inducements for industry to come into Puerto Rico, and the total reliance of the island's economy on foreign feedstock. The FEA also asserted that its intent with the expansion of the entitlements program to cover naphtha benefits was:

To render the Puerto Rican petrochemical industry more competitive with other domestic petrochemical producers located on the mainland. (41 *Fed. Reg.* 30322)

It cannot be argued that adding naphtha entitlements has produced parity, since FEA acknowledges that the entitlements program does not (and was not intended to) do this. However, through December 1977, the total naphtha entitlements earnings for Puerto Rican firms exceeded \$118 million.³⁵

Furthermore, in December 1977, the Department of Energy (DOE) revised the factor used for calculating the imputed cost of domestically produced naphtha which, in turn, is used to determine entitlement benefits.³⁶ The DOE's purpose was:

To compensate more accurately under the entitlements program for the feedstock cost disadvantage of the petrochemical industry in Puerto Rico, which is reliant on imported naphtha, as compared with mainland petrochemical producers that have access to naphtha produced by domestic refiners. (42 *Fed. Reg.* 61854)

Regulation Section 211.67(d)(iii) was amended to provide that for the purposes of determining the volume of naphtha eligible for entitlement issuances in a particular month, the imputed naphtha is to be calculated by applying a factor of 108 percent to the weighted average per barrel cost of crude oil for all domestic refiners for that month. The effective date for the revised factor was November 1977. It is too early to completely assess the impact of the new formula, but there is no doubt that Puerto Rico will

realize additional benefits. The previous formula called for a 120-percent multiplier, and the lower multiplier inures to Puerto Rico's benefit.³⁷

Small Refiners Entitlements Bias.—Entitlement benefits to Puerto Rico are also increased by the small refiners' bias. Because it is generally believed in the oil industry that small companies refine petroleum less economically than do large firms, company size is often taken into account in applying Federal requirements.³⁸ Since all Puerto Rican refiners are classified as having small operations, companies on the island are favored by this bias.

Under the regulations, additional quantities of entitlements are awarded to refiners whose:

total refinery capacity (including the refinery capacity of any firm which controls, is controlled by, or is under common control with such refiner) does not exceed 175,000 barrels per day.³⁹

The intent is to provide a degree of competitiveness between small and large refiners, although Congress clearly did not intend to totally insulate or protect small refiners from every regulation which would impose financial burdens on firms in the petroleum industry.⁴⁰ Since Puerto Rico's largest refiner, CORCO, has a refining capacity of 161,000 barrels per day, it and the other island refiners qualified for the small refiners bias.⁴¹

The bias program has the effect of reducing the cost of crude oil for smaller companies. These savings are paid for by transfer payments under the entitlements program from larger companies and, ultimately, by their customers. The estimated annual national subsidy rate under the program, based on July 1977 figures, is \$659 million. If exceptions and appeals relief is taken into account as well, the annual subsidy rate for *all* small refiners nationwide is

³⁵ Since Puerto Rico receives almost all naphtha imported into the United States for refinery feedstock purposes, the naphtha entitlements program and the revised formula for calculating entitlements were created for Puerto Rico alone.

³⁶ There is some minor dispute about the company size issue. Some companies argue that *refinery* size and not *company* size should be the barometer in fixing efficiency of refining operations. The argument is that a smaller refinery is less economical, even if operated by a large company. ["Small Refiners Bias Analysis," January 1978. Prepared for the Economic Regulatory Administration under Contract No. CR-06-70258, p. 27.]

³⁷ See EPAA at section 3(4), 15 U.S.C. § 752(4); 10 CFR § 211.51; 10 CFR § 211.62.

³⁸ See *Powerline Oil Company v. FEA*, 536 F.2d 378 (TECA 1976), 3 CCH Energy Management ¶26,048 (May 28, 1976). Powerline was seeking an exemption from the entitlements program and its required purchases thereunder. The Temporary Emergency Court of Appeals denied the relief sought, declaring that companies have no legal right to be exempted from those aspects of the energy regulatory programs which might impose certain financial burdens upon them.

³⁹ In June 1975, approximately 37 percent of CORCO's stock was acquired by Tesoro Petroleum Company. Tesoro owned and operated four refineries with a combined capacity of 76,000 barrels per day. As a result of acquisition of CORCO stock the two companies were considered a single firm under the Mandatory Petroleum Allocation and Price Regulations. So Tesoro sought exception relief, which the FEA granted. [See *Tesoro Petroleum Company*, 2 FEA ¶85,032 (August 26, 1975); *Tesoro Petroleum Company*, 2 FEA ¶83,334 (October 14, 1975).]

³⁵ DOE Draft, p. 82. Sun Oil Company, as a producer rather than an importer of naphtha, is hurt by these subsidies. The program forces down Sun Oil's naphtha "... to the price of imported foreign naphtha, less the value of the naphtha entitlement. As the naphtha entitlement increases, Puerto Rico Sun's onisland sales price decreases. . . ." ["Naphtha maker corrects report of entitlements," *San Juan Star*, December 13, 1977, p. 22.]

³⁶ 42 *Fed. Reg.* 61853 (December 7, 1977). See also: DOE Study Draft, p. 77.

approximately \$1.125 billion.⁴² These figures are important only to show the magnitude of special relief presently being given small refiners, including those of Puerto Rico. No separate figures are available for Puerto Rico under the bias program, but this preferential treatment does appear to add significantly to the entitlement benefits received by Island-based firms.

Refiner and Reseller Pricing Rules.—The MOIP fee exceptions and the various entitlements have clearly assisted Puerto Rican refiners in coping with rising foreign oil prices. The refiner and reseller rules have had a more mixed effect. For a time, Shell P.R. essentially received a subsidy under these rules and CORCO was penalized. Puerto Rican consumers have benefited and refiners' profits in general have suffered. The consequences of these rules in Puerto Rico amply demonstrate the pitfalls of complex Federal regulations.

The maximum price a petroleum firm can charge for its products in the United States is partially determined by the refiner and reseller rules. When increased product costs are incurred in one or more parts of a company classified as a refiner,⁴³ and the company wants correspondingly to increase its prices, it must determine the weighted average of all such increased costs and pass them through to its customers equally over its *entire* nationwide distribution system. When a subsidiary of a company classified as a reseller⁴⁴ incurs increased costs, it may pass them *directly* through to its customers without averaging them in the company's larger distribution system.

CORCO and Caribbean Gulf Refining Corporation were the two main refiners in Puerto Rico in 1973. Under the refiners rule, Caribbean Gulf and the other smaller refineries averaged their product costs in with their mainland parent's costs.⁴⁵ CORCO, on the other hand, had no mainland parent, and was permitted to pass on its total increased costs to its Puerto Rican customers. However, CORCO was constrained in its ability to raise prices because of (1) long-term contract commitments, and (2) competition from other island refiners that averaged their cost increases with their mainland parents: two fac-

tors which contributed to CORCO's financial woes.

To the extent that CORCO and other Puerto Rican refiners did pass their increased costs on, they did so mostly to resellers which—before May 1974—could then pass on such increases directly to their island customers. If there were no long-term contracts, and if none of the refiners had mainland parents with which they had to average costs, the Puerto Rican consumer would have received the full impact of the foreign oil price rise. Largely because of the refiner rule, however, foreign oil costs were spread throughout the United States. In effect, the refiner rule “. . . acts as a subsidy to consumers on the island.”⁴⁶

In Puerto Rico's case, the reseller rule was modified on May 16, 1974, so that it too provided a subsidy for Commonwealth consumers. Puerto Rican resellers tied to mainland refiners were made subject to the refiner rule.⁴⁷ Just as is the case with refiners, these resellers now have to average their costs with those of their mainland parents.

This reseller rule modification left one seller on the island in a unique position. Shell P.R. was not controlled directly or indirectly by any mainland refiner. After initially barring Shell from making any price increases, the FEA determined that Shell P.R. should continue to be treated as a reseller since it had no mainland refiner parent. However, the FEA still found a way in which to give relief to Puerto Rican consumers. It created the so-called “Shell Subsidy” by requiring CORCO to adjust its prices to Shell P.R. *downward* while simultaneously making an *upward* adjustment in the prices it charged its other customers.⁴⁸

The Puerto Rican consumer benefited from the FEA action, CORCO suffered, and the Dutch-British Shell Company gained. Shell's special treatment lasted for only 5 months, however. In an October 4, 1974 Amendment to Opinion and Order, the FEA discontinued the Shell subsidy stating that:

Since supplies of petroleum products now are significantly increased, the FEA believes that the removal of the Shell (Puerto Rico) price adjustment will not have the impact on the public that it would have had in May.⁴⁹

Accordingly, the FEA sought and received “as-

⁴² “Small Refiners Bias Analysis,” p. 1.

⁴³ A refiner is defined as “a firm . . . or that part of such a firm which refines covered products or blends and substantially changes covered products. . . .” [10 CFR § 212.31.]

⁴⁴ “Reseller” means a firm . . . or that part of such a firm which carries on the trade or business of purchasing covered products, and reselling them without substantially changing their form to purchasers other than the ultimate consumer.” [10 CFR § 212.31.]

⁴⁵ Caribbean Gulf's parent company is Gulf Oil Corporation of the United States. See *Texaco/Mobil/Exxon v. FEA*, 522 F.2d ____ (TECA 1976), 3 CCH Energy Management ¶26,037 (February 9, 1976), affirming *Exxon/Mobil/Texaco v. FEA*, 398 F. Supp. 865 (D.D.C. 1975), 3 CCH Energy Management ¶26,021 (June 17, 1975). Phillips, along with CORCO, was granted an FEA exemption from averaging the increased cost caused by the \$2 tax. Both firms were allowed to allocate the resulting increased costs “exclusively to the prices of the refined products they sell in Puerto Rico.” [DOE Draft, p. 59.]

⁴⁶ DOE Draft Study, p. 63.

⁴⁷ The Order was published at 39 Fed. Reg. 17764, May 20, 1974.

⁴⁸ In the May 16 Order, the FEA concluded that the prospect of having one marketer on the island, controlling approximately 20 percent of the market, passing through directly the higher costs of CORCO's products to the consumer and other purchasers, while other marketers were averaging in the higher CORCO prices with their mainland refiner firms, presented an unacceptable risk of severe market disruption. Since the maximum lawful prices of Shell P.R. would have been substantially in excess of those of the other marketers, it was felt that the impact upon Shell's independent retailers would have been very serious. In fact, the FEA stated that it feared a dealers' strike might result, with “severe repercussions for consumers.”

⁴⁹ 39 Fed. Reg. 36321 (October 9, 1974).

surances" from Shell P.R. that it would not make significant increases in prices charged on the island pending other efforts to reduce its own costs on products sold in Puerto Rico.⁵⁰

The short-lived Shell subsidy provides only a footnote in the continuing story of Federal regulations in the Puerto Rican petroleum industry. This so-called subsidy was Shell's only silver lining since post-OPEC price rise regulations and taxes began to weaken the company's competitive position.⁵¹ But the Shell incident admirably highlights the problems involved with these complex regulations. The petrochemical industry in the Commonwealth was largely founded on special importation allowances under the Mandatory Oil Import Program; it has survived since 1973 on the basis of MOIP fee exemption, entitlements, and cost averaging required by the refiner rule and the modified reseller rule.

Despite hundreds of millions of dollars in entitlement benefits, plus other favorable treatment, Puerto Rico still has a feedstock price disadvantage. In the post-OPEC price rise era, the competitive cost edge has for the present shifted to mainland companies using price-controlled domestic crude oil.

CORCO's Present Crisis

CORCO alleges that it was unable to pass the \$2 import tax on to some of its customers due to contractual arrangements. The company has fallen behind in paying the fee and as of late January 1978 owes the Commonwealth Treasury Department some \$60 million.

CORCO's total debt now amounts to more than \$380 million, which breaks down as follows:

- More than \$200 million to nine banks, headed by New York's Citibank and including \$15 million to the Government Development Bank.
- \$39 million to Gulf and \$11 million to Exxon for supplies of crude oil and naphtha feedstocks.
- \$50 million to Texaco, the parent company.
- More than \$60 million to the Treasury Department in unpaid \$2-per-barrel oil import fees.⁵²

CORCO had grown to become Puerto Rico's largest private enterprise, with more than \$600 million

⁵⁰ *Ibid.*

⁵¹ Shell's competitors in the aviation jet fuel business—ESSO and Texaco—are classified as refiners, and can average their increased costs on a national basis. Since Shell cannot cost average, its prices rose above those of its rivals despite any moderation which might have resulted from FEA's influence. Shell's situation worsened in May 1977, when CORCO ceased selling it fuel. Because it then had to import, Shell had to pay the Commonwealth \$2 a barrel tax. (A request for a ruling to rebate the tax on sales of fuel to aircraft departing Puerto Rico has been denied by the Commonwealth Government.) Hit by both the Commonwealth tax and the Federal reseller rule, Shell has almost lost its Puerto Rican business.

⁵² *Dorville Newsletter*, January 28, 1978.

in fixed assets, 1976 sales of \$1.1 billion, and employing more than 2,000 workers and affecting 7,800 jobs indirectly. CORCO supplies about two-thirds of the gasoline consumed in Puerto Rico and most of the other oil products, including the residual oil used to generate electricity for the island. CORCO had grown to be the hub of the Commonwealth petroleum refining-petrochemical complex and the showpiece of Operation Bootstrap. Now the once prosperous Commonwealth Oil Refining Company is fighting for survival.

The present crisis has been attributed to the withdrawal in recent years of most of the economic incentives provided by the United States and Puerto Rican Governments; as well as the destruction of the company's "economic base" resulting from the combination of sharply increased world crude oil prices and price controls on crude produced in the United States.

Others, however, believe CORCO's present troubles were manifest well before OPEC, and can be accounted for by poor management and conflicts of interest involving top-ranking company officials.

Competitive Position

The question that remains to be answered is whether CORCO's almost inevitable bankruptcy is unique or is indicative of the state of the petroleum refining-petrochemical complex in Puerto Rico generally. This question has been at least partially addressed by Arthur D. Little, Inc.⁵³ both in April of 1975 and in October of 1977⁵⁴ in studies on the competitive cost position of the Puerto Rican petrochemical complex.

In the study completed in April 1975, it was found that compared to the United States Gulf Coast, Puerto Rico is a higher cost location for producing petrochemicals because the island has higher feedstock, fuel, and power costs. Table 9 provides a comparison of these costs.

For a comparable petrochemical complex based on naphtha/gas oil feedstock, net operating costs were 41 percent higher in Puerto Rico than on the Gulf Coast. A comparison of Puerto Rican experience with a Gulf Coast plant based on ethane-pro-

⁵³ The methodology employed in the 1977 study was to focus on comparative costs of a hypothetical petrochemical complex producing both olefins and aromatics. Comparable petrochemical complexes were analyzed for Puerto Rico and the United States Gulf Coast, the complexes defined were identical in regard to both product slate and capacity. However, since about 70 percent of the ethylene produced in the United States is based on gas-liquids cracking, a third case was evaluated in which a gas-liquids cracker was substituted for the naphtha/gas oil cracker, without changing the derivative chemical plants. It was assumed that each of the three plants was built during the period 1971 to 1973, and brought into operation during the early part of 1974.

⁵⁴ The contractors of this study were Union Carbide Caribe, Inc.; PPG Industries (Caribe); Phillips Puerto Rico Core, Inc.; Tenneco Chemicals; and Ashtand Oil, Inc.

**Table 9.—Annual Petrochemical¹
Operating Cost Comparison²**

[In millions of dollars]

Operating cost factors	Puerto Rico naphtha feed- stock	U.S. Gulf Coast	
		Naphtha feed- stock	Ethane/ propane feed- stock
Production costs:			
Raw materials	160.6	143.5	92.9
Utilities:			
Power	42.2	13.0	12.8
Fuel	41.7	13.0	12.5
Steam and other	19.3	14.1	11.1
Labor and overhead	11.6	11.2	10.8
Maintenance	12.5	12.2	10.4
Fixed costs	43.7	46.8	39.4
Total production costs	331.6	253.8	189.9
Coproduct credits	(141.3)	(113.8)	(33.7)
Net plant costs	190.3	140.0	156.2
Transportation difference	7.2		
Net annual operating costs	197.5	140.0	156.2
Percentage difference over Gulf Coast		+41	+22

¹ Petrochemical product mix includes (1) basic petrochemicals—ethylene, propylene, benzene (naphtha plants only), and (2) derivatives—low-density polyethylene, ethylene glycol, vinyl chloride monomer, and cumene.

² Cost estimates are based on conditions existing during the fourth quarter 1974.

Source: Arthur D. Little, Inc., *Competitive Cost Position of the Puerto Rican Petrochemical Industry*, G-78169, April 1975, p. 2.

pane feedstock, indicated that Puerto Rico net operating costs were 22 percent higher.

The A. D. Little study, completed in October 1977, also concluded that the Puerto Rican petrochemical industry is not presently cost competitive with producers on the United States Gulf Coast. For a comparable petrochemical complex based on naphtha/gas oil feedstock, net operating costs in Puerto Rico were 27 percent higher than on the Gulf Coast before entitlements, after adjustment for entitlements the difference dropped to a 17-percent advantage for a Gulf Coast plant. Puerto Rican experience compared with a Gulf Coast plant based on ethane/propane feedstock indicated net operating costs in Puerto Rico were 20 percent higher before entitlements and 10 percent higher after adjustments for the entitlement program benefits. (See table 10.)

A sensitivity analysis performed as part of the latter study revealed the Puerto Rican petrochemical complex production costs to be very sensitive to shifts in feedstock costs and coproduct credits, quite sensitive to changes in fuel, power, and capital costs, but less sensitive to variations in labor costs.

Key cost differences for the naphtha/gas oil-based complexes were:⁵⁵

1. **Power Cost.**—Puerto Rican power rates were as much as 2.4 times those on the Gulf Coast.
2. **Fuel and Steam Costs.**—Puerto Rico unit costs for fuel and steam were 22–24 percent above

unit costs for the Gulf Coast complexes. However, increased consumption of steam for compressor drives and caustic evaporation in the Gulf Coast plant reduced total cost differences to 12 percent for the sum of these two cost elements.

3. **Feedstock Costs.**—Before adjustments for transportation, duties, and entitlements total naphtha/gas oil feedstock costs in Puerto Rico were estimated to be 7 percent higher than on the U.S. Gulf Coast.

4. **Transportation Costs.**—The total transportation cost penalty for Puerto Rico operations was \$20.2 million per year. About \$14.6 million was attributable to transporting raw materials, and \$5.6 million for transporting plant output.

