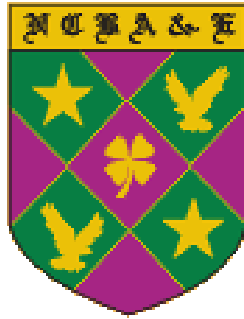


***National College of Business
Administration & Economics
Lahore***



**CONTRIBUTION OF FEMALE HUMAN
CAPITAL IN ECONOMIC GROWTH:
AN EMPIRICAL ANALYSIS OF PAKISTAN
(1972-2012)**

BY

MUSSARAT KHADIJA KHAN

**MASTER OF PHILOSOPHY
IN
ECONOMICS**

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**A dissertation submitted to
Faculty of Social Sciences**

**In Partial Fulfillment of the
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IN
ECONOMICS**

January, 2014



**IN THE NAME OF ALMIGHTY ALLAH
THE MOST BENEFICENT, COMPASSIONATE
AND THE MOST MERCIFUL**

**NATIONAL COLLEGE OF BUSINESS
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Dissertation Committee:

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Administration & Economics

DECLARATION

It is to declare that this research work has not been submitted for obtaining similar degree from any other university/college.

MUSSARAT KHADIJA KHAN
January, 2014

*DEDICATED
TO*

My Parents

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RESEARCH COMPLETION CERTIFICATE

Certified that the research work contained in this thesis entitled **“Contribution of Female Human Capital in Economic Growth: An Empirical Analysis of Pakistan (1972-2012)”** has been carried out and completed by **Mussarat Khadija Khan** under my supervision during her **M.Phil. Economics** Programme.

(Prof. Dr. A.R. Chaudhary)
Supervisor

SUMMARY

This study is to find out an impact of female human capital on economic growth of Pakistan. The study has therefore, used gender separate human capital as an explanatory variable along with other factors, labor force and physical capital. In this regard a composite human has been constructed by taking education and health as a proxy for human capital. The long run and short run dynamics among female human capital and economic growth are empirically tested on time series data spread from 1972 – 2012. Johanson's cointegration approach has been applied for the long run and Vector Error Correction Model (VECM) used for short run relationship. The results show that the relationship between female human capital and economic growth is positive and significant in long run. While in short run female human capital is positively related but statistically insignificant for an economic growth.

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CHAPTER 1

INTRODUCTION

Human capital is a complex concept. It has many dimensions and can be acquired by different ways. A variety of definitions of human capital prevailed in economic literature. In general, it is a combination of the God gifted abilities and the learning of knowledge and skills one acquire and develop throughout the lifetime (Laroche and M'etteet, 1999).

Smith (1776) initially introduced the idea of human capital by incorporating human talent and skill in capital stock of nation as a wealth of individual as well as of the society. This concept did not get much attention by economists till early 60's. Schultz (1962) and Mincer (1962) linked this concept with wage differential and economic growth. Exogenous Growth Theory by Solow (1956) has emphasized the role of labor and capital in economic growth. Though, the human capital has not been included in his growth theory but this framework of economic growth has provided ground for the emergence of endogenous growth theory by Lucas (1988) and Romer (1994). Their work basically has stimulated the interest of other economists in human capital as a determinant of economic growth.

Recent economic literature's interest in human capital generally revolves around the economic growth. Numerous empirical studies have been conducted in this regard, to establish the relationship between human capital and economic growth. Role of human capital has a general acceptance and has been acknowledged being one of the important factors to determine economic growth.

Moreover, human capital is also used as a driving force to attract other factors such as physical capital and technology. These factors are also considered very important to contribute in raising income level. This approach of accumulating physical capital through human capital is more useful and productive for poor countries because effective use of physical capital is possible only with trained and skilled manpower. Accumulation of physical capital depends upon human capital endowment. If there is under investment in human capital, there will be limited or under-utilization of physical capital (Lucas, 1988). He has suggested that poor countries are facing the problem of short of physical capital due to inadequate resources of complementary human capital.