1. **Power Costs.**—The Puerto Rican Water Resources Authority (PRWRA) produces and distributes essentially all the power consumed on the island. Ninety-nine percent of PRWRA's power production is from 14 oilfield thermoelectric generating plants. PRWRA previously was based on a system consisting of mostly hydroelectric generating facilities producing relatively low-cost power. Puerto Rico has now developed nearly all of its energy systems to be totally dependent upon imported supplies of crude

**Table 10.—Annual Petrochemical Complex
Operating Cost Comparison¹**

[In millions of dollars]

Primary feedstock for olefins, aromatics	Puerto Rico naphtha/ gas oil, naphtha	U.S. Gulf Coast	
		Naph- tha/ gas oil, naphtha	Ethane/ propane, naphtha
Operating cost factors:			
Production costs:			
Raw materials	400.0	374.5	394.7
Utilities:			
Power	68.5	124.4	24.0
Fuel and steam	71.9	64.4	57.6
Other variable costs	17.5	13.6	12.9
Labor and supervision	9.4	10.2	9.6
Maintenance	19.8	19.3	17.2
Fixed costs	67.8	74.5	67.9
Total production costs	654.9	580.9	583.9
Coproduct credits	(258.7)	(252.2)	(235.5)
Net plant costs	396.2	328.7	348.4
Transportation difference	20.2		
Net annual operating costs	416.4	328.7	348.4
Percentage difference over Gulf Coast		+27	+20
Puerto Rico entitlements	-32.7		
Net Costs	383.7	328.7	348.4
Percentage difference over Gulf Coast		+17	+10

¹ Petrochemical product mix for all three complexes includes: Basic petrochemicals—ethylene, propylene, benzene, ortho- and para-xylene; Derivatives—low density polyethylene, ethylene glycol vinyl chloride monomer, cumene, and oxo-alcohols.

Source: A. D. Little, Inc., *Competitive Cost Position of the Puerto Rican Petrochemical Industry in 1977*, p. 2.

⁵⁵ A.D. Little, 1977, p. 3.

petroleum and naphtha. "The effect of rapid growth, the change from a hydroelectric based utility to a fossil fueled thermoelectric based utility, and the rapid escalation of fuel oil prices in 1973-74, have caused a similar rapid increase in the cost of electricity."⁵⁶ As had been mentioned earlier, the industrial sectors' cost per kilowatt hour for electric power has almost doubled in the last 5 years, increasing from 2.22 cents per kWh in 1973-74 to 4.08 cents per kWh in 1976-77.⁵⁷

Special lower rates were available in the late 1960's under Public Law 82 to attract large industrial customers to the island. Under Public Law 82, large blocks of power are provided at less than the cost of production and distribution, partially subsidized by the Commonwealth of Puerto Rico. Only two of the leading petrochemical producers on the island have Public Law 82 contracts and no new power contracts are available under the provisions of this law.⁵⁸

The rate structure which now applies to new large power consumers is covered under Schedule GSTV (General Service at Transmission Voltage) of section LP-17 within the filed PRWRA tariffs.

2. *Feedstock Costs.*—When Puerto Rico's petrochemical plants were first built, they could purchase foreign naphtha at a cost of about \$2.30/bbl, compared to a Gulf Coast value of about \$3.75/bbl. This was a result of the already mentioned Mandatory Oil Import Program under which the industry was provided with naphtha import quotas which were fee-free. Following the Arab oil embargo, the cost of foreign naphtha escalated rapidly commensurate with world crude oil prices. During May 1977, 77,000 bbls/day naphtha-type feedstocks were delivered to Puerto Rico at an average value of \$15.61/bbl.

The cost of naphtha on the United States Gulf Coast is difficult to estimate as most naphtha is manufactured by heavy liquid crackers owned by major oil companies. Therefore the commodity is not widely traded and its value is a matter of specific refinery economics and transfer pricing.

Federal Energy Administration regulations in force at the time of the A. D. Little study relating to the Puerto Rican petrochemical entitlements program established a multiplier of 1.2 over the United States average refiners' acquisition cost for all crude oil as a fair valuation for Gulf Coast naphtha. This multiplier produces a value of \$14.17/bbl for Gulf Coast naphtha in May 1977. The entitlement value allowed (\$1.44/bbl for May 1977) is the difference between reported costs for naphtha imports and the estimated or "computed" Gulf Coast naphtha value. The A. B. Little report assumed imports of 66,230 bbls of

naphtha per day (343 day/year, and arrived at the annual value of the entitlements at the May level of \$32.71 million. (The value of naphtha entitlements from July 1976 through August 1977 was \$81.5 million.)

3. *Transportation Costs.*—The hypothetical petrochemical complex in Puerto Rico must import two major items for its operation. The first is the naphtha feedstock and the second is salt. As most Gulf Coast heavy liquids cracking plants are located adjacent to a refinery, transportation costs for these products are negligible. Combining the transportation costs involved with feedstocks and raw materials with the difference that a petrochemical plant in Puerto Rico will spend each year in product transportation costs than a comparable Gulf Coast complex provides the following estimates of the total additional transportation cost associated with a petrochemical plant located in Puerto Rico:

Feedstock and raw material	
transportation cost	\$14,595,000
Product transportation cost	
difference	+5,649,000
Total transportation cost	
difference	20,244,000

4. *Labor Costs.*—A.D. Little's study calculated labor costs on base wage rates of \$5.86 per hour for Puerto Rico and \$8.32 per hour for the Gulf Coast complexes. On the basis of these figures, base rates were found to be approximately 42 percent higher on the Gulf Coast. Fringe benefits, which include legislative benefits and additional benefits (overtime, Christmas bonuses, etc.), which are general practice in the petrochemical industry, on a dollar-per-hour basis are essentially equivalent at \$3.40 per hour on the Gulf Coast and \$3.57 per hour in Puerto Rico. However, fringe benefits as a percentage of base wage rates are 49 percent higher in Puerto Rico. On a total compensation basis in 1977, wage rates for hourly workers are only 24 percent higher on the Gulf Coast than in Puerto Rico.

Supervisory compensation was found to be equivalent in Puerto Rico and on the Gulf Coast, because of the transferability of labor.⁵⁹

5. *Other Costs.*—Water is used in the processing of petrochemical as boiler feed water, process steam and cooling water. Costs of water for each of these uses in Puerto Rico is higher than for the comparable Gulf Coast producer. The higher cost of boiler feed water in Puerto Rico (\$3.55/gallon compared to \$1.80/gallon for the Gulf Coast) is a result of higher prices for fresh water, chemicals, and energy.

As about 85 percent of the cost of steam is fuel-related, the higher cost of steam in Puerto Rico is a reflection of higher fuel prices.

⁵⁶ A.D. Little, 1977, p. 23.

⁵⁷ FEA Draft, p. 46.

⁵⁸ A.D. Little, 1977, p. 23.

⁵⁹ A.D. Little, 1977, p. 29.

Business insurance is slightly higher in Puerto Rico due to the requirement that operators must insure against earthquake damage, which increases their annual insurance bill to 0.7 percent compared to a facility on the Gulf Coast which pays an annual premium of about .5 percent of capital investment.

On Puerto Rico, petrochemical producers are exempt from local taxes whereas on the Gulf Coast an average figure for property taxes is 2 percent of capital investment.

ENVIRONMENTAL REGULATIONS

Environmental regulations, whether they be standards and requirements set by the U.S. Environmental Protection Agency or by the Puerto Rican Environmental Quality Board, impact upon the petroleum refining/petrochemical complex in two distinct ways. The first effect is an increasing proportion of capital expenditures in the last few years going to pollution control equipment which is considered to add only to production cost and not to production capacity. The second effect is a decrease in supplies of certain substances as raw materials for the chemical industry or the elimination of certain chemicals in particular use categories.

Regulations affecting the use of lead in gasoline could have an impact on the availability of butane (a natural gas liquid) for use as chemical feedstock. Likewise, these regulations impart upon the availability of certain aromatics (benzene, toluene, and the mixed xylenes from which are separated other xylene and para-xylene) for chemical feedstocks.

Lowered lead content of gasoline results in reduction of octane rating. This loss of octane could be restored by increasing aromatic levels. As current reformer capacity to produce aromatics is operating at effective capacity, division of available aromatic supplies to gasoline use would seriously restrict the production of aromatic-dependent petrochemical products such as synthetic rubber, plastic materials, and synthetic fibers. (The quantities of aromatics employed for gasoline blending are substantially greater than quantities used for petrochemical production.) In addition, the increased use of aromatics to maintain octane levels in gasoline could require increased butane content to provide vapor pressure for easy engine starting in cold weather.

Chlorofluorocarbon products (industrial organic chemicals), commonly called fluorocarbons, are used primarily—about 50 percent of all production—as aerosol propellants. They are ideal propellants, possessing the required vapor pressure and are nonflammable, relatively nontoxic, and physically stable. The controversy over the fluorocarbon destruction of ozone in the stratosphere and the possible effect of

the destruction on the warming of world climate and the increased incidence of skin cancer, led the U.S. Food and Drug Administration to respond. The FDA announced in November of 1976 an orderly phaseout of all nonessential uses of fluorocarbon propellants in food, drug, and cosmetic products. This phaseout will also result in declining production of hydrofluoric acid employed for fluorocarbons for aerosols.

This curtailment in the use of fluorocarbons in aerosols also impacts on the chlor-alkali industry (industrial inorganic chemicals), and accounts for a disappearance of about 9 percent of the total consumption of chlorine. Also, affecting this industry are EPA bans of the production of a number of chlorinated pesticides, solvents, and intermediates.

Most recently, due to increasing concern over cancer and other health hazards faced by workers and consumers, the EPA has ordered the chemical and petroleum refining industries for the first time to report to it what substances they are making by May 1, 1978. Once the list is published any chemical maker wanting to produce a substance not on the inventory will have to notify the EPA of that fact 90 days in advance so the agency can decide whether the new substance should be allowed on the market.⁶⁰

THE FUTURE

The future of the petroleum refining industry as a competitor in the U.S. marketplace will be dependent upon a reduction in energy costs, for power fuel and steam, and a reduction in transportation costs. One possible way to reduce energy costs is to eliminate the \$2 per barrel excise tax for oil imported and consumed on the island. This tax applies to petroleum refiners and is understood to also apply to the Puerto Rican Water Resources Authority. This would require the Commonwealth Government to exclude this fee from their budget as a source of revenue.

The passage on December 7, 1977, of an amendment to the entitlements program will increase revenue from this source of Federal aid to petrochemical companies in Puerto Rico by approximately \$1.9 million a month plus retroactive compensation to November 1977. The factor used to determine entitlements value of naphtha feedstocks imported into Puerto Rico was revised from 1.2 to 1.08. The multiplication of the average U.S. refiner cost for all crude oil by this new rate decreases the imported Gulf Coast naphtha value and so increases the difference in cost between Gulf Coast and Puerto Rican naphtha, resulting in increasing the naphtha entitlement value. In September of 1977, at a factor of 1.2,

⁶⁰ *San Juan Star*, December 23, 1977, p. 11.

naphtha was receiving an entitlement of \$1.69/bbl. Now, at a factor of 1.08, naphtha receives an entitlement of \$2.19/bbl. Using the number of barrels of naphtha imported into Puerto Rico in September 1977 (3,703,193 bbls) as a base and multiplying that by the additional \$0.50 entitlement results in an additional \$1.85 million a month or a new total of approximately \$97 million a year in naphtha entitlements alone. This amendment limits the value of entitlements to the naphtha imports so as not to exceed that which a refiner gets for a barrel of crude, namely \$2.19/bbl. This is designed to make petrochemical producers indifferent to importing naphtha or refining it from crude and so enable the refining industry in Puerto Rico to remain viable.

The new benefits to be reaped from the entitlements program will greatly aid, indirectly, Puerto Rican petrochemical producers in meeting feedstock costs (one of the key cost differences relative to Gulf Coast producers).

Other indicators of the health of the Puerto Rican petroleum refining/petrochemical complex are available in tables 11, 12, and 13. Unfortunately, it is not possible to obtain some of this information for years after 1972.

Table 11.—Selected Operating Ratios, Puerto Rico, United States, 1972

	(281) Industrial in- organic chem- icals	(286) Industrial organic chem- icals	(29) Petro- leum and coal products	(2911) Petro- leum refining
Value added per employee (thousands of dollars):				
Puerto Rico	\$22.30	\$49.40	\$42.00	\$51.00
United States	\$33.60	\$44.46	\$41.53	\$45.58
Value added to payroll (ratio):				
Puerto Rico	3.86	5.15	4.44	4.76
United States	3.10	—	—	3.68

Table 12.—Selected Financial Ratios, 1975

	Net profits to equity	Net profits to sales
(281) Industrial inorganic chemicals:		
Puerto Rico	10.60	13.70
United States	15.63	4.96
(286) Industrial organic chemicals,		
Puerto Rico	—17.60	—19.70
(29) Petroleum refining and related products:		
Puerto Rico	6.90	2.70
United States	15.10	4.19

Table 13.—Net Earnings to Sales, Puerto Rico and United States, Selected Years

[In percentages]

	1967	1970	1972	1973	1974	1975	1976	1977
(281, 282, 286)—Petrochemicals, Puerto Rico	24.54	—12.79	—3.86	5.05	4.48	¹ 0.85	12.74	12.79
(281)—Industrial inorganic chemicals, United States	4.28	—	3.82	5.25	—	4.96	—	—
(29)—Petroleum and coal products, Puerto Rico	7.57	7.06	2.99	7.46	5.98	1.28	1.43	.90
(2911)—Petroleum refineries:								
Puerto Rico	2.34	5.21	.73	5.85	4.29	1.28	1.13	² (—)
United States	5.05	—	5.03	7.03	—	4.19	—	—

¹ This figure can be accounted for in some degree by a more than \$23 million loss in industrial organic chemicals.

² Indicates a loss of less than 1 percent.

Sources: Unpublished data provided by Fomento. U.S. rates calculated from Dun and Bradstreet's *Key Business Ratios*, various years. U.S. rates are for profits after taxes. Puerto Rican rates are for corporations receiving tax exemptions.

The Textile Products Industry

DEFINITION

The textile mill products industry covers a large number of industrial activities, ranging from the ginning and compressing of cotton, and dyeing and finishing of textile fabrics to the manufacture of blankets, hairnets, and synthetic leather. The actual inclusion of individual products in the industry's definition varies between the United States and Puerto Rican agencies. For the purposes of this analysis, the textile mill products industry is defined to include:

Establishments engaged in performing any of the following operations: (1) preparation of fiber and subsequent manufacturing of yarn, thread, braids, twine, and cordage; (2) manufacturing broad woven fabric, narrow woven fabric, knit fabric, and carpets and rugs from yarn; (3) dyeing and finishing fiber, yarn, fabric, and knit apparel; (4) coating, waterproofing, or otherwise treating fabric; (5) the integrated manufacture of knit apparel and other finished articles from yarn; and (6) the manufacture of felt goods, lace goods, nonwoven fabrics, and miscellaneous textiles.¹

This classification, which consists of major industry group 22, includes both the "integrated" mill which purchases materials, produces textiles and related articles within the establishment, and sells the finished products; and the "contract" or "commission" mill which processes material owned by others.

The industry composition is as follows:

- SIC-221: Broad woven fabric mills, cotton.
- SIC-222: Broad woven fabric mills, manmade fiber and silk.
- SIC-223: Broad woven fabric mills, wool, including dyeing and finishing.
- SIC-224: Narrow fabrics and other smallwares mills: cotton, wool, silk, and manmade fibers.
- SIC-225: Knitting mills.
- SIC-226: Dyeing and finishing textiles, except wool fabrics and knit goods.

- SIC-227: Floor covering mills.
- SIC-228: Yarn and thread mills.
- SIC-229: Miscellaneous textiles goods.²

THE DEVELOPMENT OF PUERTO RICO TEXTILE MILL PRODUCTS INDUSTRY

Early Development

The textile industry in Puerto Rico began with the construction of a \$4.5 million textile mill in 1947 by the Puerto Rican Industrial Development Company (PRIDCO). This construction project, together with the new tax exemption program which went into effect in the same year, represented the government's new emphasis in the promotion of private industries in leading the island to an industrialized society.

Since that time, through the two following decades, the labor-intensive industries, including textiles, apparel, leather, and tobacco products, received the most attention and assistance from Fomento. These industries best suited the conditions prevailing in the Puerto Rican economy, which had experienced high unemployment rates and abundant low cost labor. Furthermore, these labor-intensive industries generally required unskilled workers who could acquire the necessary training in a short time.

As a result of the relatively low wages and the Industrial Incentives program, the island textile industry experienced a very rapid growth rate, especially in the early period following the start of Operation Bootstrap (1948). From a few hundred workers, employment in the Puerto Rican textile products industries grew to 1,450 by 1949. Five years later (1954), employment doubled to 2,774; and this level doubled again in 1958. Income originating in textile mill product industries also increased twelvefold in the 1950-60 decade, netting nearly \$14 million in 1960.³

² *Ibid.*, pp. 71-81.

³ U.S. Bureau of the Census, *Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures, 1954, 1958, 1963, and 1967 series.*

¹ U.S. Executive Office of the President, Office of Management and Budget, Statistical Policy Office, *Standard Industrial Classification Manual*, at 71 (1972).

By 1967, two decades after the first textile mill was built by PRIDCO, the industry reported a value of shipments of \$82 million and a work force of 5,735. This employment level is equivalent to 4.7 percent of employment in the entire manufacturing industry which had become the largest private sector in Puerto Rico.⁴

The Last 10 Years

This period is characterized by a general slowing down of the growth rate of both the industry's income and employment, with employment showing a negative growth rate since 1970 and income reaching its peak in 1974, then declining thereafter.

Employment.—The highest employment level was reached in 1970 with 8,904 people employed. (See table 1.) Knitting mills accounted for 7,270 workers, or 81.6 percent of the total employment in the textile industry group. In other years, the knitting mills industry never contributed less than three-fourths of the total textile employment. Its decline (to 3,233 in 1976) was apparently the major cause of the decline in employment of the industry group as a whole.

Table 1.—Employment In The Textile Industry

Year	Total	Broad woven fabric mills, narrow fabrics, and others	Knitting mills	Floor covering mills	Dyeing and finishing textiles, yarn, thread, and miscellaneous
1967	6,809	261	5,439	445	664
1968	8,198	478	6,258	455	1,007
1969	8,675	631	6,900	488	656
1970	8,904	614	7,270	182	838
1971	6,752	—	—	—	—
1972	7,693	431	6,147	264	851
1973	7,594	555	5,755	249	1,035
1974	7,165	464	5,588	193	920
1975	4,898	241	3,934	186	537
1976	4,277	439	3,233	161	444
1977	4,600	—	—	—	—

Source: Puerto Rico, Department of Labor, *Census of Manufacturing Industries of Puerto Rico*, various years.

Output and Income.—The textile industry's output, approximated by "sales," increased from \$76 million in 1967 to \$188 million in 1971, decreased in 1971 and 1972, reached a second high in 1974 of \$181 million, then decreased in the following years. Net income originating in the textile industry tends to follow the output trends. However, it reached the highest level of \$55.6 million in 1974, then declined in more recent years. (See table 2.)

⁴ *Ibid.*

Table 2.—Sales and Net Income Originating (NIA) in Puerto Rico Textile Products Industry

[In thousands of dollars]

Year	Sales	Net income originating
1967	76,306	24,097
1968	89,199	29,722
1969	102,132	36,610
1970	137,805	41,114
1971	187,506	48,576
1972	158,492	41,279
1973	164,192	51,720
1974	181,035	55,658
1975	168,688	48,833
1976	118,344	39,380
1977	174,917	42,258

Source: Commonwealth of Puerto Rico Planning Board, unpublished sources for "Income and Product Accounts."

External Trade.—Table 3 shows Puerto Rican imports of textile products exceeded exports in all years since 1969, except for 1974. Note that during this year, net income originating from textile activities was at its peak and sales were at the second highest level.⁵

Table 3.—Import and Export of Textile Products, Puerto Rico, 1969–76

[In thousands of dollars]

Year	Total exports ¹ (to United States and foreign countries)	Total imports (from foreign countries)	Trade surplus or deficit
1969	53,547	192,413	—138,866
1970	55,476	174,295	—118,819
1971	62,483	191,554	—129,071
1972	74,037	180,700	—106,663
1973	151,808	182,037	—30,229
1974	194,075	176,378	17,697
1975	100,195	188,894	—88,699
1976	15,949	223,135	—207,186

¹ The total may have been overestimated because the reclassification of some items from Schedule B-based products, SIC group 22, also include some items belonging to other SIC groups.