There is consensus regarding the role of human capital in growth process and the means to acquire by increasing educational attainment and improving health status. In contrary, gender separate human capital is quite conflicting regarding its role in economic growth. Birdsall et al. (1997) have more neutral findings and have reported no significant difference between genders regarding their role in economic growth. But Barro and Lee (1994) have concluded in their study that male education has positive influence on economic growth, while female education has negative influence on economic growth. However, Caselli et al. (1996) have opposite findings to that of Barro and Lee (1994).

The conventional wisdom of developed economies is that an investment on female education and health in developing countries is more rewarding compare to investment on male (Knowels et al., 2002). The better use of the world's female population, not only promotes economic growth but also facilitate social uplift of the society. Thus the third (out of eight) millennium development goal is to promote gender equality regarding opportunities. Such equality will empower women socially and economically. It will therefore, help to reduce poverty, enhance human well-being, and ensure sustainable economic growth. The general perception is that the female half of the population is undervalued and underutilized in the growth process all over the world. Therefore, the countries do not explore or capitalize the full potential of one half of their societies and are misallocating their resources. This gender inequality is quite visible in developing countries and is considered as one of the major hindrance in their economic growth (Morrison et al., 2007).

Gender equality means equality in opportunities and access to basic rights. It does not mean equality in output or efficiency. The available opportunities and access to basic right will help to determine the level of human development. The basic components required for development of human capital are education and health. It can be measured by the availability of basic education, health facilities, sanitation and pure drinking water. But unfortunately in developing economies, the development of human capital is not very satisfactory in case of male human development but it is extremely poor in case of female human development.

The equal opportunities of education and health to raise human capital is possible only with proper manpower planning otherwise, there will be wastage of physical capital as well of human resource (Chaudhary, 1978). Investment on human capital is an indicator of a level of human development in an economy. Mostly, it has a positive impact on economic growth. Mass education must assume an integral part of the development strategy so that the under privileged groups also effectively participate in the production process

and the society becomes closer to the ideal of equity and social justice. The developed community has a clear understanding that development planning and implementations without considering and taking into account the gender equality or in case, they may fail to address disparities between males and females will not be effective at all and will face serious cost implications.

The gender inequality index indicates that gender equality of basic rights is weaker in developing countries either due to poor development policies or lack of effective implementation of these development policies compared to developed economies. It restricts the country's economic and social uplift. The role of gender equality has there for, been emphasized as an essential component of effective economic and human development strategies.

Gender inequality not just exists but is a serious issue all over the world irrespective of it that the country is developed or less developed. World's poor are mostly represented by women due to their lack of access to economic opportunities. So poverty alleviation is not possible without the development of female human capital.

Inequality has different dimensions from basic rights to economic and social opportunities, which varies from country to country. There are intra-household disparities as well. These are usually in the form of food distribution, decision making, assets ownership, investment on male and female members etc. In poor households, female children are subject of chronic malnutrition and additional suffering of unequal opportunities to education and health.

Pakistani society is also subject of gender inequality and females suffer from unequal opportunities in health, education, nutrition and in control over productive resources. All these disparities inhibit females to reach their optimum potential and productivity. Male members of the family are preferred in education, quality food for good health and facilities to acquire skill due to their more productive role in the society. So to empower the role of female in a society, it is very important to provide parallel opportunities regarding education, health and acquiring skill.

Pakistan's overall, economic performance in social sector has never been very commendable since its independence 1947. In 1960's, comparatively overall better economic performance has been registered in Pakistan's economic history, which has not been retained. However, after the 1965 war with India, the spending on defense has been increased. While the education and health sectors have faced a sharp cut in their expenditure. The

responsibility of poor performance in basic education can also be put on the nationalization of private educational institutions in 1972.

The social sector is still the most neglected sector of the Pakistan economy. Among South Asian countries, Pakistan has one of the lowest overall public expenditures 2.4 percent of GDP on education and 0.8 percent of GDP on health sectors. Whereas, India spending 3.1 percent of their GDP's on education and 1.2 percent of their GDP's on health. Even Bangladesh is spending 2.2 percent of GDP on education and 1.2 percent on health (UNDP, 2013).

According to Human Development Index (HDI), which is a three dimensional measure of basic achievements in health, education and living standard. Pakistan is ranked 146 out of 186 countries. At the same time, India and Bangladesh are ranked 136 and 146 respectively. As per Gender Inequality Index (GII), which reflects three dimensions of inequality such as, reproductive health, empowerment & economic activity, Pakistan is ranked 123 out of 146 countries. Whereas, Bangladesh is ranked 111 and India is ranked at 132 in the world ranking (UNDP, 2013). It shows that women of subcontinent are far behind men in acquiring empowerment and labor participation.

1.1 STATEMENT OF PROBLEM

Pakistan's social sector is quite neglected with inconsistent economic growth rate. Literacy rate is very low specially, among female segment of the society. Women are generally, subject of economic and social inequalities all over the world. Moreover, the role of female human capital is also debatable in the literature of economic growth. The focus of this study is therefore, to analyze the role of female human capital in economic growth of Pakistan.

1.2 OBJECTIVES OF THE STUDY

This study shall investigate the female human capital participation in economic growth as a case study of Pakistan. There is hardly any ambiguity about the perception of positive role of gender neutral human capital in economic growth but the gender specific human capital is still debatable and controversial in the relevant literature (see literature review for detail). The broad objectives of this study are stated below:

- i) To analyze short and long run dynamics of female human capital on economic growth of Pakistan.
- ii) To suggest appropriate policy measures based on empirical analysis.

1.3 HYPOTHESIS

Following hypothesis is formulated to achieve above mentioned objectives.

H_0 : Female human capital does not affect economic growth of Pakistan.

1.4 ORGANIZATION OF THE STUDY

This chapter gives introduction with some background of the study alongwith objectives and hypothesis to be tested. Chapter two is based on the historical performance regarding policies formulation, implication and achievements in the fields of education and health used in this study to build human capital. Literature regarding the contribution of neutral and specific human capital in economic growth is reviewed in chapter three. This chapter gives the relevant literature and contribution of eminent economists in developing the concept and theories regarding role of human capital (gender neutral and gender specific) in economic growth. In chapter four the theoretical framework and econometric methodology along with data sources is discussed. Empirical findings of the model are given in chapter five. Chapter six summarizes the main findings of the study and present some conclusions and policy recommendations based on these conclusions. Further areas regarding this study for further research are also recommended in this chapter.

CHAPTER 2

OVERVIEW OF EDUCATION AND HEALTH POLICIES IN PAKISTAN

2.1 INTRODUCTION

Economic growth rate of Pakistan on average is around 5 percent since 1947. It has been a mixture of paradox over the last sixty five years. Though some achievements have been made in different sectors of an economy but the economic growth rate has not been very consistent over the period. A brief comparison among neighboring countries has given in Table 2.1. It gives an overview of economic growth rates in the region from 1980 - 2010. It shows that Pakistan's economic growth rate has fallen from 7.3 percent in 1980-84 to 4.43 percent in 2005-10. Whereas, India's economic growth rate has been recorded much lower than Pakistan from 1980-89. But has shown improvement from 4.7 percent in 1990-94 to 8.55 percent in 2005-10. Bangladesh separated from Pakistan in 1971, its economic growth has gradually improved from 3.24 percent in 1980-84 to 6.26 percent in 2005-10. Moreover, its economic growth rate is quite consistent over the period.

Table 2.1
Regional Comparison of Economic Growth (%)

	1980-84	1985-89	1990-94	1995-1999	2000-2004	2005-2010
Bangladesh	3.24	3.20	4.60	5.01	5.43	6.26
India	5.47	5.91	4.70	6.76	5.72	8.55
Pakistan	7.30	6.43	4.54	3.41	4.34	4.43

Source: Constructed by author based on World Development Indicators (2013)

This instability of economic growth rate is due to the inconsistency in policies followed by Pakistan's Governments from time to time and all most each Government prepared a set of new economic policies from the scratch (Zaidi, 2005). Economic Growth Rate in different eras is viewed in table 2.2. It shows the growth rate from 1950 to 2010 and onward.