Source: Commonwealth of Puerto Rico, Economic Development Administration, Industry Profile Series, *The Textile Mill Products Industry in Puerto Rico 1977*, and Planning Board, *External Trade Statistics* series. The items were tabulated according to TSUSA, Schedules B and P; and their respective correlations to the SIC-based product classifications.

The large trade deficit in 1976 was due to a 50-percent decrease in exports to foreign countries (from \$9.6 million in 1975 to \$4.3 million in 1976), and a dramatic drop of textile product shipments to the United States (from \$47.1 million to \$15.9 million in 1975 and 1976, respectively).⁶ Tables 4, 5, and 6 depict the imports and exports by items.

⁵ The value of "export," which was greater than that of "sales" in 1974, was probably due to the overestimation of "export" (see f.n. table 3) and/or a decrease of inventories.

⁶ The cause of such a large export drop relative to a small decrease in 1975–76 sales is difficult to explain. Trade data compiled independently by the U.S. Department of Commerce confirm that this is not a recording error.

Table 4.—Shipment of Textile Products from United States to Puerto Rico, FY 1975, FY 1976

	1976	1975
Broad woven fabrics cotton	\$84,955,381	\$39,463,045
Broad woven fabrics—manmade fibers and silk	39,067,520	47,656,848
Broad woven fabrics wool	19,142	35,120
Narrow woven fabrics	13,203,766	13,227,863
Hosiery and knit fabrics	28,760,344	23,794,647
Carpets and rugs, wholly or in chief weight textile fibers, and mats, screens, etc., of vegetable plaiting material	5,231,766	5,246,008
Yarn and thread textile fibers	28,545,766	21,922,926
Textile goods not elsewhere classified	11,858,171	31,240,904
Total	211,641,910	182,587,361

Source: Puerto Rico, Economic Development Administration, *The Textile Mill Products Industry in Puerto Rico, 1977*, p. 7.

Table 5.—Imports of Textile Products from U.S. Virgin Islands and Foreign Countries

	1976	1975
Textile fibers and textile products	\$1,472,734	\$1,145,015
Woven fabrics	3,048,472	602,765
Fabrics of special construction or for special purposes, articles of wadding or felt, fish nets, machine clothing	6,943,904	4,533,078
Specified products miscellaneous	28,303	24,286
Total	11,493,413	6,305,144

Source: Puerto Rico, Economic Development Administration, *The Textile Mill Products Industry in Puerto Rico, 1977*, p. 7.

Table 6.—Value of Puerto Rico Exports of Textile Products FY 1976

SIC number	Description	To United States	To foreign countries and Virgin Islands
221	Broad woven fabric mills, cotton..	\$163,153	\$727,737
222	Broad woven fabric mills, man-made fiber and silk	493,856	958,745
223	Broad woven fabric mills, wool: including dyeing and finishing..	35,970	1,598
224	Narrow fabrics and other small-ware mills: cotton, wool, silk, and manmade fibers	66,382	639,359
225	Knitting mills	1,271,996	366,351
227 ¹	Floor covering mills	3,345,583	215,940
228 ²	Yarn and thread mills		705,964
229 ³	Miscellaneous textiles goods	6,264,768	691,795
	Total	11,641,708	4,307,489

¹ Six out of the total of 12 commodities within the Schedule B number range are classified textiles.

² 19 out of 29 mills.

³ 59 out of 80 mills.

Source: Puerto Rico, Economic Development Administration, *The Textile Mill Products Industry in Puerto Rico, 1977*, p. 8.

Fomento Assistance.—Fomento was credited with the growth of the textile industry in the early years. Today, it is also influential in maintaining the industry in the island. A Federal Department of Labor Survey which covered two-thirds of the textile establishments in Puerto Rico in November 1975 shows:

- 62 percent of the establishments were promoted by the EDA (had tax exemption)

- 11 percent had exemption certificates pending, and

- 27 percent had no tax exemption.

EDA, however, reported that only 11 of 63 Fomento plants were locally owned.⁷

If "Fomento plants" are defined as those receiving tax exemption or EDA's assistance (in terms of loans, leased facilities, etc.), net income originating in these plants accounted for nearly the entire income of the textile industry as a whole.

Table 7.—Net Income Originating in Textile Industry Fomento Plants and All Plants, 1967–77¹

Year	All plants (millions of dollars)	Fomento plants (millions of dollars)	Fomento plants/total (percentage)
1967	31.0	23.4	75.5
1968	37.6	24.5	78.5
1969	34.4	26.5	77.0
1970	41.1	40.8	99.3
1971	48.6	48.3	99.4
1972	41.3	41.1	99.3
1973	51.7	51.5	99.6
1974	55.7	55.5	99.6
1975	48.8	48.7	99.8
1976	39.3	39.2	99.7
1977	42.3	41.2	97.4

¹ Data for 1970–77 period are from a revised series, and therefore not comparable with the 1967–69 data.

Source: Puerto Rico Planning Board, *1977 Informe Economico al Gobernador and Ingreso y Producto 1975*.

COMPETITIVE POSITION

Puerto Rico-U.S. Competition

In earlier years of Operation Bootstrap, Puerto Rico was an ideal location for the textile and other labor-intensive industries. During this time, average earnings per island worker were 42 cents per hour. This level was 28 percent of the U.S. average hourly wage (\$1.50 per hour); it was only a little higher than one-half of the U.S. minimum wage (\$0.75 per hour). In addition, the tax exemption program and other assistance by Fomento had increased the attractiveness of textile investments in the island relative to other parts of the Nation. Foreign imports were small and did not cause a significant threat to the industry's expansion.

The application of certain U.S. and Puerto Rican minimum wages, and the increase in the competition between economic sectors and between industries within the manufacturing sector, had caused Puerto Rican manufacturing wages to rise rapidly. The year 1965 marked, for the first time, the island's average hourly earnings surpassing the U.S. minimum wage.

⁷ Commonwealth of Puerto Rico, Economic Development Administration, Industry Profile Series, *The Textile Mill Products Industry in Puerto Rico, 1977*, p. 4.

By 1977, Puerto Rican earnings in manufacturing stood at \$3.81 per hour, nine times as large as that in 1950.⁸

Concerning the competitive trend of Puerto Rico's textile industry, its average labor productivity (measured by value added per employee) rose 276 percent, as compared with 266 percent increase in the United States for the 1954-72 period. (See table 8.) However, the industry's rapidly increasing wages had caused a 7-percent decline in value added per dollar of payroll. In the United States, this ratio increased 22 percent for the period. Nevertheless, the absolute level of value added per dollar of labor cost (payroll) in Puerto Rico's textile industry was \$2.40 in 1972, 25 percent higher than that in the United States.

Table 8.—Value Added Per Employee and Per Dollar of Payroll, United States and Puerto Rico, 1954, 1972

	Value added per employee	Value added per dollar of payroll
Puerto Rico, 1954	\$3,107	\$2.59
Puerto Rico, 1972	\$8,581	\$2.40
Percentage change	276	-7
United States, 1954	\$4,557	\$1.57
United States, 1972	\$12,179	\$1.92
Percentage change	266	22

Source: Puerto Rico Economic Development Administration, *Competitive Position of Manufacturing Industries*, 1975, pp 13-14.

Available data on average wages of production workers indicate that the relationship between labor costs in the U.S. and Puerto Rican textile industries have followed a relatively stable trend in the last 10 years: (a) production worker wage differentials increased steadily; (b) the Puerto Rican wages averaged about 66 percent of U.S. workers' wages, and showed a slight decrease in the post-1972 years. (The mean percentage for 1967-71 was 66.8 percent, compared with 64.9 percent for 1972-76.) (See table 9.)

⁸ See table 4, chapter V.

Table 9.—Average Wages of Textile Production Workers, Puerto Rico and the United States, 1967-76

Year	Puerto Rico	United States	Differential dollars	Puerto Rico wages as a per- centage of U.S. wage
1967	\$1.37	\$2.06	\$0.69	66.5
1968	1.50	2.21	.71	67.9
1969	1.56	2.34	.78	66.7
1970	1.61	2.45	.84	65.7
1971	1.73	2.57	.84	67.3
1972	1.79	2.74	.95	65.3
1973	1.94	2.95	1.01	65.8
1974	2.10	3.19	1.09	65.8
1975	2.15	3.40	1.25	63.2
1976	2.36	3.67	1.31	64.3

Source: See table 5, chapter V.

In brief, although wages in the Puerto Rico textile industry increased rapidly in the past decade, wages in the U.S. industry also increased at approximately the same rate, thus helping the island maintain a wage advantage over its mainland counterpart. Recently available data confirm this conclusion: In 1977, Puerto Rico's average hourly wage in the textile industry only amounted to 61 percent of South Carolina, 63 percent of Alabama, 65 percent of Georgia and Virginia, and 72 percent of Kentucky, where wages rank the lowest.⁹

This wage advantage is shrinking rapidly when costs of other factors are taken into consideration.

(a) An additional major cost of operating a textile plant in Puerto Rico is the high benefits (mostly mandatory) paid to island workers. For example, local law requires that Puerto Rican textile workers be given relatively generous vacation leave, sick leave, overtime pay, and other benefits such as maternity pay, dismissal pay, nonoccupational disability benefits, and a 2-percent Christmas bonus, regardless of the company's financial and profit conditions. It is estimated that in 1976, the combined costs of a Puerto Rican textile employee's paid vacations, sick leave, and other legally required payments amounted to 22.1 percent of payroll, comparing with 12.7 percent for the United States.¹⁰

(b) Another factor added to the cost of operating a manufacturing plant in Puerto Rico is the island's high cost of energy. The cost per kilowatt hour in the United States ranges between 66 percent to 73 percent of that of Puerto Rico. This percentage is substantially lower than that of Alabama (56 percent to 63 percent), or Louisiana (40 percent to 46 percent).¹¹ This high energy cost is particularly important to the textile industry which ranks high in energy consumption.¹²

Conclusion: Puerto Rico's textile industry had maintained a substantial competitive edge over its U.S. counterpart in early years. With rapidly increasing wages, the island industry's position had deteriorated. In the past 10 years, the wage ratio had stabilized, but the industry has been facing an increase in costs of mandatory benefits and energy, and probably high costs of transportation to and from the island.

Foreign Competition

While the U.S. textile industry does not appear to have a competitive advantage over that of Puerto

⁹ See table 7, chapter V.

¹⁰ See table 8, chapter V.

¹¹ See table 18, chapter V.

¹² The ratio of electricity costs to value added in the U.S. textile industry ranked second, after primary metals, in 1975. However, the industry's fuel consumption ranked sixth among twenty major industry groups. See table 18, chapter V.

Rico, foreign competition is posing a major threat to the existence of the island textile industry. The value of textile imports to the United States from South Korea increased by \$33.4 million, and imports from Taiwan increased by \$49 million from 1970 to 1976. However, the most significant increase in imports in this period was that of Hong Kong, with the reported increase of \$82.6 million. Data on textile imports by selected major countries (table 10) shows that United States increased its purchases of textile products from all countries from 1970 to 1976, except for two: Mexico and Pakistan.

The U.S. mainland industry also experienced an increasing difficulty in maintaining a favorable foreign trade balance. In the first half of 1976, after the industry had recovered from the 1973-75 recession, the U.S. Department of Commerce reported that several years of trade surplus by the United States had come to an end with the value of textile imports approximating that of exports.¹³

The main reason for the rapid expansion of foreign products is that wages in these countries are generally substantially below those of the United States and Puerto Rico. Specifically, in 1976, the average textile industry wage in Hong Kong was 38 percent of that of Puerto Rico. The percentage was 23 percent of South Korea and 21 percent of Taiwan. (See table 1, chapter V.) With the added required benefits in Puerto Rico and the increase in minimum wage effective last January 1, 1978, the

labor cost differentials are expected to have widened, and the island's competitive position worsened.¹⁴ Bilateral export restraints negotiated with numbers of supplier countries under the International Arrangement for Textiles—commonly referred to as the MFA, or the Multi-Fiber Agreement—are Federal initiatives which have provided protection to U.S. textile companies.

LINKAGES

A major obstacle to the growth of Puerto Rican textile industry has been the lack of support by other industries in the island. Most textile products are destined to serve as an input in the apparel industry, but a large majority of Puerto Rico apparel firms are not purchasing local inputs.

In 1976, only 14 out of 37 textile industries surveyed sold all of their output and 6 sold a large portion of their output to local sources.¹⁵ Note that during this year, Puerto Rico imported \$223 million of textile products from the United States and foreign countries. In 1977, 77 apparel firms were surveyed and only 5 purchased a significant portion of material locally.¹⁶

¹⁴ The volume of foreign imports of textile mill products is affected by the U.S. tariff rates and import quota. However, the general consensus is that these trade barriers are not sufficient to help Puerto Rico's declining textile industry to reverse its trend. For listings of tariff rates and quotas of specific items by country, see U.S. Department of Labor, *The Textile Mill Products Industry in Puerto Rico*.

¹⁵ *Ibid.*, p. 11.

¹⁶ Vol. II, p. 8 of this Report.

¹³ U.S. Department of Commerce, *U.S. Industrial Outlook, 1977*, p. 270.

Table 10.—Value of U.S. Imports of Textile Products from Selected Countries, CY's 1970-76
[In millions of dollars]

	1970	1971	1972	1973	1974	1975	1976
Mexico	18.2	24.3	34.6	58.1	87.0	58.4	12.4
Guatemala	0.1	0.2	—	1.4	1.8	0.7	3.3
El Salvador	—	0.8	0.9	1.2	2.1	1.7	3.1
Haiti	2.4	3.1	3.4	3.8	13.6	8.1	5.5
Dominican Republic	—	0.1	—	—	0.1	0.7	1.2
Colombia	4.4	3.9	8.9	11.0	14.0	11.1	19.3
Brazil	12.9	14.7	20.2	26.9	48.2	35.6	39.2
Uruguay	1.8	1.5	0.4	1.0	1.9	1.1	4.0
Finland	3.4	3.9	2.6	3.3	4.8	3.7	5.7
United Kingdom	7.2	100.0	98.7	103.3	74.5	56.5	79.3
France	36.4	40.3	56.9	65.9	48.0	47.1	54.9
Spain	9.6	11.8	11.8	14.0	13.0	9.3	13.3
Italy	75.1	66.0	80.0	98.7	76.3	60.6	93.7
India	137.5	164.8	218.3	187.0	21.5	119.3	165.1
Pakistan	60.1	58.0	22.3	17.8	31.9	18.4	39.3
Thailand	0.3	1.3	4.0	2.4	4.1	3.5	18.4
Singapore	2.3	2.3	3.9	4.6	5.6	2.6	7.7
Philippines	3.5	3.6	4.5	6.7	12.1	11.7	16.7
South Korea	13.8	20.7	24.8	20.1	31.2	28.4	47.2
Hong Kong	44.8	47.6	68.9	89.5	112.6	69.8	127.4
Taiwan	12.4	19.5	22.2	25.3	34.8	36.8	61.4
Japan	301.9	375.8	354.1	300.7	278.2	271.4	353.6

Source: Puerto Rico Economic Development Administration, *Economic Analysis of the Industrial Incentive Program of Puerto Rico, 1978*, table 28 (translated).

The problem of weak interindustry linkages in general and that of the Puerto Rican textile industry in particular is complicated and difficult to correct.¹⁷ The textile industry's contribution to the Puerto Rican economy is substantial because the industry uses a large number of Puerto Rico's most abundant resource, labor.¹⁸ Additional government attention and specific incentive programs for interindustry transactions could promote the demand for Puerto Rican textile products by the local apparel firms.

CONCLUSION

The Puerto Rico textile industry began with the construction of a textile plant by PRIDCO, and the initiation of Operation Bootstrap to promote manufacturing as a lead sector in economic development. Textiles and a few other labor-intensive industries were encouraged because of their high demand for unskilled labor. In the subsequent years, the island's textile industry grew rapidly because of tax incentives and especially low wages in Puerto Rico.

The growth rates, in both income and employment, have decreased consistently since the early 1960's, and their absolute levels have dropped since 1973-74. The island's export of textile products to the United States and foreign countries decreased

from \$194 million in 1974 to \$16 million in 1976, and textile trade deficit was at a record high. The textile industry in Puerto Rico does not appear viable at present, and most probably will continue to decline as a contributor to overall development.

Examination of production/cost data show the main cause of the decline of Puerto Rican textile products industry is the growing imports from low wage foreign countries. The rapidly increasing minimum wage, high benefits, and other costs of operation in the island have effectively cut the cost advantage of Puerto Rican textile industry over that of the mainland to near-zero. They have caused a serious problem for the island to compete in the nonforeign control portion of the U.S. market. In addition, the new wage law (effective in January 1978) will raise the minimum wages of nearly all Puerto Rican workers to the U.S. level of \$3.35 per hour by 1981. This level is 40 percent higher than the average wage of Puerto Rican textile industry as of the end of 1976, and can be expected to damage the industry's competitive position.

The delayed application of the minimum wage law, additional incentives to labor-intensive industries, and policies to encourage interindustry linkages would be helpful to the survival of the textile industry. In the absence of government action, and barring any significant change in the island and world economic conditions, the Puerto Rican textile industry is expected to meet considerable difficulty in the years ahead.

¹⁷ For details, see chapters VII and VIII of this report.

¹⁸ For discussion of the industry's contribution to Puerto Rican income, see chapter IV.

The Apparel Industry

INDUSTRY DEFINITION

Too often, the textile mill production industries (SIC-23) in Puerto Rico are confused with the apparel industry (SIC-24). Although the products are similar, their respective development potential is different. Textile mill product industries (SIC-23) employ only 3 percent of the current (1976) manufacturing workers and represent a declining number of absolute job opportunities, down 37.2 percent since 1967. (For additional details, see individual profile on textile mill products.) In contrast, the apparel industry employs 26 percent of the workers in the manufacturing sector, employs at present (1976) 7 percent more workers than it did in 1967, and accounts for more than 16 percent of the total compensation paid to industrial workers in Puerto Rico.

From the textbook, the apparel industry group, also known as the "cutting-up and needlework trade," includes establishments which produce clothing and fabricated products by cutting and sewing purchased woven or knit textile fabrics and related materials such as leather, rubberized fabrics, plastics, and furs.¹ By 3-digit SIC categories, these firms include:

- 231 Men's, youths', and boys' suits, coats, and overcoats.
- 232 Men's, youths', and boys' furnishings, work clothing, and allied garments.
- 233 Women's, misses', and juniors' outerwear.
- 234 Women's, misses', children's, and infants' undergarments.
- 235 Hats, caps, millinery.
- 236 Girls', children's, and infants' outerwear.
- 237 Fur goods.
- 238 Miscellaneous apparel and accessories.
- 239 Miscellaneous fabricated textile products.

United States Apparel Industry

The common market relationship between Puerto Rico and the United States requires that any overview of the industry include a summary of apparel manufacturing on the U.S. mainland. Industry trends in the United States, whether financial, tech-

nological, or structural, directly influence production activities in Puerto Rico.