Table 2.2
Real GDP Growth Rate (%)

Years	Growth Rate
1950-59	3.4
1960-69	6.8
1970-79	4.8
1980-89	6.5
1990-99	4.6
2000-09	4.8
2010 onward	3.6

Source: Economic Survey of Pakistan 2011-2012

The strategies regarding economic policies in different eras are that the first decade after independence from British Government comprising East and West Pakistan (1947-58) was the period of settling down. There was shortage of basic infra-structure and country was facing resettlement of millions of refugees. Moreover, there were tremendous political and economic challenges.

The following decade (1958-1968) was marked as the “era of development”. The economic growth rate during this period was very high though accompanied by regional and income inequalities. Which concentrated wealth in few hands and the scandal of twenty rich families emerged in that era. However during the second half of that era, growth rate was very low due to Indo Pak war in 1965 and political instability.

The economic strategy of new regime after the separation of East Pakistan was based on nationalization and public sector driven national development strategies. Economic growth during this era (1971-77) was relatively low compared to the decades before and after, but fairly adequate under the restricted and controlled public policies.

The next tenure spread from 1977 to 1988. That era was the return of high growth rates but during that period, the role of military increased greatly in the economy, politics and foreign policy. United States’ excessive involvement against Soviet Union’s invasion in Afghanistan involved Pakistan directly or indirectly and in return Pakistan Government gained in the form of foreign aids.

By the end of this era in 1988, an active civilian based democracy emerged and numerous elected governments established but could not

sustained longer. From 1988-99 was the highly unstable era in Pakistan's political history. The economic growth rate was low due to political instability.

Pakistan's economy expanded again during the next regime from 1999-2008. That regime was known for uninterrupted economic activity, little political opposition and large dosages of foreign aid and assistance. But those few years of remarkable growth quickly unraveled.

Since 2008, the economic growth rate has fallen down. The country is in the state of war against terrorism. It has deteriorated the law and order situation in a country and opened number of challenges on economic and political fronts. In present scenario, the local as well as foreign investors are not willing to invest here in Pakistan. Moreover, physical and human capital is also draining out into the regions having better economic opportunities such as Bangladesh, Malaysia.

The most commonly used proxies for human capital are education and health. They enhance the abilities of manpower. It is evident from the modern economic growth theories that coefficient of human capital generally has positive value and play significant role in economic growth theory (discussed in next chapter three). The policies concerning education and health help in accumulation of human capital. In next two sections of this chapter, we have overviewed the education and health policies formulated since independence.

2.2 OVERVIEW OF EDUCATION POLICIES IN PAKISTAN

Pakistan's basic education system was ranked as the least effective system in the world. Pakistan is ranked 103 out of 144 countries in terms of quality of primary education. It is characterized by high illiteracy rate, low primary and secondary school enrolment, high dropout rates and poor quality of education. Whereas, in the quality of educational system is ranked at 75 (World Economic Forum, 2013).

At the time of independence, Pakistan was facing number of social issues, including education. Its population was illiterate and majority of it was belonging to the backward regions of the country. In the circumstances, education was considered the most important factor in the development of newly established country. Resultantly, a National Education Conference was organized in 1947. It was concluded that Universalization of Primary Education (UPE) was the core solution of illiteracy and targeted to achieve by 70's. Since then, UPE remained at the priority of all education policies forwarded by different governments. In this regard, numbers of schemes and

projects have been initiated and considerable resources have been utilized to materialize the objective. But unfortunately, authorities could not achieve all set targets in qualitative and quantitative terms.

After sixty five years, Pakistan still remains largely an illiterate country. Pakistan's current literacy rate 58 percent, is considerably short of the 88 percent, it has been committed to achieve by 2015 MDG target. The gender gap has also been observed in the literacy rate as male at 69 percent and 46 percent for women. Apart from gender, there is also regional disparity. It has urban and rural discrimination. Urban areas have literacy rate of 74 percent, compared to rural area having literacy rate of only 49 percent. Moreover, regional inequality can also be extended to provinces. In this regard, Punjab and Sindh have literacy rate at 59 percent following Khyber Pukhtun Khwa having only 52 percent and 46 percent in Balochistan (Economic survey of Pakistan, 2013).