On the mainland, the apparel manufacturing industry is highly competitive. Entry has been relatively easy with low capital and low labor skill requirements. Geographically, it is a diversified industry and remains the Nation's largest industrial employer. Apparel firms exist in all 50 States with 23 States each employing 10,000 or more workers. New York and Pennsylvania have the highest number of workers in the industry, though there is a southward migration of industries. Forty-five percent of the total workforce in the industry is concentrated in the Southern States.

The industry is presently recovering from the 1974-75 doldrums, the worst recession in four decades for the apparel manufacturers. Total employment (1975-76) is up, but still below levels of previous years. Sales and profits for 1975 likewise show only modest improvement, 2 percent and 9 percent over 1974 respectively.

Increasing costs of production and rising imports in all segments of industry continue to hinder growth. Two high cost factors for the apparel industry in particular are energy and labor. Increased energy and labor costs tend to push industry out of the United States and increase the competitiveness faced by U.S. industries in the world market. Import competition also continues to be a fluctuating threat to the United States industries. During the 1967-74 period, the compound rates of import growth, by value, has been 20.1 percent. The apparel and textile trade deficit was \$3.4 billion in 1977, up 20 percent from 1976. The impact of this trade deficit on U.S. industries in part can be measured by Federal assistance: import relief assistance to 50,000 workers.

Increased foreign competition, high labor and energy costs, and changes in the marketing-distribution system have also altered the industry's structure in recent years. Concentration of the industry into larger, more diversified plants continues to occur. One percent of the plants in 1975 constituted 30 percent of the market. The structural change is indicated by a declining number of plants, and by average employment per plant increasing from 43 workers in 1959 to 62 workers in 1973. (There was an

¹ U.S. Department of Commerce, Domestic and International Business Administration, *U.S. Industrial Outlook 1977*.

average of 93 workers per plant in Puerto Rico in 1976.) Although entry into the industry is relatively easy, the number of business failures is high. In 1975, for example, a 4-percent increase in bankruptcies occurred; 192 firms failed with over \$55 million in liabilities.

The Puerto Rican Apparel Industry

The apparel industry and its associated industry, textiles, have both had a long history of success in Puerto Rico. The apparel industry grew in Puerto Rico in the 1920's, pushed to the island by the lack of cheap labor in the United States when the American immigration laws became more restrictive. Puerto Rico had a large unemployed labor force which accepted the low wage rates and proved to be highly skilled needlecraft workers.

The Puerto Rican apparel industry grew around this home needlework industry. In 1940 the industry was the second most important economic activity on the island, representing 61 percent of all manufacturing employment, 17 percent of exports and 22 percent of manufacturing income. By 1943, 45,000 people were employed in the industry. The majority of the work was being done in the home on a piece-work basis.

The dominance of the apparel and textile industries diminished somewhat in the 1950's, although apparel remained a leading employer and income producer onisland. In 1950, the apparel industry alone employed 10,800 workers, approximately 22 percent of the industrial labor force. The home

needlecraft industry (enumerated separately) had declined dramatically as cottage industries became relatively inefficient, and wages increased onisland. In 1950, apparel accounted for 19.6 percent of the net income originating in manufacturing.

The growth and change in the industry since 1950 is represented in table 1. The number of establishments expanded until the 1972-73 period then declined to 1976. In part, this reflects a restructuring of the industry with most firms growing in size. The number of firms increased 17.3 percent from 1954 to 1976, though growth since 1967 is a negative 1 percent.

Employment growth presents the same general trend, expanding 105 percent since 1954, but peaking out in the 1972-73 period. By 1977, employment had fallen 3,424 from the 1973 record of 40,721 workers. During the 1975-77 years, the employment has stabilized, not responding as well as many industries to the postrecession growth.

The high growth experienced in other sectors in the late 1960's and early 1970's has begun to diminish the primary development role the apparel industry plays in the island economy:

- Apparel employment as a percentage of total manufacturing employment peaked at 29 percent in 1967, but has been fairly stable during the 1974-77 period.

- Apparel sales as a percentage of total manufacturing sales peaked at 12 percent to 13 percent in 1967, but have stabilized at 6 percent to 7 percent

Table 1.—Selected Economic Data on the Puerto Rican Apparel Industry

	1954	1958	1963	1967	1972	1973	1974	1975	1976	1977
Number of establishments	341	347	386	405	466	465	435	405	400	NA
Total number of employees	17,645	17,998	26,622	34,474	39,624	40,721	38,027	36,075	37,054	36,200
Employment as a percentage of manufacturing employment	26	25	27	29	27	27	25	26	26	25
Sales ¹	NA	(71,964)	(143,742)	(201,477)	(261,663)	—	—	—	—	—
		87,369	179,247	284,888	466,022	—	—	—	—	—
Sales ²	—	—	—	(185,535)	(231,032)	(246,507)	(259,697)	(238,873)	(267,145)	(274,698)
Sales as a percentage of sector sales ¹	NA	10	12	13	11	NA	NA	NA	NA	NA
Sales as a percentage of sector sales ²	NA	NA	NA	12	10	9	7	6	7	6
Net income	NA	NA	NA	113,467	185,716	173,943	216,042	204,918	245,332	261,849
Net income as a percentage of sector income	NA	NA	NA	17.0	14.5	11.3	11.6	10.6	10.3	9.2
		(40,593)	(72,762)	(102,367)	(141,781)	—	—	—	—	—
Value added by manufacturing	—	44,206	90,734	144,748	252,512	NA	NA	NA	NA	NA
WPI—Apparel, United States	92.6	93.4	95.4	100	114.8	119.0	129.5	133.4	139.9	146.6
WPI—Commodities, annual average, United States	—	—	—	100	119.1	134.7	160.1	174.9	183.0	198.2
WPI—Industrial commodities, United States	85.0	93.6	94.7	100	117.9	125.9	153.8	—	—	—

¹ See sources below.

² See sources below.

Figures in parentheses—1954 constant dollars.

NA—Not available.

Sources: ¹ U.S. Bureau of the Census, Economic Censuses of Outlying Areas, Puerto Rico: Census of Manufactures, 1963, 1967, 1972. (Washington, D.C.: Government Printing Office.)

² Puerto Rico Planning Board, *Puerto Rico Income and Product Accounts* (Unpublished Data).

Puerto Rico Department of Labor, *Census of Manufacturing Industries of Puerto Rico*, various years.

during the 1974-77 period. Absolute sales (\$ 1954) increased 48 percent during the 1967-77 period. Expansion in production has occurred while the relative position of the industry has decreased.

- Net income as a percentage of total manufacturing income has declined from 17 percent in 1967 to 9.2 percent in 1977. The decline has been consistent, although it appears to be stabilizing.

In summary, the apparel industry still maintains a primary role in Puerto Rico's industrial structure. Employment growth since 1967 was low, 3.6 percent, *but positive*, ranking it 13th in growth among 19 industry groups. (Statistically the large employment base dampens the growth rate. In numbers of new employees, 1967-77, the industry ranked sixth.) The low growth of Puerto Rican industries, in part, reflects the industry's trend in the United States. Table 2 compares U.S.-Puerto Rican employment as a percentage of total manufacturing employment, and as a percentage of a base 1967 employment.

Table 2.—Summary Statistics, United States and Puerto Rico
[In percentages]

Year	Total manufacturing employment		Change since 1967 in employment	
	United States	Puerto Rico	United States	Puerto Rico
1967	28.5	7.2	—	—
1968	29.3	7.1	12.3	0.6
1969	29.2	7.0	13.3	.8
1970	26.9	7.0	3.0	-2.4
1971	26.2	7.2	1.3	-3.7
1972	26.6	7.2	9.6	-1.7
1973	26.6	7.0	13.9	.6
1974	25.4	6.7	6.4	-3.6
1975	26.4	6.7	.9	-11.6
1976	25.6	6.9	3.6	-7.0

Source: EDA Information Sheets, Unpublished, December 1977, *Handbook of Labor Statistics 1976*, U.S. Department of Labor, Bureau of Labor Statistics.

The table also emphasizes the reliance the Puerto Rican economy has historically placed on the apparel industry. In Puerto Rico, the industry employed three to four times the proportion of total manufacturing workers. Both on the mainland and in Puerto Rico, employment has dropped in the industry, although growth rates in Puerto Rico are more favorable than in the United States, i.e., 3.6 percent and -7.0 percent, respectively.

THE STRUCTURE OF THE INDUSTRY IN PUERTO RICO

The structure of the Puerto Rican apparel industry is concentrated in three primary subgroups which, in 1972, accounted for:

- 77.9 percent of the establishments,
- 85.8 percent of the employment,

- 87.9 percent of the value added, and
- 87.3 percent of the value of shipments.

These three groups include: Men's and Boys' Furnishings (SIC-232); Women's and Misses' Outerwear (SIC-233); and Women's and Children's Undergarments (SIC-234). (See table 3.) The leading industries are firms producing Brassieres and Allied Garments (SIC-2342). This group alone accounts for 22.5 percent of the industry's establishments, 34.1 percent of its employment, and over one-third of its value added and value of shipments. In comparison with all apparel industries, SIC-2342 accounted for 4 percent of all manufacturing establishments, and 7.6 percent of all industrial employment in 1976.

Tables 3 and 4 present the structure of the apparel industry in Puerto Rico, represented by those firms which play a dominant role in 1976. Other groups within the industry are fragmented and difficult to define. These groups include: Miscellaneous Apparel and Accessories (SIC-238), and Miscellaneous Fabricated Textile Products (SIC-239). The importance of both latter subgroups has diminished in Puerto Rico since 1958.

Of the three major groups, SIC-232, 233, and 234, Men's and Boys' Furnishings (SIC-232) has had the greatest proportional growth in sector employment, increasing from 17.8 percent in 1958 to 28.8 percent in 1976. Real growth in employment, 1958 to 1976, in SIC-232, was 233 percent. During the same period, SIC-233 and SIC-234 index a 125 percent and 148 percent growth, respectively.

The greatest increase in value added and total shipments occurred in the subgroup Women's and Misses' Outerwear, SIC-233. Though accounting for a smaller proportion of total sector business, growth in value added was 664 percent, with a 647 percent growth in value of shipments, current dollars (367 percent and 357 percent growth in 1954 dollars, respectively).

In summary, three major subgroups of the apparel industry dominated the sector in 1976. Of these three subgroups, Women's and Children's Undergarments remains the most important. While high growth has occurred in firms producing Men's and Boys' Furnishings, the largest and most influential group of firms in the apparel industry are involved in the production of Brassieres and Allied Garments, subgroup 2342.

CONTRIBUTION TO PUERTO RICAN INCOME

One measure of the apparel industry's contribution to the growth and development of Puerto Rico

Table 3.—Structure of Apparel Industry in Puerto Rico SIC-23 Apparel

	1958 ¹	1963 ¹	1967 ¹	1972	1972 ¹	1976
232—Men's and boys' furnishings:						
Establishments	69	78	82	106	86	98
Employment	3,208	5,179	7,962	9,597	8,708	10,673
Value added by manufacturing	7,150	17,867	30,415	—	54,129	—
Value of shipments ²	16,504	42,032	71,683	—	107,257	—
233—Women's and misses' outerwear:						
Establishments	67	55	69	93	105	84
Employment	2,375	2,960	4,249	5,142	5,431	5,337
Value added by manufacturing	5,418	10,668	20,800	—	41,389	—
Value of shipments ²	10,012	21,538	38,062	—	74,796	—
234—Women's and children's undergarments:						
Establishments	69	111	137	164	135	129
Employment	6,465	12,854	17,261	19,271	19,741	16,031
Value added by manufacturing ²	19,684	44,819	73,019	—	126,523	—
Value of shipments	31,115	82,052	134,942	—	225,238	—
2341—Women's and children's underwear:						
Establishments	30	43	51	59	57	52
Employment	1,552	3,833	6,038	5,738	6,104	5,014
Value added by manufacturing	4,227	14,224	23,887	—	38,084	—
Value of shipments ²	8,427	27,119	46,069	—	66,065	—
2342—Brassieres and allied garments:						
Establishments	39	68	86	105	98	77
Employment	4,913	9,021	11,223	13,533	13,637	11,017
Value added by manufacturing	15,457	30,595	49,132	—	88,434	—
Value of shipments ²	22,688	54,934	88,873	—	159,173	—

¹ Source—from Census of Manufactures, U.S. Economic Census of Outlying Areas, Various Years; all other statistics are from Census of Manufacturing Industries of Puerto Rico, Bureau of Labor Statistics.

² Source—Puerto Rico Planning Board, *Puerto Rico Income and Product Accounts* (Unpublished Data).

Table 4.—Structure of Apparel Industry in Puerto Rico: Percentage of Sector, Selected Years, 1958–76

	1958	1963	1967	1970	1972	1976
232—Men's and boys' furnishings:						
Establishments	19.9	20.2	20.2	19.1	22.7	24.5
Employment	17.8	19.4	23.1	20.9	24.2	28.8
Value added by manufacturing	16.2	19.7	21.0	—	21.4	—
Value of shipments	19.7	23.4	25.2	—	23.0	—
233—Women's and misses' outerwear:						
Establishments	19.3	14.2	17.0	19.1	20.0	21.0
Employment	13.2	11.1	12.3	14.3	13.0	14.4
Value added by manufacturing	12.3	11.8	14.4	—	16.4	—
Value of shipments	12.8	12.1	13.4	—	16.0	—
234—Women's and children's undergarments:						
Establishments	19.9	28.8	33.8	38.1	35.2	32.3
Employment	35.9	48.2	50.1	53.3	48.6	43.3
Value added by manufacturing	44.5	49.4	50.4	—	50.1	—
Value of shipments	39.7	45.8	47.4	—	48.3	—
2341—Women's and children's underwear:						
Establishments	8.6	11.1	12.6	15.6	12.7	13.0
Employment	8.6	14.4	17.5	20.7	14.5	13.5
Value added by manufacturing	9.6	15.7	16.5	—	15.1	—
Value of shipments	10.8	15.1	16.2	—	14.2	—
2342—Brassieres and allied garments:						
Establishments	11.2	17.6	21.2	22.5	22.5	19.3
Employment	27.3	33.8	32.6	32.6	34.1	29.7
Value added by manufacturing	35.0	33.7	33.9	—	35.0	—
Value of shipments	29.0	30.6	31.2	—	34.2	—
Percentage of sector represented:						
Establishments	59.3	—	—	—	77.9	77.8
Employment	66.9	—	—	—	85.8	86.5
Value added by manufacturing	73.0	—	—	—	87.9	—
Value of shipments	72.2	—	—	—	87.3	—

Source: Census of Manufactures, U.S. Economic Census of Outlying Areas, Various Years; Census of Manufacturing Industries of Puerto Rico, Bureau of Labor Statistics; Puerto Rico Planning Board, *Puerto Rico Income and Product Accounts* (Unpublished Data).

is the proportion of net income associated with the sector. Table 5 clarifies the position of the apparel industry in the manufacturing sector, and identifies its relative contribution to growth.

The net income associated with the apparel industry expanded from \$113.5 million in 1967 to \$261.8 million (current dollars) in 1977. Though the sector has experienced a 131-percent growth over the time period, this growth has not been constant. In 1969, 1971, and 1975 the net income decreased. In 1954 constant dollars, net income rose from \$8.3 million in 1967 to \$119 million in 1977, a 48.2-percent growth rate. The absolute increase in net income growth indicates a degree of stability or low growth for the industry in terms of net income.

The contribution of net income from the apparel industry, when contrasted with the growth in other industrial sectors, is less significant in 1977 than it was in 1967. Though still contributing a major portion of the total net income associated with the manufacturing sector, (22.5 percent in 1977) the proportion of net income has decreased 5 percent over the 10-year period.

Secondly, it is important to measure the percentage of net income associated with labor income. An industry with a high return or a high percentage of net income associated with labor income will tend to return more income to the local community rather than to its respective corporate identity. Labor income in isolation has experienced a 40-percent growth in 1967-77 in terms of constant 1954 dollars. During this decade, labor income rose from \$61.6 million in 1967 to \$86 million in 1977. (In terms of current dollars, labor income rose from \$87.1 million in 1967 to \$190.1 million in 1977.) Labor income as a percentage of net income has decreased over the 10-year period; from 76.7 percent in 1967 to 72.6 percent in 1977. The continuous decline in labor income, as a percentage of net income, may be interpreted as an index of capitalization occurring in the industry.

In contrast, the percentage of total manufacturing net income was lower in 1967 than in 1977. Two factors are emphasized by this comparison. First,

apparel stands out as a labor-intensive industry in relation to the total manufacturing sector. Second, the capitalization that is occurring in the manufacturing sector as a whole is occurring at a much more rapid rate in the apparel industry per se. The differential between percentages of labor income as a percentage of total manufacturing net income in 1967 was roughly one-half the differential exhibited in 1977.

Despite the divergent trend of the percentage of labor income between apparel and the manufacturing sector as a whole, apparel has maintained a relatively stabilized ranking as far as labor intensiveness across the 25 industry groups goes. In 1967, apparel ranked sixth highest in percentage of labor income to net income. By 1977, structural change among industry groups moved the apparel industry down only one rank to seventh highest.

INDUSTRY LINKAGES

The contribution of export industries to the development of the Puerto Rican economy is intensified by the extent to which these industries are tied to the local economy. As the economy of Puerto Rico develops, it is expected that local linkages among industries will increase to a limited extent based on local resource availability, etc. This is especially true of insular economies where barriers of distance and transportation cost help to promote an integrated industrial sector.

However, the development in Puerto Rico of industries whose production is linked to mainland plants has somewhat diminished the potential for interindustry linkages onisland. Several studies have indicated that during the years (1950-72) of industrial development, a slight increase in linkages onisland has occurred.²

A second indicator of increased linkages in the apparel industry can be drawn from the estimations of employment multipliers in the 1977 Report to the

² Weisskoff, R. and E. Wolf, "Development and Trade Dependence: The Case of Puerto Rico, 1948-1963," *Review and Economics and Statistics*, 1975.

Table 5.—Labor Income as a Percentage of Industry Group (SIC-23) Contribution to Net Income

Item	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Net income (millions of dollars)....	113.5	133.1	158.4	172.0	165.4	185.7	199.9	216.0	204.9	245.3	261.8
Net income as a percentage of manufacturing net income	27.5	27.9	28.8	28.7	25.1	24.7	23.7	23.3	21.2	23.9	22.5
Labor income (millions of dollars)....	87.1	103.0	124.0	133.4	127.2	139.2	154.2	166.9	160.7	181.0	190.1
Labor income as a percentage of net income	76.7	77.4	78.3	77.5	76.9	74.9	77.1	77.2	78.4	73.7	72.6
Manufacturing labor income as a percentage of manufacturing net income	61.8	62.7	63.4	62.5	61.3	58.5	54.5	49.5	49.7	43.1	40.8
Rank of SIC-23 out of 25 industry groups	6	7	6	8	8	9	9	6	6	8	7

Source: Puerto Rico Planning Board, *Income and Product Accounts* (Unpublished Worksheet Data).

Table 6.—Apparel Products: Industry: Onisland Linkages

[In thousands of dollars]

Products shipped and contract receipts in Puerto Rico to—												
Value of shipments	Total	Local sales as a percentage of value of shipments	As a percentage of		Retailers	As a percentage of Puerto Rican shipments	Domestic consumers	As a percentage of Puerto Rican shipments	Other manufacturing enterprises	As a percentage of Puerto Rican shipments	Others including government	As a percentage of Puerto Rican shipments
			Wholesalers	Puerto Rican shipments								
1963												
23	177,158	16.0	7,305	25.8	12,114	42.7	341	1.2	7,977	28.1	600	2.1
232	41,793	25.5	3,070	28.8	6,878	64.4	1	—	476	4.5	248	2.3
233	21,209	3.352	1,175	35.1	2,133	63.6	42	1.3	—	—	2	.1
234	81,952	5.7	2,115	45.0	825	17.6	2	—	1,752	37.3	2	—
1967												
23	282,494	14.0	13,365	33.8	16,181	40.9	980	2.5	7,232	18.3	1,766	4.5
232	71,533	20.3	6,112	42.0	7,847	54.9	(D)	—	(D)	—	178	1.2
233	37,673	22.7	2,708	31.7	4,989	58.4	(D)	—	(D)	—	(D)	—
234	134,254	5.2	3,497	49.8	1,135	16.2	—	—	(D)	—	(D)	—
1972												
23	61,180	21.8	28,725	28.6	34,266	34.1	4,819	4.8	28,068	27.9	4,593	4.6
232	107,116	21.5	5,350	23.3	12,223	53.2	920	4.0	1,094	4.8	3,390	14.6
233	72,504	46.0	14,124	42.3	15,592	46.7	504	1.5	3,167	9.5	—	—
234	224,932	12.7	4,185	14.7	2,298	8.1	2,294	8.0	18,695	65.5	1,065	3.7

(D)—Withheld to avoid disclosing figures for individual

(D)—Withheld to avoid disclosing figures for individual companies.

Source: U.S. Bureau of the Census, Economic Census of Outlying Areas, Puerto Rico: Census of Manufactures, 1963, 1967, 1972. (Washington, D.C.: Government Printing Office.)

Governor. In this report, the employment multiplier has increased from 1.12 in 1963 to 1.44 in 1972. The increase in the multiplier appears rather large, however, when compared with the movement of shipments associated with the apparel industry from 1963 to 1972 (latest data available). Table 6 indicates the destination for products shipped from plants in Puerto Rico. In terms of the dollar amount of shipments, there has been a constant increase in the amount of sales to the local economy. Local sales as a value of total shipments increased from 16 percent in 1963 to 21.8 percent in 1972 for the sector. The majority of production, 78.2 percent, is exported (1972).

By destination, the majority of Puerto Rican goods are shipped to retailers in Puerto Rico for all three time periods. However, the percentage of goods shipped to retailers in Puerto Rico has decreased from 42.7 percent in 1963 to 34.1 percent in 1972. Only one other destination "other manufacturing enterprises" has, decreased in proportion of local shipments. Even this decrease was marginal, dropping from 28.1 percent in 1963 to 27.9 percent in 1972. All other destinations, i.e., wholesalers, domestic consumers, and others including government, have increased the proportion of Puerto Rican shipments.

Within industry groups, SIC-232—Men's, Youths', and Boys' Furnishings, and SIC-233—Women's, Misses', and Juniors' Outerwear, ship primarily to retailers in Puerto Rico. The majority of shipments in SIC-234—Women's, Misses', Children's, and Infants' Undergarments, went to wholesalers in Puerto Rico in 1963 and 1977. In 1972, a structural shift occurred and the majority of shipments from SIC-234 went to other manufacturing enterprises in Puerto Rico. In 1972, only 8.1 percent of the dominant SIC-234 apparel producing group was retailed in Puerto Rico.

In summary, the movement of Puerto Rican products and of linkages to Puerto Rican industries from the apparel group has increased over the 1963-72 period. This increase has not been structurally similar across the industry subgroups. Movement of apparel products to Puerto Rican wholesalers, while increasing overall, decreased in the Women's, Misses', Children's, and Infants' Undergarments industries. Movement of Puerto Rican apparel products to retailers decreased across the board from 1963 to 1972. Movement of Puerto Rican domestic production to domestic consumers increased slightly across all industry subgroups, although the proportion of total shipments has never exceeded 8 percent. Shipments to other manufacturing enterprises in general decreased, but in industry group SIC-234, increased to 65.5 percent of shipments in 1972.

COMPETITIVE POSITION: WAGE RATES, PRODUCTIVITY, AND PROFITABILITY

The viability of the apparel industry in Puerto Rico pivots on its profitability to the investor. Profitability depends on the productivity of capital and labor on the island, and the differential between Puerto Rican productivity and productivity among international competitors. Wage rates influence both profitability and some indices of productivity. This section briefly reviews three indices of competitiveness in the apparel industry in Puerto Rico. (A more detailed discussion on competitiveness of Puerto Rican industries can be found in chapter V.)

Wage Rates

Historically, lower wage rates along with tax incentives in Puerto Rico have played a major role as an inducement for industry to relocate onisland. Industries with intensive labor needs, and with labor cost a high percentage of value added, found that Puerto Rico offered a margin of competitiveness not found on the mainland. As Puerto Rican wage rates have increased, particularly under the minimum wage laws, the differential between Puerto Rico and mainland wage rates is closing. Thus, Puerto Rico may become less appealing as a location for industrial growth and expansion. Of course, this depends on other factors, such as productivity, etc.

At the same time that the percentage differential between U.S. mainland and Puerto Rican wage rates is decreasing, the differential between Puerto Rico and other Caribbean regional areas is increasing. In many respects, labor-intensive industries that require large amounts of unskilled labor are finding it profitable to relocate offisland in some of the lower wage countries in the surrounding area.

Table 7 presents the average hourly wage rates for both the United States and Puerto Rico during the 1967-76 time period. Wage rates in both countries increased dramatically. However, the wage dif-

Table 7.—Apparel Industry Average Hourly Wage Rates for Production Workers

Year	Puerto Rico	United States	Differential
1967	\$1.30	\$2.03	\$0.73
1968	1.47	2.21	.74
1969	1.58	2.31	.73
1970	1.60	2.39	.79
1971	1.73	2.49	.76
1972	1.77	2.62	.85
1973	1.83	2.78	.95
1974	1.97	2.99	1.02
1975	2.14	3.19	1.05
1976	2.34	3.41	1.07

Source: Puerto Rico, Department of Labor, *Census of Manufacturing Industries* (Various Years). U.S. Department of Labor, *Employment and Earnings*.

ferential in absolute terms has increased in favor of Puerto Rican competitiveness. The absolute differential, \$0.73 in 1967, has increased to \$1.07 in 1976.

However, the differential between U.S. and Puerto Rican wages has decreased relatively, with Puerto Rican wages being 64 percent of U.S. wages in 1967, and 69 percent in 1976.

Puerto Rican wage rates in the apparel industry remain below the industry's rates in 10 Southeastern States. (See table 6, chapter V.) Average wage in Puerto Rico in 1977 was \$2.42, compared with \$3.30 for 10 Southeastern States. Total labor costs in the apparel industry are moving in a trend similar to the wage cost alone, indexing a relatively higher proportion of U.S. labor cost in 1976 than in 1973. (See table 9, chapter V.)

Table 8 presents wages as a percentage of total cost. As referenced in the contribution to net income tables at the beginning of this section, the decrease in wage benefits as a percent of total cost could result from an increase in capitalization. Labor cost for the apparel industry decreased from 37.1 percent of total cost in 1967 to 35.8 percentage in 1977. (This decrease may also index an increase in profits or other factor costs in total cost estimates. For example, table 10 shows profits to total cost increasing from 11.7 percent in 1967 to 14.0 percent in 1977.)

Table 8.—Wage Benefits as a Percentage of Total Costs, SIC-23

	1967	1970	1972	1974	1975	1976	1977
Percentage	37.1	36.5	38.5	40.0	35.8	35.7	35.8

PROFITS AS A PERCENTAGE OF TOTAL COSTS, SIC-23

Percentage	11.7	11.2	13.8	12.0	11.0	13.2	14.0
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Source: Puerto Rico, Planning Board, *Income and Product Accounts* (unpublished worksheet data).

Without knowing the importance of other factor costs, it is difficult to determine if a wage increase, such as an imposed minimum wage, would specifically cut back profits, or whether some restructuring of the industry would occur. The restructuring, for example, may include an increase in capital cost and a decrease in employment, without decreasing profitability.

Apparel Industry Productivity

Productivity measures for industry groups are illusive. It is difficult to determine whether labor or capital productivity has increased the common ratio. It is also difficult to determine whether entrepreneurial ability, reorganization, or structural differences, have influenced the production of a particular firm or group of firms. Thus, the productivity

measures reviewed here offer only an estimation of productivity. Three indices are presented below in table 9.

Table 9.—Apparel Industry Productivity

Year	Output per employee		Value added dollar payroll		Value added per employee	
	Puerto Rico	United States	Puerto Rico	United States	Puerto Rico	United States
1954	—	(NA)	2.21	1.59	1,763	4,320
1958	4,354	11,034	1.79	1.64	2,456	5,049
1963	6,733	13,248	1.79	1.74	3,408	6,091
1967	8,264	15,534	1.75	1.76	4,198	7,331
1972	11,761	19,949	2.03	1.86	6,373	9,675

Source: U.S. Bureau of the Census, *Economic Censuses of Outlying Areas, Puerto Rico: Census of Manufactures, 1963, 1967, 1972*. (Washington, D.C.: Government Printing Office.)

Two of these indices are focused on employment; output per employee, and value added per employee. According to these indices, both the United States and Puerto Rico increased productivity dramatically during the 1954 to 1972 time period. Output per employee has increased about equally for Puerto Rico and the United States, 170 percent during the 15-year period.

Value added per employee shows much the same trend. The index for both Puerto Rico and the United States has increased over the 1954-72 time period. However, Puerto Rico has a higher rate of increase—261 percent. During the same time period, the U.S. value added per employee increased only 123 percent. The differential in growth rates in Puerto Rico and the United States has a tendency to increase the competitive position of Puerto Rico relative to the United States. In 1954, value added per employee in Puerto Rico was only 14.5 percent of that in the United States. By 1972, value added per employee in Puerto Rico was 51.8 percent of that in the United States.

Productivity as measured by output per employee and value added per employee in Puerto Rico is still much below similar indices for the United States. However, the competitive position of Puerto Rican industry has improved over the 15-year period.

The second measure of productivity, value added per dollar of payroll, presents a different picture. The low wages in Puerto Rico have given island industries an advantage over the United States which they have maintained during the 15-year period. In 1954, value added per dollar of payroll in the United States remained at 72 percent of that in Puerto Rico. By 1972, value added per dollar of payroll in the United States relative to Puerto Rico had increased to 91 percent. Though drawing closer to the Puerto Rican index, the United States remains in an unfavorable competitive position.

In summary, available statistics allow two estima-

tions of Puerto Rican productivity. These two productivity indices are in some ways conflicting with respect to the evolution of the apparel industry. The indices, output per employee, or value added per employee, imply that productivity on Puerto Rico is less than that in similar mainland industries. However, the *relative* position of Puerto Rican industrial productivity has improved.

The second index, value added per dollar of payroll, presents Puerto Rico as being competitive (primarily the result of low Puerto Rican wage rates). However, the *trend* of this index indicates that Puerto Rico is becoming less favorable with respect to U.S. mainland industries.

Overall, the two divergent trends may be interpreted as positive or negative in terms of potential growth in the apparel industry. In one sense, the poor competitive position (output value added per employee and value added per dollar of payroll) may forecast an industry of decreasing viability on-island. Conversely, however, the increasing trend of productivity (output and value added per employee) and a continued competitiveness in productivity (value added per dollar of payroll) indicate that capitalization of the Puerto Rican industry is occurring and that the apparel industry would be competitive in the future.

Apparel Industry Profitability

As indexed in table 8, the profits to total cost in the apparel industry in Puerto Rico are increasing. This indicates that from 1967 to 1977, the benefit to industries locating in Puerto Rico has increased.

Table 10 further details the profitability of the apparel industry in Puerto Rico. From 1957 to 1976, profit-to-sales ratios have remained fairly constant. Profits were 11.5 percent of total sales in 1957 and had increased to only 11.6 percent by 1976. (These statistics were taken from a sample set provided by Fomento.)

Profit-to-sales for all firms in Puerto Rico (indexed

by the Planning Board statistics on income and product accounts) presents a slightly lower profit margin, but the same stability in the overall trend.

By way of contrast, profit-to-sales for all firms, 1967-77, increased considerably. In 1967, 11.7 percent of sales were identified as profits; by 1977, the ratio increased to 17.2 percent.

Of greater importance to the investor are the profits-to-equity estimations. These figures, provided by Fomento, do not present a consistent trend. There was a 25-percent return to equity in 1957, and a 21-percent return to equity in 1975. In 1972, however, profits-to-equity was indexed at 28 percent. In general, the trend appears to be negative.

Profits-to-sales and profits-to-equity comparisons of U.S. industries are available only for 1973. During this year, both profits-to-sales and profits-to-equity ratios in Puerto Rico were higher than in similar industries in the United States. In terms of the data available for 1973, aftertax profitability of industries in Puerto Rico remained a considerable inducement for industrial migration to the island.

Industrial Structure

As mentioned above, the indices of profitability and productivity may be distorted somewhat by the aggregation of data available. In addition, these indices may be biased by the structural differences in the industry on both the mainland and Puerto Rico. Table 11 shows two structural factors which need to be considered: (1) production workers as a percentage of total employment; and (2) size of establishment.

The number of employees per establishment shows that Puerto Rican industries are slightly larger than their U.S. counterparts. In both the United States and Puerto Rico, the size of the firms tends to increase; in Puerto Rico in 1966 an average of 81 workers per establishment, increasing to 93 in 1976. Comparable statistics are not available for the United States for all time periods, but the 1967 index of 51

Table 10.—Apparel Industry Profitability

	1957	1963	1967	1968	1970	1972	1973	1975	1976	1977
Profits to sales:										
Puerto Rico (Fomento)	11.5	11.7	11.6	11.1	9.4	21.3	11.0	12.4	11.6	—
United States	—	—	—	—	—	—	2.05	—	—	—
Profits to equity (Fomento):										
Puerto Rico	25.0	20.3	21.3	19.2	19.2	28.0	23.7	21.0	—	—
United States	—	—	—	—	—	—	10.8	—	—	—
Profits to sales (all firms):										
Puerto Rico	—	—	10.4	10.1	10.1	12.1	11.1	9.9	11.7	12.3
United States	—	—	—	—	—	—	2.05	—	—	—
Profits to sales (all firms):										
Entire manufacturing sector,										
Puerto Rico	—	—	11.7	11.7	10.0	12.5	13.7	12.6	15.7	17.2

Sources: Unpublished data provided by Fomento. U.S. rates calculated from the U.S. Federal Trade Commission, *Quarterly Financial Report for Manufacturing, Mining and Trade Corporations*, various years. U.S. rates are for profits after taxes. Puerto Rican rates are for corporations receiving tax exemptions.

Table 11.—Industrial Structure, Apparel Industry

	Production workers as a percentage of total employment	Employment per estab- lishment
1966	95.0	81
1967	95.1 (83.5)	83
1968	95.0 (88.2)	87
1969	94.8 (87.9)	85
1970	94.7 (87.7)	81
1972	94.7 (87.3)	84
1973	94.4 (86.9)	88
1974	93.4 (86.3)	87
1975	93.8 (85.9)	89
1976	93.8	93

Figures in parentheses indicate U.S. ratios.

Source: Puerto Rico, Department of Labor, *Census of Manufacturing Industries* (various years). U.S. Department of Commerce, *U.S. Industrial Outlook 1977*. (Washington, D.C.: Government Printing Office.)

employees per establishment and the 1973 index of 52 employees per establishment, presents an increasing trend toward larger firms.

The second index, production workers to total employment, also emphasizes the structural differences between Puerto Rican and mainland apparel industries. Puerto Rican industries are production units, rather than complete corporations. During the 1966-76 time period, the structural differences between U.S. and Puerto Rican industries have remained relatively constant. The larger percentage of production workers per total employment in Puerto Rico tends to distort the index of productivity. As a general rule, production workers earn a lower salary than administrative and clerical workers in the same industrial complex. Thus, value added per dollar of payroll and value added per employee ratios may overestimate Puerto Rican productivity relative to the United States.

SUMMARY AND CONCLUSIONS

The apparel industry in Puerto Rico has historically played an important role as a contributor to employment and personal income. At present (1977), however, the industry's leadership position is decreasing. Total costs of production have increased onisland relative to the Caribbean regional area. Labor cost differentials with industries on the mainland, historically a part of the incentive package, have decreased. International competition and import growth have reduced the relative share of the U.S. market available to Puerto Rican producers. Other industry groups in Puerto Rico are growing more rapidly, decreasing apparel's *relative* share of contribution to income and employment.

Despite the loss of "lead industry" identification, apparel manufacturing in Puerto Rico continues to play a major role in industrial growth onisland. The structure of the industry is changing. Products of higher quality are being produced and additional capital investment is improving competitiveness with mainland industries.

While no longer the lead sector, the overall competitive position of the apparel industry remains favorable with respect to industries on the U.S. mainland. (See chapter V.) Among 19 industry groups, apparel ranks relatively low in labor cost competitiveness and productivity as measured by value added per dollar of payroll. In all other competitive factors considered, apparel ranked among the higher groups; competitive in value added per worker; competitive in profits to sales; and very competitive in profit to equity.

In terms of the impact of economies of scale, profitable rates of return appear available for small-

Table 12.—Apparel Industry Economies of Scale

Item description for accounting period—	Average ratio	Asset values (in thousands of dollars)										
		Under 100	100-200	250-500	500-1,000	1,000-5,000	5,000-10,000	10,000-25,000	25,000-50,000	50,000-100,000	100,000-250,000	250,000 and over
1. July 1973 through June 1974;												
2. July 1974 through June 1975												
Average receipts per unit												
(1973-74: millions of dollars):												
Men's and boys' clothing	3.64	.36	.67	1.06	1.92	4.89	12.13	27.11	55.83	79.04	196.41	654.45
Women's and children's clothing ..	1.95	.24	.61	1.30	2.35	5.79	16.04	28.71	69.94	102.31	281.30	—
Average receipts per unit												
(1974-75: millions of dollars):												
Men's and boys' clothing	4.39	.35	.49	1.24	2.11	5.48	13.88	28.60	58.00	85.00	248.20	432.23
Women's and children's clothing ..	2.40	.27	.66	1.44	2.65	6.03	16.99	30.86	70.84	93.34	286.60	—
Net profit before tax as a percentage of sales (1973-74):												
Men's and boys' clothing	2.8	2.5	2.2	.7	2.7	2.5	3.9	5.0	2.1	.8	.8	3.5
Women's and children's clothing ..	2.6	1.0	.9	.7	2.1	2.9	3.9	5.5	3.3	2.2	2.1	—
Net profit before tax as a percentage of sales (1974-75):												
Men's and boys' clothing	2.7	5.3	.5	3.1	2.5	3.1	1.5	5.2	3.9	2.9	1.9	1.2
Women's and children's clothing ..	3.5	4.3	2.1	2.3	1.8	3.2	5.9	6.3	4.9	3.5	3.1	—

Source: *The Almanac of Business and Financial Ratios*, 1977, 1978.

and medium-sized firms. (See table 12.) The growth potential for small, and medium-sized firms is particularly true of industries which produce men's and boys' clothing, the fastest growing subsector in the apparel industry.

The lead subgroup, in terms of employment and income, is SIC-234, Women's and Children's Undergarments. This subgroup accounts for 32 percent of the apparel establishments and 43 percent of apparel employment on island.