Federal Ministry of Education was responsible for the development, formulation and coordination of national policies, programs and plans along with the developing whole curriculum. While policy implementation, was the responsibility of the respective regional and local administrations. Provinces have developed education departments to administer the respective education policies. While, Educational institutions situated in federal areas and controlled by federal Government are still controlled and administered by the Federal Ministry of Education.

In 2010, the 18th Amendment in Constitution has passed by the parliament to devolve the administrative power from central to provincial governments. It has given more independence and autonomy to the provinces in several areas such as education being one of them. Thus each province is now free to make their policies independently with minimum federal coordination (Economic Survey of Pakistan, 2013).

Variety of education policies, Plans and schemes have been formulated to promote education. However, history of education has reviewed that the repetition of targets and objectives is a common phenomena among all efforts. Nothing has been learnt from past by making same mistakes over the period. Thus the plans and policies have not been very successful by achieving set targets. The salient issues regarding educations are highlighted below along with plans to meet their targets.

After independence (1947), National Education Conference (NEC) was the first ever effort in the field of education. The emphasis was on primary, secondary and adult literacy. Due to high illiteracy rate, the objective of adult

literacy was introduced to bring awareness of education among masses. This conference stressed to provide adult education at a wider scale along with primary education. Adult education was required to complement primary education. This system of education was new but it was realized that it would increase enrolment in primary education and help to achieve the objective in a period of 25 years. The Committee on adult education has identified some issues regarding lack of trained teachers for adult schools, non-availability of materials and literature required for adult schools and special instructions and teaching methodologies for adult education. The target of first years, were for hiring and training of teachers to make 500,000 persons literate (Bengali, 1999).

First six year Educational Development Plan was launched in 1951. It provided the requirements in various fields of education and explained identified problems and constraints facing to full fill the educational tasks. The major constraint highlighted was that of shortage of trained teachers along with school buildings, teaching aids and scientific equipments.

The efforts of the first decade 1947-57 could not produce the fruitful results in achieving desired targets and reviews analyzed that the literacy rate has not changed. But it has actually declined with a very little margin of 0.1% from 16.4 percent in 1951 to 16.3 percent. The analysts put responsibility of such failures on administrative and organizational inefficiencies.

The First Five Year Plan (1955-1960) was delayed and launched in December 1957. Plan proposed to increase the number of school up to 20000 by establishing 4000 new schools during the plan period. The requirements were therefore, increased by the expansion of schools. Accordingly, it was proposed to increase the number of trained primary school teachers to meet the new requirements. By establishing new school, the enrolment rate were expected to increase from 43 to 49 percent but in actual was attained only 36 percent by the end of the plan.

The Second Plan (1960-65) proposed to raise the proportion of school going children up to 50 percent by the end of the plan. In this regard 15,200 new primary schools were plan to cater the requirements. These efforts were made to raise the primary enrolment rate above 50 per cent. This era is also special for paying attention on girl's as well as on boy's education. More attention was emphasized on primary education program for girls and was observed that less than one fourth of primary school going children, were girls. Next plan (1965-70), revised the target up to 70 percent by 1970. However, the enrollment rate dropped to 39 percent in 1970.

As per population census 1972 of the Pakistan (without east), country's overall literacy rate was about 22 percent. While urban literacy was three times higher than rural. Similarly male literacy was also three times greater than female literacy rate. The worst was of rural female, it was only 4.7 percent (Bengali, 1999).

The 1972 - 80, Education Policy aimed to eradicate illiteracy. In this regard no time frame work were planned but suggested to control it at the earliest possible through already proposed policies of adult education, free elementary education and universalization of education all over the Pakistan. The low girl child enrolment was also identified specially in primary school. It was therefore, recommended to increase the female primary school enrolment along with increase in female teachers to achieve the desired objective of enrollment. But during the process, the policy was overtaken by the military coup in 1977 and the military regime changed priorities according to their objectives. The 1979 education policy was presented one year after the launching of the Fifth Five Year Plan. In 1980's, lot of initiatives were taken in the field of education and literacy. The literacy commission was also established in 1981.