The apparel industry will continue to play an important role in the development of the Puerto Rican industrial base. It remains a unique industry

because it utilizes Puerto Rico's most abundant resource—labor—and, at the same time, remains competitive with mainland counterparts. To remain viable, however, the industry must continue to change structurally. Higher quality goods will replace lower quality goods, which are relatively dependent on low wage labor.

The industry remains production oriented, however, with material supplies historically channeled within individual corporations. Increased benefits can accrue to Puerto Rico if local supply and support industries are developed to increase backward linkages.

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Appendix C—Analysis of Shipments to the United States

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Appendix C.—Analysis by Major Product Groups of Puerto Rican Shipments of Manufactures to the United States

THE IMPORTANT PRODUCT GROUPS

The major exports to the mainland United States in CY 1976 are shown in table 1 ranked by their dollar values in that year. The 11 commodity groups shown accounted for 82.3 percent of total shipments to the United States in (calendar year) CY 1976. Especially noteworthy are the growth rates since 1965 of several groups: essential oils and cosmetics (49.5 percent); mineral tars (42.5 percent); organic chemicals (30 percent); and pharmaceuticals (27 percent). Tobacco showed an absolute decline, even in the current dollars used, and apparel's growth, at 4.4 percent annually, was so low as to be negative if deflated to real terms.

Table 1.—Puerto Rican Shipments to the United States by 2-digit Schedule P Commodity Groups Ranked by CY 1976 Values

[In millions of dollars]

Schedule P number	Commodity	1965	1976	Percent- age of total ship- ments 1976	Average annual growth rate 1965-76; percent- age
51	Alcohols, glycols, chemicals	24.9	443.8	12.9	30.0
33	Mineral fuels	62.3	382.3	11.8	17.9
84	Apparel	230.1	370.2	11.4	4.4
54	Pharmaceuticals	24.5	328.6	10.1	27.0
03	Fish (tuna)	56.8	256.2	7.9	14.7
72	Electrical equipment	65.2	250.4	7.7	13.0
89	Miscellaneous manufactured articles	27.5	157.2	4.9	17.1
55	Essential oils and cosmetics	1.6	135.2	4.2	49.5
52	Mineral tars	2.6	128.9	4.0	42.5
12	Tobaccos	123.9	115.9	3.6	(0.6)
86	Scientific instruments, watches	27.1	100.1	3.1	12.6
	Total	646.5	2,668.8		13.7
	Total as percentage of total Puerto Rican exports to United States	68.7	82.3		

Note: Figures in parentheses indicate negative change.

Source: U.S. Bureau of the Census, FT 800.

A somewhat different view is had when recent exports to the mainland are broken out by 5-digit commodity groups. Table 2 on p. 266, lists the top exports in this fashion and ranks them by dollar values in FY 1977. Again, organic chemicals are in first place, but subsequent ranks are ordered differently from that of the 2-digit breakout. The importance of tuna is clear by its second place position. The only apparel item in this group, brassieres, could drop to a lower ranking if an incipient trend continues within the apparel sector to move production to lower-labor-cost areas such as the Dominican Republic. Subsequent-year data, whether CY 1977 or FY 1978, will likely show a drop in the value of cigar shipments because of two plant closings that occurred in the summer of 1977.

The changing nature of the Puerto Rican economy is reflected in a comparison of the top 40 exports (at the 5-digit commodity group level) to the mainland United States in FY 1971 and FY 1977. (See table 3.) In the earlier year, the following commodity groups were among the top 40 but had dropped out of the top 40 by FY 1977:

Table 3.—Puerto Rican Exports to the United States—Commodity Groups Dropping Out of the Top 40 Between FY 1971 and FY 1977

Schedule P number	Commodity
06120	Refined sugar.
12122	Leaf tobacco, cigar wrapper, stemmed.
66700	Pearls and precious and semiprecious stones.
72223	Switchgear assemblies.
83109	Travel goods, handbags, and similar articles.
84117	Male undershorts.
84122	Female slips and petticoats.
84133	Female dresses and skirts.
84137	Female sweaters.
84167	Corsets and foundation garments.
85111	Canvas shoes with rubber soles.
85113	Male footwear, nonrubber.

Looking at the reverse of this, in table 4 we see the following exports which were not in the top 40 of

Table 2.—Puerto Rican Exports to the United States—Top 20 Commodities Ranked by FY 1977 Values (Fiscal Years)

[In millions of dollars]

Rank	Schedule P number	Commodity description	1971	1977	Average annual growth Rate 1971-77; percentage
1	51299	Organic chemicals, n.e.c.	18.4	339.8	62.5
2	03201	Tuna fish, canned	97.3	290.8	20.0
3	33215	Gasoline, n.e.c., except jet fuel	97.1	234.4	15.8
4	54180	Medicinal and pharmaceutical preparation, n.e.c.	66.5	213.4	21.4
5	33230	Distillate fuel oils	20.9	202.5	46.0
6	72224	Electrical apparatus for circuits, n.e.c.	61.0	141.9	15.1
7	55300	Perfumery and cosmetics, except soaps	5.2	138.5	72.9
8	51285	Alcohols, n.e.c.; glycols	12.6	136.8	48.8
9	52100	Mineral tars and crude chemicals	18.1	117.6	36.6
10	84161	Brassieres	86.8	114.9	4.8
11	12210	Cigars	99.5	105.9	1.0
12	86100	Scientific, medical, optical instruments	19.3	92.5	29.8
13	72999	Electrical machinery and parts, n.e.c.	11.0	62.3	33.5
14	11251	Rum	26.0	59.7	14.8
15	86400	Watches and clocks	30.5	59.4	11.8
16	54177	Pharmaceutical preparations for parasitic and infectious diseases	.6	58.2	112.7
17	71900	Nonelectric machinery and appliances, n.e.c.	17.9	58.1	21.7
18	59900	Chemical materials and products, n.e.c.	1.5	57.7	84.0
19	89309	Artificial plastic products, n.e.c.	8.6	54.5	36.1
20	72499	Other telecommunications equipment, n.e.c. including radar	22.3	48.8	14.0

Source: Puerto Rico Planning Board.

FY 1971 but had moved into that group by FY 1977:

Table 4.—Puerto Rican Exports to the United States—Commodity Groups Moving into the Top 40 Between FY 1971 and FY 1977

Schedule P number	Commodity
01300	Meat and meat products, prepared or preserved.
06200	Sugar confectionery.
08100	Feed for animals.
33291	Naphtha, mineral spirits, solvents.
54170	Pharmaceutical preparations for endocrine system and metabolic diseases.
54177	Pharmaceutical preparations for parasitic and infectious diseases.
55300	Cosmetics.
59900	Chemicals, n.e.c.
66300	Nonmetallic mineral manufactures.
73200	Road motor vehicles and parts, n.e.c.
84115	Male shirts.
84135	Female slacks and shorts.
89309	Artificial plastic products, n.e.c.

More important perhaps are the commodity groups that remained among the top 40 from FY 1971 to FY 1977. As seen in table 5, these groups are:

Table 5.—Puerto Rican Exports to the United States—Commodity Groups in the Top 40 in Both FY 1971 and FY 1977

Schedule P number	Commodity
03201	Tuna fish, canned.
06110	Sugar, raw.
11251	Rum.
12210	Cigars.
33215	Gasoline, n.e.c., except jet fuel.
33230	Distillate fuel oils.
51285	Alcohols, n.e.c., glycols.
51299	Organic chemicals n.e.c.

Table 5.—Puerto Rican Exports to the United States—Commodity Groups in the Top 40 in Both FY 1971 and FY 1977—Con.

Schedule P number	Commodity
52100	Mineral tars and crude chemicals.
54171	Pharmaceutical preparations for central nervous system and sense organs.
54172	Pharmaceutical preparations for cardiovascular system.
54180	Medicinal and pharmaceutical preparations, n.e.c.
65113	Yarn, thread, tire cord, and fabric, MMF, noncellulosic.
71900	Nonelectric machinery and appliances, n.e.c.
72224	Electrical apparatus for circuits, n.e.c.
72499	Other telecommunications equipment, n.e.c., including radar.
72999	Electrical machinery and parts, n.e.c.
84126	Panties.
84179	Hosiery, not elastic or rubberized.
86100	Scientific, medical, optical instruments.
86400	Watches and clocks.
85114	Female shoes, except rubber.
89100	Sound recording and musical instruments, and parts.

While the dollar values of these 23 product groups are all high enough (above \$19.7 million) to place them in the top 40 for FY 1977, individual trade trends are mixed. Sugar, cigars, textiles, and the two apparel groups (panties and hosiery) are stagnant or actually declining. Fuels, chemicals, drugs, electrical apparatus, and instruments are prospering at growth rates ranging from good to very strong.

Illustrative of high growth rates the following 10 commodity groups which had the highest growth rates among the top 40 export groups in FY 1977 are shown in table 6.

Several of these commodity groups are examined individually in the following pages.

TUNA

Tuna has become one of Puerto Rico's significant export sectors with \$256 million in shipments to the mainland United States in CY 1976. (See table 7.) It is the dominant employer in the cities of Ponce and Mayaguez. For the 10-year period ending in CY 1976, it had an average annual growth of 15.7 percent, and the dollar value of shipments failed to increase in only two of those 10 years. Puerto Rico tuna has an important share of the U.S. market: the share was 20 percent in CY 1966 and rose to 28 percent in CY 1976. As a share of the total U.S. tuna pack, Puerto Rico has risen from 22 percent in CY 1966 to 30 percent in CY 1976. Puerto Rican tuna during this period has always exceeded U.S. tuna imports by several times over: More than twice in CY 1966 to approaching 4 times over in CY 1976 (not counting 1973 and 1974 when the multiple was more than 6 and 9, respectively.)

Table 6.—Fastest Growing Items in Top 40 Group, FY 1977

Rank by dollar value	Schedule P number	Commodity	Annual average growth rate 1971-77 (percentage)
16	54177	Pharmaceutical preparations for parasitic and infectious diseases	112.7
28	01300	Meat and meat products, prepared and processed	94.9
18	59900	Chemicals, n.e.c.	84.0
22	06200	Sugar confectionery	82.7
7	55300	Perfumery and cosmetics	72.9
1	51299	Organic chemicals, n.e.c.	62.5
8	51285	Alcohols, n.e.c., glycols	48.8
5	33230	Distillate fuel oils	46.0
31	73200	Road motor vehicles and parts, n.e.c.	38.8
9	52100	Mineral tars and crude chemicals	36.6

RUM

Unexpectedly large earnings from rum sales during World War II provided funds for the first economic development efforts in Puerto Rico during the late 1940's. Today this traditional product continues to be important to Puerto Rico despite its 10th place position by dollar value (\$53.5 million) in CY 1976. The major reason for rum's importance is the rebate to the Commonwealth Government of

the entire Federal Excise tax collected on sales of Puerto Rican rum. This tax amounted to more than \$120 million in 1976 and rose to about \$150 million in 1977. It provides around 10 percent of Commonwealth internal revenues and is a revenue source with potential for growth. Consequently, rum receives a lot of attention, and the Commonwealth Government appears to have been consistently concerned about rum in connection with the Multilateral Trade Negotiations and possible loss of protection against foreign rum through possible reductions in the U.S. tariff on rum. Rum is also a product on which the island's long-term claim may be tenuous to some extent since the major part of rum exports are from a single company with rum facilities in at least eight countries. The second largest rum producer also has production in other countries. These companies can be expected to operate in Puerto Rico only so long as it is advantageous to do so.

Puerto Rican shipments of rum to the mainland United States have enjoyed a steady increase since at least 1966 (see table 8), averaging an annual growth of 12 percent over the period. The annual increase was much larger in CY 1975 and CY 1976 when the growth in current dollars was 22 percent and 28 percent respectively.

Table 8.—United States Rum Imports By Value

[In thousands of dollars]			
Calendar Year	From Puerto Rico ¹	From foreign countries ²	Puerto Rico market share (percentage)
1966	17,116	901	95.0
1967	20,979	834	96.2
1968	23,823	873	96.5
1969	21,736	997	95.6
1970	25,455	1,019	96.2
1971	33,064	1,108	96.8
1972	33,150	1,009	97.0
1973	44,965	1,007	97.8
1974	33,817	1,153	96.7
1975	41,528	1,634	96.2
1976	53,479	1,463	97.3
Average annual growth rates (in percentage):			
1966-76	12.1	5.0	—
1970-76	13.2	6.2	—

¹ Source: FT 800, U.S. Bureau of the Census.

² Source: FT 246, U.S. Bureau of the Census.

Table 7.—Tuna (Calendar Years)

[In thousands of dollars]

	1966	1969	1972	1974	1976	1976/1966	Average annual growth (percentage)
U.S. tuna pack ¹ (includes Puerto Rico)	270,329	297,456	633,313	823,893	853,463	3.16	12.2
U.S. tuna imports ² (TSUSA items 1123 and 1129)	27,597	37,067	49,060	29,037	67,502	2.45	9.4
U.S. market	297,926	334,523	682,373	852,930	920,965	3.09	11.9
Puerto Rico shipments to United States ³	59,724	75,973	190,437	266,238	256,046	4.29	15.7
Puerto Rican share of U.S. market (percentage)	20.0	22.7	27.9	31.2	27.8	—	—

¹ Source: Industry and Consumer Services Division, National Marine Fisheries Service, NOAA.

² Source: FT 246, U.S. Bureau of the Census.

³ Source: FT 800, U.S. Bureau of the Census.

Through the years, Puerto Rican rum has had very little competition from foreign rum in the U.S. market. In all recent years (see tables 8 and 9) the Puerto Rican share of the U.S. rum market has been well above 90 percent, and the share has increased slightly.

Table 9.—United States Rum Imports by Quantity

[In thousands of proof gallons]

Calendar Year	From Puerto Rico ¹	From foreign countries ²	Puerto Rico market share (percentage)
1966	4,052	—	—
1967	4,940	—	—
1968	5,202	—	—
1969	4,852	—	—
1970	5,940	367	94.2
1971	8,619	375	95.8
1972	8,435	399	95.5
1973	10,321	379	96.5
1974	7,527	426	94.6
1975	10,687	683	94.0
1976	13,977	588	96.0
Average annual growth rates (in percentage):			
1970-76	15.3	8.2	—

¹ Source: FT 800, U.S. Bureau of the Census.

² Source: DISCUS, NAABI.

The Puerto Rican concern is that this position could be eroded or destroyed by agreements reached in the Multilateral Trade Negotiations. The entire U.S. distilled spirits industry is believed to be entering a period of declining growth. Rum is said to be highly price-sensitive (though there are no good data to support this). A large portion of the U.S. consumers of rum are young (under 35) and influenced by brand loyalties. Thus, if the duty on rum (\$1.75 per proof gallon) is reduced, the lowered U.S. landed cost of imported foreign rum could allow a lower price or more money for advertising (which is believed to be critical) or both, and this could lead to brand switching and lost market share for Puerto Rican rum. Two further, and important, consequences in this situation would be a reduction in the rebated excise tax and the complete loss of the major distillers in Puerto Rico if they moved to lower cost production areas in foreign territory.

TOBACCO

This is a traditional sector which, in export dollars, is more than twice as important as rum to Puerto Rico and also provides a rebate of the excise tax.

Puerto Rican tobacco means, for the most part, cigars. There is a cigarette factor on the south coast, but its output is not carried as a separate line item in the export data. In FY 1977, cigars (at \$105.9 million) were 11th by dollar value in ship-

ments to the mainland. However, it is a stagnant sector: the average annual growth rate for FY's 1971-77 was 1 percent; the rate for CY's 1966-76 was little better at 1.6 percent. Two cigar plants closed in the summer of 1977, and the closures will be reflected in future export data. (See table 10.)

Table 10.—Puerto Rican Cigar Shipments and the U.S. Cigar Market

[In thousands of dollars]

Calendar year	Puerto Rican shipment ¹	Imports ²	U.S. production ³	U.S. market	Puerto Rican market share (percentage)
1966	84,191	2,305	—	—	—
1967	95,011	2,683	—	—	—
1968	85,516	3,736	—	—	—
1969	87,880	4,621	375,000	467,201	18.8
1970	100,689	5,240	382,600	488,529	20.6
1971	96,170	6,130	367,400	469,700	20.5
1972	104,573	8,434	357,500	470,507	22.2
1973	103,251	11,510	350,300	465,061	22.2
1974	94,060	13,580	333,800	441,440	21.3
1975	96,537	15,771	316,600	428,908	22.5
1976	98,860	19,309	285,200	403,369	24.5
Average annual growth rates (in percentage):					
1966-76	1.6	23.7	—	—	—
1969-76	1.7	22.7	-3.8	-2.1	—

¹ Source: FT 800, U.S. Bureau of the Census.

² Source: FT 210, U.S. Imports for Consumption, U.S. Bureau of the Census.

³ Source: Annual Survey of Manufactures, U.S. Bureau of the Census.

While the island's cigar industry was in this non-growth position, its share of the U.S. market grew (from 18.8 percent in CY 1969 to 24.5 percent in CY 1976) as the U.S. market contracted by 2.1 percent on average each year during the same period. U.S. cigar production also was declining by an average 3.8 percent annually while imports of cigars rose at 22.8 percent annually. Some supplier countries had spectacular growth rates as they moved into positions of importance in the declining market. Among these countries are the Dominican Republic, Nicaragua, and Honduras. (See table 11.)

CHEMICALS

Chemicals in this discussion are petrochemicals, mainly organic chemicals. They are now the single most important product group exported from Puerto Rico to the mainland United States, and they also are Puerto Rico's single most important foreign export. Puerto Rico shipped \$443.8 million of chemicals within this group (as measured at the 2-digit Schedule P level) to the mainland in CY 1976; this was 12.9 percent of all island products shipped that year. In contrast, in CY 1965, chemical exports were

Table 11.—U.S. Imports of Cigars and Cheroots, Total and Selected Supplier Countries (Calendar Years)

[In thousands of dollars]

	1969	1971	1973	1975	1976	1976/1969	Average annual growth 1969-76 (percentage)
Total, all countries	4,709	6,277	12,046	16,334	19,527	4.15	22.5
Mexico	302	659	1,146	1,564	1,969	6.52	30.7
Honduras	176	306	989	1,968	2,097	11.91	42.5
Nicaragua	81	422	807	1,548	2,563	31.64	63.8
Dominican Republic	7	14	101	735	1,362	194.6	112.3
Jamaica	954	1,579	3,060	3,572	---	---	---
Brazil	99	208	276	349	321	3.24	18.3
Netherlands	353	404	807	899	868	2.46	13.7
Spain	659	618	1,128	609	1,012	1.54	6.3
Philippines	253	209	362	83	108	0.43	(11.5)
Canary Islands	1,636	1,728	3,050	4,620	4,321	2.64	14.9
Total of 10 suppliers	4,520	6,147	11,726	15,947	14,621	3.23	18.3
Percentage of total imports	96	97.9	97.3	97.5	74.9	---	---

Note: Figures in parentheses indicate negative percentage.

Source: FT 150, U.S. General Imports, U.S. Bureau of the Census.

only \$24.9 million (2.6 percent of shipments to the mainland). Thus, chemical exports increased over 17 times, or 30 percent each year on average, over the 11-year period. This growth supported the plans

Table 12.—Relative Share of U.S. Import Market for Chemicals (Including Pharmaceuticals) (Selected Countries)

[In percentages]

	1965	1968	1971	1974	1976
Canada	26.4	23.2	21.3	16.5	20.0
Great Britain	6.3	6.6	7.0	6.2	8.3
France	6.5	5.3	4.8	6.3	7.2
West Germany	10.6	13.5	12.9	11.1	9.6
Japan	5.3	7.3	10.5	10.6	7.1
Puerto Rico	6.7	9.4	13.4	13.4	18.5

Source: FT 800, table 3, U.S. Bureau of the Census and OBR, U.S. Foreign Trade Annual, table 6.

of the Commonwealth Government that the primary petrochemical industry would become the backbone of the current stage of Puerto Rican economic development. Achievement of this objective depended on the use of low-cost naphtha imported from foreign sources. During the 1960's special regulations within the Mandatory Oil Import Program provided necessary import quotas for naphtha available to Puerto Rico at \$2.30 per barrel compared to Gulf Coast naphtha at \$3.75 per barrel. This has changed, and more recently imported naphtha cost varied from \$14.45/bbl to \$15.97/bbl when at the same time domestic U.S. prices under controls were around \$14.00/bbl.

During the 1965-76 period, Puerto Rico significantly increased its share of U.S. general chemical

Table 13.—Chemicals (Calendar Years)

[In thousands of dollars]

SIC number		1969	1971	1973	1975	1976	1976/1969	Average annual growth (percentage)
U.S. production: ¹								
2815 } 2865 }	Cyclic intermediates and crudes	1,896,300	2,077,500	2,763,900	4,202,700	5,230,700	---	---
2818 } 2869 }	Industrial organic chemicals, n.e.c.	6,356,000	6,814,800	8,548,300	14,098,900	16,794,500	---	---
	Total	8,252,300	8,892,300	11,312,200	18,301,600	22,025,200	2.7	15.1
	U.S. general imports, ² organic chemicals	314,000	400,000	639,000	1,027,000	1,193,000	3.8	21.0
Schedule P								
number								
Puerto Rican shipments to United States: ³								
51	Organic chemicals	35,873	34,705	140,045	296,258	443,808	12.4	43.2
52	Mineral ore	19,716	19,162	57,445	144,027	128,920	6.0	29.3
	Total	55,589	53,867	197,490	440,285	562,728	10.1	39.2
	Total U.S. market	8,621,889	9,346,167	12,148,690	19,768,885	23,780,928	2.8	15.6
	Puerto Rican share (percentage)	0.6	0.6	1.6	2.2	2.4	---	---
	Puerto Rican share of imports (percentage)	15.0	11.9	23.6	30.0	32.1	---	---

¹ Source: Annual Survey of Manufactures.

² Source: U.S. Foreign Trade annual, table 6.

³ Source: FT 800, U.S. Bureau of the Census.

imports (this includes pharmaceuticals), from 6.7 percent in CY 1965 to 18.5 percent in CY 1976. (See table 12.) Most major foreign suppliers increased their shipments of chemicals to the United States, indicating a growing U.S. market. U.S. domestic production of organic chemicals was itself growing steadily, at a 15-percent average annual rate for the period 1969-76, and the Puerto Rican share of these chemicals rose from 0.6 percent in CY 1969 to 2.4 percent in CY 1976 as Puerto Rican shipments grew by almost 40 percent a year on average. (See table 13.)

The market shares mentioned do not fully reflect the importance of Puerto Rican production of specific products in the mainland market. Puerto Rican production capacity for individual basic or intermediate petrochemicals ranges up to as much as almost 30 percent of total U.S. capacity for the particular chemical. Some of these are listed below. (See table 14.)

Table 14.—Puerto Rican and Mainland United States Production Capacities for Selected Chemicals

Product	Millions of pounds capacity		Percentage Puerto Rico/United States
	Puerto Rico	United States	
Vinyl chloride monomer	600	7,045	8.5
Ethylene glycol	450	5,155	8.7
L.D. polyethylene	310	7,025	4.4
2-Ethylhexanol	135	460	29.3
Cumene	600	3,650	16.4
Benzene (million gallons) ...	185	1,798	10.3
Paraxylene	300	4,175	7.2
Orthoxylene	310	1,467	21.1
Ethylene	960	29,190	3.3

Source: Materials Division, Office of Basic Industries, BDBD/ITA, U.S. Department of Commerce.

APPAREL

Apparel was the third most important product group exported to the mainland United States in CY 1976. In CY 1965 it had been first, at 24.5 percent of total shipments. In current dollars, the value of apparel shipments to the mainland rose from \$230.1 million in CY 1965 to \$370.2 million in CY 1976, an average annual growth of 4.4 percent. (See table 15.)

As apparel dropped from first to third place in total shipments to the mainland, Puerto Rican clothing lost some of its share of the mainland market. (See table 16.) In CY 1965, the island had 30 percent of U.S. apparel imports; in CY 1976, 9 percent. Lower-wage-cost countries increased their market share during the 11-year period.

When Puerto Rican shipments to the United States are compared to domestic U.S. consumption of clothing the trend is the same: Puerto Rico is losing total

Table 15.—Puerto Rican Apparel Shipments to the United States, Schedule P, Group No. 84

Calendar year	Value (millions of dollars)	Year-to-year percentage change
1965	230.1	—
1966	259.5	12.8
1967	293.9	13.2
1969	356.9	(0.01)
1968	356.9	21.4
1970	370.2	3.7
1971	300.3	(18.9)
1972	362.4	20.7
1973	379.2	4.6
1974	363.8	(4.1)
1975	316.5	(13.0)
1976	370.2	17.0

Note: Figures in parentheses indicate minus percentage.

Source: FT 800, U.S. Bureau of the Census.

Table 16.—Clothing Shipments as Percentage of U.S. Clothing Imports (Selected Countries)

	1965	1967	1969	1972	1974	1976
Hong Kong	14.9	15.5	16.6	17.9	17.8	22.5
Italy	13.1	10.9	8.7	4.6	4.0	3.3
Korea	1.4	3.0	6.4	10.5	10.6	16.6
Taiwan	1.5	2.7	6.0	14.0	15.5	15.5
Japan	17.8	17.0	17.4	13.4	6.7	5.3
Puerto Rico	30.1	31.1	24.3	16.1	13.5	9.2

Source: FT 800, U.S. Bureau of the Census; OBR, U.S. Foreign Trade Annual.

market share. Of interest here is the no-growth position of Puerto Rican shipments for the period 1969-76. (See table 17.)

Within the general apparel group there are several subgroups of particular importance to Puerto Rico; these are male work clothing, male and female underwear, and brassieres. These products accounted for 60 percent of Puerto Rican shipments to the mainland in CY 1976. While there is some difficulty in getting comparable numbers, the market share erosion and subsector stagnation are clear: for the period CY 1969 through CY 1976 there were actual declines in current dollar terms in both male and

Table 17.—Total U.S. Clothing Market (Calendar Years)

[Millions of dollars]			
	1969	1976	Average annual growth (percentage)
United States imports ¹	1,115	3,634	18.4
United States production ²	17,180	26,055	6.1
Puerto Rican shipments ³	357	370	0.5
Total apparent market	18,652	30,059	7.1
Puerto Rican share of total market (percentage) ...	1.9	1.2	—
Puerto Rican share of United States imports (percentage) .	24.3	9.2	—

¹ Source: OBR, U.S. Foreign Trade Annual.

² Source: Annual Survey of Manufacturers.

³ Source: FT 800, U.S. Bureau of the Census.

female underwear shipments, essentially no growth in value of shipments of brassieres, and some growth in work clothing shipments.

Despite the eroding market share and general stagnation, several apparel products have remained in the top 40 exports by value to the mainland United States. In FY 1971, these products were (in descending order by dollar value) brassieres, hosiery, panties, corsets, slips and petticoats, dresses and skirts, male underwear, male slacks and outershorts, and female sweaters. In FY 1977, the clothing items in the top 40 were brassieres, panties, hosiery, female slacks and shorts, male slacks and outershorts, and male shorts. The declining market for Puerto Rican clothing in the United States is reflected in the reduc-

tion in the number of clothing items (from 9 to 6) in the top 40 over this period plus the fall in relative rank of the clothing items in the top 40 for each year. In FY 1977, brassieres were in 4th place, hosiery in 8th, and panties in 11th place. By FY 1977, brassieres were in 10th place, panties in 23d, and hosiery in 26th place. For the period FY 1971 to FY 1977, of the clothing items in the top 40 shipped to the mainland, only female slacks and shorts and male shirts enjoyed attractive growth rates (30 percent and 24.2 percent annually, respectively), while brassieres and panties were not holding their own (4.8 percent and 4.9 percent), and hosiery declined by 8.8 percent annually in current dollars. (See table 18.)

Table 18.—U.S. Production, U.S. Imports, and Puerto Rican Shipments to the Mainland United States

[In thousands of dollars]

Selected apparel items	1969	1972	1975	1976	Average annual growth (percentage)
Male underwear:					
United States production	477,400	592,600	654,000	810,300	7.9
United States imports	1,834	3,468	3,633	4,111	12.2
Puerto Rican shipments	24,011	22,267	32,417	15,145	-6.4
Total	503,245	618,335	690,050	829,556	7.9
Puerto Rican share (percentage)	4.8	3.6	4.7	1.8	—
Male work clothing:					
United States production	1,071,300	1,624,800	2,141,300	2,533,800	13.1
United States imports	32,939	112,455	120,365	268,090	34.9
Puerto Rican shipments	24,560	25,143	39,279	43,086	8.7
Total	1,128,799	1,762,398	2,300,944	2,844,976	14.1
Puerto Rican share (percentage)	2.2	1.4	1.7	1.5	—
Female and children's underwear (includes brassieres):					
United States production	1,977,000	2,087,100	1,971,400	2,217,700	1.7
United States imports	38,394	76,574	101,665	163,852	23.0
Puerto Rican shipments	174,391	177,765	139,450	168,314	-0.5
Total	2,189,785	2,341,439	2,212,515	2,549,866	2.2
Puerto Rican share (percentage)	8.0	7.4	6.3	6.6	—
Of which brassieres:					
United States production	276,600	385,100	270,800	328,100	2.5
United States imports	17,681	34,855	46,819	76,143	23.2
Puerto Rican shipments	95,707	111,477	88,492	111,391	2.2
Total	389,988	531,432	406,111	515,634	4.1
Puerto Rican share (percentage)	24.5	21.0	21.8	21.6	—

Source: FT 800 and FT 210, U.S. Bureau of the Census; Annual Survey of Manufactures.

Note to Apparel subsection:

Throughout the apparel analysis, extensive use is made of average annual growth rate calculations expressed in percentages. Although these are usually helpful, on occasion they may be misleading. A case in point is that of hosiery shipments to the mainland. In one table (table 19) it can be noted that for the period FY 1971 through FY 1977 hosiery shipments declined annually by 8.8 percent. In another table (table 20) for the period CY 1965 through CY 1976, the average growth is a positive 14.6 percent. The reason for the seeming conflict is due to the fact that, for the longer period, as shown in table 20,

Table 19.—Puerto Rican Shipments to the United States, Selected Apparel Items

[In millions of dollars]

Schedule P number	Description	FY 1971	FY 1977	Average annual growth (percentage)
84161	Brassieres	86.8	114.9	4.8
84126	Panties	26.4	35.1	4.9
84179	Hosiery	56.0	32.2	(8.8)
84135	Female slacks and shorts	6.1	29.4	30.0
84101	Male slacks and outershorts	12.7	26.1	12.8
84115	Male shirts	6.6	24.4	24.2

Note: Figures in parentheses indicate minus percentage.

Source: Puerto Rico Planning Board.

shipments started low, grew rapidly, and then declined substantially. Table 20 also illustrates the different rates of change that can result when using data based on either calendar or fiscal years.

Table 20.—Puerto Rican Hosiery Shipments to the United States, Schedule P, No. 84179

Year	Millions of dollars		Year-to-year percentage change		Average annual growth percentage for period of each year to most recent year	
	Calendar year	Fiscal year	Calendar year	Fiscal year	Calendar year	Fiscal year
1965	6.6				14.6	
1966	8.2		24.2		13.7	
1967	12.9		57.3		9.7	
1968	20.2		56.6		4.9	
1969	35.7		76.7		(2.6)	
1970	56.0		56.9		(10.1)	
1971	37.2	56.0	(33.6)		(4.5)	(8.8)
1972	33.0	26.6	(11.3)	(52.5)	(2.7)	3.9
1973	35.1	36.5	6.4	37.2	(5.5)	(3.1)
1974	35.3	35.9	0.6	(1.6)	(8.4)	(3.6)
1975	26.2	32.5	(25.8)	(9.5)	13.0	(0.5)
1976	29.6	27.6	13.0	(15.1)		16.7
1977		32.2		16.7		

Note: Figures in parentheses indicate minus percentage.

Source: FT 800 U.S. Bureau of the Census and Puerto Rico Planning Board.

Twelve Items of Apparel

Table 21 shows the dollar value of 12 selected apparel items shipped to the mainland during the period CY 1965–76. These prominent items accounted for 72.5 percent of total apparel shipments in CY 1965 and 78 percent of such shipments in CY 1976. These data present a mixed picture for the 12-year period: on the basis of the current dollar values 8 have shown growth in varying amounts while 4 have declined. The average annual growth rates for the same period, shown in table 22, show

that 4 have had positive average annual growth (male knit sport shirts, male shirts, female knit sport shirts, and panties); 4 have been more or less stagnant (male slacks, male underwear, female slacks, and brassieres); and 3 have actually declined (female slips, dresses, and female sweaters). The 12th item, hosiery, has an up-and-down record already described in the note to this section above. Performance for each of the 12 is summarized below.

Male slacks and outershorts (No. 84101): Variable performance since 1965, with a peak in 1975 and a sharp decline in 1976.

Male knit sport shirts (No. 84113): Best performance of the 12 with steady growth; dollar value increased by 26 times and quantity by 11 times over the period; unit value doubled; value of shipments peaked in 1974.

Male shirts (No. 84115): Good growth, especially in 1976 when dollar value more than doubled over 1975 to an 11-year peak.

Male underwear (No. 84117–9): Cyclical ups and downs; trend is toward stagnation as a group; peak year was 1968; briefs and shorts exhibit a different behavior from that of undershirts.

Female slips and petticoats (No. 84122): A serious decline here; peak year was 1968; value and quantity in CY 1976 were both about 40 percent of that in CY 1965.

Female knit sport shirts (No. 84125): Some variation in performance but growth overall; peak year was 1973; CY 1976 dollar value was 9 times that of CY 1965 while quantity doubled.

Panties (No. 84126): Some variation but unspectacular overall growth; CY 1976 dollar value was 3 times that of CY 1965 while quantity increased somewhat less than 3 times; CY 1976 value was close to peak of 1973.

Dresses and skirts (No. 84133): Substantial de-

Table 21.—Apparel Shipments to United States (Selected Items) (Calendar Years)

[In millions of dollars]

Schedule P number	Item	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
84	Total apparel	230.1	259.5	293.9	356.9	356.9	370.2	300.3	362.4	379.2	363.8	316.5	370.2
84101	Male slacks and outershorts	9.2	8.8	10.0	11.0	15.9	15.6	10.3	15.9	20.1	26.6	37.1	20.7
84113	Male knit sportshirts	0.4	0.5	1.1	2.2	2.7	2.9	3.7	8.1	7.4	12.3	8.1	10.0
84115	Male shirts	4.2	6.5	5.7	7.8	8.7	7.5	6.0	9.3	12.3	12.7	10.0	22.4
84117–8–9	Male underwear	16.9	20.6	25.0	34.5	24.0	23.4	18.0	22.1	20.3	30.0	17.8	15.2
84122	Female slips and petticoats	15.1	21.4	27.1	29.9	23.7	22.1	15.5	15.1	13.7	11.6	6.6	6.1
84125	Female knit sportshirts	0.3	0.4	0.8	0.6	0.3	0.4	0.9	1.3	3.6	1.1	2.0	2.5
84126	Panties	10.5	17.5	19.7	26.0	24.5	26.8	23.9	33.9	34.5	24.7	20.0	33.0
84133	Female dresses and skirts	5.0	5.8	6.7	6.9	4.7	12.9	9.2	6.2	2.5	2.9	0.9	1.8
84135	Female slacks and outershorts	14.9	10.8	15.5	17.2	9.8	8.3	5.0	11.4	14.1	24.2	7.2	26.8
84137	Female sweaters	24.8	24.2	23.1	22.0	16.3	12.0	9.4	13.1	7.3	1.9	5.5	8.2
84161	Brassieres	59.0	70.5	69.8	81.4	95.7	90.5	89.8	111.5	121.3	88.5	96.6	111.4
84179	Hosiery	6.6	8.2	12.9	20.2	35.7	56.0	37.2	33.0	35.1	35.3	26.2	29.6
	Total of items	166.9	195.2	217.4	259.7	262.0	278.4	228.9	280.9	292.2	271.7	238.0	287.7
	Percentage of total apparel	72.5	75.2	74.0	72.8	73.4	75.2	76.2	77.5	77.1	74.7	75.2	78

Source: FT 800 U.S. Bureau of the Census.

Table 22.—Apparel Shipments to United States (Calendar Years)

Schedule P number	Item	Unit	Value		Average annual growth (percentage)	Quantity		Average annual growth (percentage)	Unit value		Average annual growth (percent- age)
			1965	1976		1965	1976		1965	1976	
84101	Male slacks and outershorts	doz.	\$9,182,910	\$20,694,064	7.7	369,922	912,900	8.6	\$24.82	\$22.67	(0.8)
84103	Male sweaters	doz.	3,701,521	4,494,390	1.8	77,111	52,788	(3.4)	35.03	85.14	8.4
84105	Male swimwear	doz.	56,540	—	—	501	—	—	112.85	—	—
84107	Male outer- garments nsbt ¹	lb.	3,000	—	—	600	—	—	5.00	—	—
84109	—do—n.e.c. ²	lb.	674,628	7,381,651	24.3	333,616	2,258,014	19.0	2.02	3.27	4.5
84111	Male nightwear	doz.	5,840,973	4,027,739	(3.3)	279,079	167,303	(4.5)	20.93	24.07	1.3
84113	Male knit sportshirts	doz.	379,950	10,003,630	34.6	32,663	391,033	25.3	11.63	25.58	7.4
84114	Male shirts	doz.	1,199,709	—	—	55,589	—	—	21.58	—	—
84115	Male dress, work, sportshirts	doz.	4,141,476	22,392,290	16.6	189,045	639,049	11.7	21.91	35.04	4.4
84117	Male briefs and undershorts	doz.	6,442,077	8,469,721	2.5	1,042,679	844,354	(1.9)	6.18	10.03	4.5
84118	Male briefs, undershorts, undershirts	doz.	3,031,573	—	—	491,860	—	—	6.16	—	—
84119	Male knit undershirts	doz.	7,442,614	6,653,190	(1.0)	1,194,728	1,217,984	0.2	6.23	5.46	(1.2)
84120	Male under- wear nsbt ¹	lb.	642,179	—	—	387,581	—	—	1.66	—	—
84121	Male under- wear n.e.c. ²	lb.	361,478	22,100	(22.4)	182,830	8,000	(24.8)	1.98	2.76	3.2
84122	Female slips and petticoats	doz.	15,054,736	6,084,766	(7.9)	1,105,876	468,787	(7.5)	13.61	12.98	(0.4)
84123	Female night- wear	doz.	3,382,962	7,873,224	8.0	190,127	377,693	6.4	17.79	20.84	1.4
84125	Female knit sportshirts	doz.	260,409	2,520,238	22.9	46,056	109,953	8.2	5.65	22.92	13.6
84126	Panties	doz.	10,524,006	32,950,701	10.9	2,532,920	7,048,540	9.8	4.15	4.67	1.1
84127	Female under- wear n.e.c.	lb.	6,033,867	—	—	1,338,767	—	—	4.51	—	—
84129	Female blouses	doz.	1,367,397	1,708,859	2.0	81,651	214,651	9.2	16.75	7.96	(6.5)
84131	Female collars and fronts for blouses	doz.	20,571	385	(30.3)	3,455	24	(36.4)	5.95	16.04	9.4
84133	Female dresses and skirts	doz.	4,990,817	1,846,436	(8.6)	134,085	42,565	(9.9)	37.22	43.38	1.4
84135	Female slacks and outershorts	doz.	14,927,818	26,775,785	5.5	348,040	590,707	4.9	42.89	45.32	0.5
84137	Female sweaters	doz.	24,751,510	8,201,113	(9.6)	345,470	241,407	(3.2)	71.65	33.97	(6.6)
84139	Female swimwear	doz.	1,190,276	500	(49.3)	9,736	40	(39.3)	122.25	12.50	(18.7)
84141	Female outer- wear nsbt ¹	lb.	144,445	—	—	48,420	—	—	2.98	—	—
84143	Female outer- wear nec. ²	lb.	1,105,016	2,260,747	6.7	264,486	522,170	6.4	4.18	4.33	0.3
84161	Brassieres	doz.	58,971,034	111,390,669	6.0	6,885,012	6,912,201	0.04	8.57	16.12	5.9
84179	Hosiery	doz.	6,611,986	29,631,310	14.6	2,214,574	5,762,745	9.1	2.99	5.14	5.0

¹ Not specified by type.

² Not elsewhere classified.

Source: FT 800 U.S. Bureau of the Census.

cline here, especially if measured from the 1970 peak; 1976 value was 37 percent of that of 1965 and 1976 quantity was 32 percent of that of 1965.

Female slacks and outershorts (No. 84135): Very uneven pattern here, with CY 1976 dollar value approaching twice that of CY 1965.

Female sweaters (No. 84137): Essentially a steady decline from peak year in 1965; unit value dropped from \$71.65 to \$33.97.

Brassieres (No. 84161): Little growth by value (6.0 percent annually) and none in quantity (0.04 percent annually); peak year was CY 1973 with \$121.3 million; unit value has doubled in 11 years;

item remains far and away the largest apparel product.

Hosiery (No. 74179): This item had rapid growth following CY 1965, peaked in CY 1970, and then steadily declined; of the 12 compared, item was third largest by dollar value in CY 1976. For further comment on this item, see note to this section above.

Apparel Unit Values

The suggestion has been made that the Puerto Rican apparel industry is moving into higher priced clothes as one response to rising labor costs.

Table 21 was constructed to find movements of this sort. Examination of the data does not show much of this. Three items had substantial unit value increases (1 unit equals 1-dozen products):

		Unit Values	
		CY 1965	CY 1976
84103	Male sweaters	\$35.03	\$85.14
84113	Male knit sport shirts	11.63	25.58
84125	Female knit sport shirts	5.65	22.92

The combined value of shipments of these 3 items accounted for 1.9 percent of all apparel shipments to the mainland in CY 1965 and 4.6 percent in CY 1976 and are not significant segments of the apparel sector.

On the other hand, 3 items had substantial declines in unit values (again, 1 unit equals 1-dozen products):

		Unit Values	
		CY 1965	CY 1966
84119	Male knit undershirts . .	\$6.23	\$5.46
84129	Female blouses	16.75	7.96
84137	Female sweaters	71.65	33.97

These last 3 apparel items formed percentages of total apparel shipments very similar to those of the group of 3 with rising unit values: 1.6 percent in CY 1965 and 4.5 percent in CY 1976.

TEXTILES

Textiles have been a volatile sector in recent years, with rapid growth in the early 1970's, fol-

lowed by a very sharp decline. In CY 1965, textile shipments to the mainland United States were \$31.5 million and 3.4 percent of all such shipments (table 25). The sector's fast growth peaked in CY 1973 with \$177.0 million, 7 percent of total shipments to the mainland that year. An abrupt fall to the \$25.8 million level occurred in CY 1975, 1 percent of shipments. A further decline occurred in the following year, and thus, CY 1976 textile shipments were less than those of CY 1965. Restating some of this, textile shipments increased by more than 5 times from CY 1965 to CY 1973, and then fell to one-seventh of the CY 1973 peak by CY 1976. Some revival has occurred, for data for FY 1977 (ended June 30, 1977) show textile shipments to the mainland to have been \$36.1 million.

A similar pattern is shown in the data for Puerto Rico's share of the U.S. market for imported textiles. The island's share went from 3.9 percent in CY 1965 to 10.1 percent in CY 1973, and then down to 1.4 percent in CY 1976. (See tables 23 and 24.)

What caused the rapid growth and decline in Puerto Rican textile shipments? It appears to be due to the behavior of a single product group: Schedule P No. 65113, Yarn, Thread and Tire Cord, manmade fiber, noncellulosic. This product group (see table 25) shipped only \$2.7 million in CY 1965; in CY 1974 it shipped \$158.7 million or 91.6 percent of total textile shipments. Then in a single year the current dollar value of shipments dropped to \$11 million; and fell more, to \$9.2 million, in CY 1976. A large part of the reason for the sharp decline probably was the 1975 closing of a single large plant, Phillips Core in Guayama, which made nylon fibers and employed 1,600 workers.

Some additional portion of the decline may be due to the consolidation that is said to be occurring in the industry. That is, some textile mills that for-

Table 23.—Relative Share of United States Import Market Textiles Other than Clothing
(Schedule P No. 65 and Schedule B No. 65), (Calendar Years), (Selected Countries)
[In percentages]

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Hong Kong	3.0	3.9	4.6	3.9	4.1	3.7	3.2	4.2	5.1	6.2	5.6	7.5
Italy	6.3	5.0	5.3	7.0	5.8	6.3	4.4	4.8	5.6	4.2	4.9	5.5
India	22.5	19.3	20.3	16.8	18.3	11.5	11.1	13.3	10.7	11.9	9.6	9.8
Japan	26.3	26.0	25.3	26.6	26.5	25.3	25.3	21.5	17.2	15.4	21.8	20.9
Puerto Rico	3.9	3.8	3.8	4.9	5.1	4.7	4.3	7.0	10.1	9.6	2.1	1.4

Source: FT 800, U.S. Bureau of the Census; OBR, U.S. Foreign Trade Annual.

Table 24.—U.S. General Imports, FAS Transaction Values
[Value in millions of dollars]

Commodity	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Textiles, other than clothing, total . . .	800	909	808	962	1,019	1,135	1,391	1,528	1,580	1,615	1,219	1,635
Textile yarn and thread	66	106	82	130	100	223	351	305	262	190	128	192

Source: OBR, U.S. Foreign Trade Annual.

Table 25.—Puerto Rican Shipments to the United States of Total Textiles and Yarn, Thread, and Tire Cord

Yarn, thread, and tire cord						
Calendar year	Total textiles (number 65) (thousands of dollars)	Total (number 651) (thousands of dollars)	As a percentage of total textiles	Manmade fibers, noncellulosic (number 65113)		
				(Thousands of dollars)	As a percentage of total yarn, thread, tire cord	As a percentage of total textiles
1965	31,515	12,959	41.1	2,662	20.5	8.4
1966	35,985	14,435	40.1	4,092	28.3	11.4
1967	36,471	14,910	40.9	3,447	23.1	9.5
1968	49,769	30,105	60.5	16,427	54.6	33.0
1969	54,878	35,903	65.4	32,862	91.5	59.9
1970	56,198	31,556	56.2	24,993	79.2	44.5
1971	63,599	42,510	66.8	39,993	94.1	62.9
1972	115,683	94,910	82.0	78,731	83.0	68.1
1973	177,034	159,965	90.4	146,978	91.9	83.0
1974	173,333	161,752	93.3	158,708	98.1	91.6
1975	25,755	11,746	45.6	10,965	93.4	42.6
1976	24,388	9,435	38.7	9,155	97.0	37.5

Source: FT 800, U.S. Bureau of the Census.

merly exported now use their output to supply their own apparel plants.

When the other textile groups are examined (table 26), it is seen that shipments of broad woven cottons have all but disappeared; broad woven synthetics and knits doubled from CY 1965 to CY 1970 and then fell back to less than one-fifth of the 1965 value; the narrow and special fabrics and made-up textile articles did very little one way or the other; and floor coverings have declined generally.

Puerto Rican share of the U.S. mainland market in each of the subgroups in 1976 was insignificant, in all cases no more than one-tenth of one percent. (See table 27.)

PHARMACEUTICALS

Pharmaceuticals have been among the most spectacular of the new industries to come to Puerto

Table 27.—Textiles (CY 1976) U.S. Market and Puerto Rican Share

[In millions of dollars]

	United States market	Puerto Rican shipments	Puerto Rican share (percentage)
Yarn, thread, tire cord	7,212	9.2	0.1
Cotton, broadwoven	4,364	0.003	—
Manmade fibers, broadwoven	5,893	0.446	—
Knits	4,337	0.580	0.01
Narrow and miscellaneous	3,631	5.0	0.1
Floor coverings	3,670	2.6	0.1

Sources: Annual Survey of Manufactures.

FT 210, U.S. Imports for Consumption, U.S. Bureau of the Census.
FT 800, U.S. Trade with Puerto Rico, U.S. Bureau of the Census.

Rico. From a modest \$6.0 million in shipments to the mainland in FY 1955, the volume of shipments grew to \$24.5 million in CY 1965, and then to \$328.6 million in CY 1976 when drugs were 10.1 percent by current dollar value of all shipments to the mainland from Puerto Rico. The most recent data are for FY 1977 (ending June 30, 1977) and show drug shipments to have reached \$401 million, a 45.8-percent increase over the preceding fiscal year. These shipments are almost entirely intracompany. The dramatic growth is credited to the increase in new plants coming into production. The growth is so promising that Governor Romero, in his annual message on the State of the Commonwealth (delivered February 1, 1978) identified pharmaceuticals as one of three industries to receive special developmental attention. He said then:

With the proper technical training and educational programs, as well as with the new industrial incentives program, we intend to turn Puerto Rico into a center of attraction for the pharmaceutical industry, and for the electronics, and the scientific and hospital instruments and equipment industries. These industrial sectors, which have industries with great growth potential in the United States and in the entire world, will in the next decade also be important stanchions in Puerto Rico's industrial growth by virtue of the fact that they are high-salary industries that re-

Table 26.—Puerto Rican Shipments to United States (Calendar Years)

[In thousands of dollars]

Schedule P number	Textiles	1965	1968	1970	1972	1973	1974	1975	1976
65	Total textiles	31,515	49,769	56,198	115,683	177,034	173,333	25,755	24,388
651	Yarn, thread, tire cord	12,959	30,105	31,556	94,910	159,965	161,752	11,746	9,435
65113	—do— MMF, ¹ noncellulosic	2,662	16,427	24,993	78,731	146,978	158,708	10,965	9,155
652	Broadwoven cotton	1,082	397	638	1,939	433	974	927	3
653	Broadwoven and knit MMF ¹	5,864	7,034	12,462	8,424	6,718	2,940	2,330	1,026
654	Tulle, lace, ribbons	1,469	1,942	1,488	1,212	1,415	1,077	788	1,199
655	Special fabrics	1,984	349	1,933	1,914	3,209	2,392	1,932	3,784
656	Made-up articles of textiles	3,855	4,387	4,090	4,556	4,200	3,435	4,629	6,305
657	Floor coverings, tapestries	4,301	5,556	4,030	2,727	1,094	764	3,403	2,637

¹ Manmade fiber.

Source: FT 800, U.S. Bureau of the Census.

quire highly developed skills; that require a fair amount of labor; and that have great potential for exporting to Caribbean and Latin American markets. The incentives and personnel training programs should speed up this tendency.

The U.S. Department of Commerce (Bureau of Domestic Business Development) shares much of this optimism for the industry and says in the 1978 *U.S. Industrial Outlook* that "drug and cosmetics industries are confident of continuing success—real sales growth and above-average profits . . . Prospects: more growth, higher earnings, intense competition."

Table 28 provides a detailed look at drug industry trade for the period CY 1969 through CY 1976. The data confirm that overall the sector is doing very well: shipments have grown over 4 times in 7 years; Puerto Rico's share of the U.S. drug market has more than doubled (to 3.3 percent) in the same period. Puerto Rico's share of U.S. pharmaceutical imports is far higher: 30.5 percent in CY 1965, rising to 62.4 percent in CY 1973, and holding at 54.8 percent in CY 1976. (See table 29.)

There have been wide variations in the performance of individual groups, ranging from average annual growth rates as high as 270 percent down through products whose shipments have declined. The entire Puerto Rican drug sector grew during the CY 1969–76 period at almost 23 percent each year on average while the U.S. market increased at a 9.6 annual rate.

Table 29.—Comparative Shares of U.S. Medicinal and Pharmaceutical Imports (Calendar Years)

	1965	1967	1969	1971	1973	1974	1975	1976
Great Britain	9.0	6.2	5.0	4.3	5.4	7.9	6.2	6.3
West Germany	8.5	4.7	5.0	4.7	5.7	8.3	6.9	6.8
Italy	2.5	3.7	2.2	2.6	2.4	2.8	5.9	4.8
Japan	4	2.8	2.8	3.2	3.2	6.2	4.5	4.5
Puerto Rico	30.5	45.8	48.4	58.2	62.4	48.3	54.6	54.8

Source: FT 800, U.S. Bureau of the Census; OBR, U.S. Foreign Trade Annual.

The Puerto Rican position relative to those of other principal suppliers of the U.S. pharmaceutical import market is shown in table 29, above.

INSTRUMENTS

Instruments, including scientific, measuring and control, optical, medical and dental, are another promising growth area for Puerto Rican manufacturing. As noted above, this is a sector to which increased attention will be given.

Data show that for several years Puerto Rican shipments of instruments to the mainland United States were relatively stable at a dollar volume of \$16–\$17 million annually. (See table 30.) Only in CY 1975 did growth begin when shipments doubled to the \$36-million level. The growth continued, reaching \$45.8 million in CY 1976. On the other hand, the Puerto Rican share of the U.S. instruments market has not increased since CY 1969 and

Table 28.—U.S. Imports; U.S. Production; and Puerto Rican Shipments to United States (Calendar Years)

[In thousands of dollars]

SIC number	Pharmaceuticals	1969	1970	1971	1972	1973	1974	1975	1976	1976/1969	Average annual growth (percentage)
2834	U.S. imports	83,000	87,000	119,000	149,000	167,000	211,000	235,000	269,000	3.24	18.3
	U.S. production	5,017,000	5,264,300	5,610,500	6,295,400	6,841,000	7,463,200	8,247,200	9,217,300	1.84	9.1
Schedule P number	Puerto Rico shipments to United States										
54110	Vitamins	—	—	—	2,285	805	1,222	844	3	—	—
54170	Pharmaceuticals:										
	Endocrine, etc.	86	2,431	7,899	16,373	31,003	24,384	54,250	45,372	527.6	244.9
54171	For nervous system	49,315	45,536	62,452	48,786	52,344	32,854	42,943	11,351	0.23	—18.9
54172	Cardiovascular	2,054	13,427	16,072	15,848	22,319	49,395	40,374	31,105	15.1	47.4
54173	Respiratory	2,846	3,176	3,770	3,804	4,584	3,724	12,795	6,165	2.2	11.7
54174	Digestive	62	41,666	8	—	121	111	2,753	11,551	—	—
54175	Skin	1	3	460	573	258	33	545	189	—	—
54176	Vitamins	967	1,251	2,721	1,151	121	1,939	5,298	4,672	4.83	25.2
54177	Parasitic, infective	43	7	3,333	5,339	6,792	6	24,805	44,453	1034	270.0
54178	Veterinary use	2	1,242	428	1,880	1,445	1,681	8,061	6,235	—	—
54180	N.e.c.	22,382	41,859	86,445	132,110	152,598	85,368	89,359	167,312	7.48	33.3
	Total Puerto Rico	77,758	150,598	183,588	228,149	272,390	200,717	281,027	328,408	4.22	22.9
	Total apparent U.S. market	5,177,758	5,501,898	5,913,088	6,672,549	7,280,390	7,874,917	8,781,227	9,814,708	1.90	9.6
	Puerto Rico share (percentage)	1.5	2.7	3.1	3.4	3.7	2.5	3.2	3.3		

Sources: Imports: OBR, U.S. Foreign Trade Annual, table 6, U.S. General Imports. U.S. Production: Census Bureau: Annual Survey of Manufactures, Value of Production Shipped. Puerto Rican Shipments: FT 800, U.S. Bureau of the Census.

remains insignificant at less than ½ of 1 percent. Although individual products may have a larger share of their specialized market, the available data do not allow that determination. Average annual growth rate calculations show that for the period

1969-76 Puerto Rican shipments of instruments to the United States have grown somewhat slower each year than has the apparent U.S. market but even more slowly than the overall growth of U.S. imports of instruments.

Table 30.—Summary for Instruments: U.S. Imports, U.S. Production and Puerto Rican Shipments to the United States (Calendar Years)

[In thousands of dollars]

SIC num- ber	Instruments	1969	1971	1973	1975	1976	1976/ 1969	Average annual growth rate 1969-76 (percentage)
U.S. imports:								
	Optical, medical, and dental equipment	146,000	169,000	305,000	358,000	467,000		
	Scientific, measuring, and control instruments	77,000	78,000	134,000	140,000	161,000		
	Total	223,000	247,000	439,000	498,000	628,000	2.82	15.9
U.S. production:								
3811	Engineering and scientific instruments	1,115,300	1,110,500	1,317,200	1,526,200	1,598,500		
3821	Mechanical measuring devices	1,427,300	1,421,900	—	—	—		
3822	Automatic temperature controls	563,300	594,100	846,400	735,300	996,000		
3823	Process control instruments	—	—	923,800	1,406,300	1,594,400		
3824	Fluid meters and counting devices	—	—	383,500	443,900	508,900		
3825	Instruments to measure electricity	—	—	1,639,600	1,955,200	2,078,300		
3829	Measuring and controlling devices n.e.c.	—	—	601,000	778,600	804,800		
3831 }	Optical instruments and lenses	525,000	411,800	650,400	1,029,900	1,122,300		
3832 }								
3841	Medical instruments	686,000	871,300	1,200,300	1,539,200	1,849,300		
	Total	4,316,900	4,409,600	7,562,200	9,414,600	10,552,500	2.44	13.6
	Total apparent U.S. market	4,559,617	4,673,165	8,018,964	9,948,843	11,226,274	2.46	13.7
	Puerto Rican share	0.4	0.4	0.2	0.4	0.4		

Sources: OBR, U.S. Foreign Trade Annual; ITA, U.S. Department of Commerce; PT 800, U.S. Bureau of the Census; U.S. Trade with Puerto Rico; U.S. Bureau of the Census Annual Survey of Manufactures.

Appendix D.—Selected Bibliography

The bibliography has been subdivided in the following manner:

JOURNALS AND MONOGRAPHS
 PUERTO RICO GOVERNMENT DOCUMENTS
 UNITED STATES GOVERNMENT DOCUMENTS
 BOOKS
 PUERTO RICO INTERAGENCY STRATEGY COMMITTEE

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