The Sixth Five Year Plan (1983-88) also claimed education being the most important investment to support any socio-economic development program. The past performance was reviewed the reason that Pakistan was ranked lower among development indices. Pakistan's literacy rate was very alarming, it was registered below 25 percent and only 50 percent of the children in primary school going age at time were enrolled in schools.

National Literacy Plan 1984 -86, was launched specifically to raise the literacy rate by establishing new literacy centers. It was expected to raise the literacy rate about 7 percent to achieve on average 33 percent during that plan. Though the Federal Government was responsible for the whole plan but the concerned Provincial Literacy Council were supposed to assist the Federal Government. It included projects, which are short listed below:-

- i) Evening Schools
- ii) Iqra Projects
- iii) Voluntary Teacher Program
- iv) Masjid School
- v) Volunteer Literacy Projects of NGOs
- vi) Literacy Projects by Social Welfare Agencies
- vii) Literacy Village Program

The next Five Year Plan from 1988- 93, the literacy rate was estimated to be about 80 per cent during the proposed plan. It was also recommended to provide an equal access to school to each and every child and would ensure that school going children would not be deprived of one of their most important basic right of education due to an absence of education unit within their reachable range. But the plan did not work and the desired literacy rate could not achieve due to unrealistic targets and higher population growth rate. Moreover, drop-outs also increased the number of illiterates every year.

The Eighth Five Year Plan (1993-98) again highlighted the importance of education for economic development and also being the basic right of each and every child, irrespective of gender, regional and religious discrimination. But plan failed again to achieve the goals and could enroll only 50 percent of girls and 80 percent of boys of the school going age. Moreover, the adult literacy rate was hardly 35 percent.

It was acknowledged in the Education Policy for (1998-2000) that the economic, social and political uplift of a society or a nation could not be possible without education. It was also claimed that the overall strategies from 1947 to 1997 were based on ineffective existing system and there were successive failure of every plan. The Policy was recommended to establish new primary schools through all possible formal, non-formal and religious sources. It also proposed to upgrade existing system by introducing evening schools in already existing primary schools and must be supported by hiring new competent staff to meet the requirement. The expenditure was accordingly proposed to increase 90 percent of existing allocation of 2.2 percent of GNP. It was expected to increase the primary school enrolment up to 90 percent till 2002.

The common feature of all education policies and plans was that they claimed and emphasized on the importance of education with optimism of success. But all of them failed to achieve their objectives, except Second Five Year Plan. The target of 100 percent gross as well net primary school enrolment has not been achieved so far. The total net enrolment for primary education was 56 percent during 2010-11. The percentage of male enrolment (60 percent) was 13 percent higher than female enrolment (53 percent). While, total gross enrolment was 92 percent during 2010-11.

The literacy front has also shown almost similar results due to flawed system and unrealistic or unachievable targets. The targets were therefore, not fully achieved. The objective to achieve 100 percent literacy proposed in first Education policy (1959) could not be achieved till 2010-11. The latest Education Policy (2009) has not targeted to raise literacy rate up to

100 percent but proposed a target bit realistic up to 89 percent by the end of 2015. Whereas in actual the literacy rate was 58 percent till 2010-11. Male literacy rate was higher at 69 percent compare to female at 46 percent. Similarly, there was disparity among urban and rural literacy rates from 74 percent to 49 percent respectively.

The regional and gender based discrimination along with shifting of educational goals and targets have not restricted the achievements regarding enrollment and literacy rate but has also slowed down the development of human capital and so the economic growth.

2.3 OVERVIEW OF HEALTH POLICIES IN PAKISTAN

Health sector has shown an improvement through its indicators over the last sixty five years. In 1947, the average life expectancy was 34 years and it gradually improved over the period up to 65 years in 2011. Though the health indicators have shown progress but still health status of Pakistan is very poor. While neighboring countries, India and Bangladesh's performance in health sector is better than Pakistan.

At the time of independence, most of the population had not an excess to basic health facilities and pure drinking water. There was only single medical college. Due to number of serious challenges to the Government, health sector did not get much attention and did not show any improvement till 1951. (Lashari, 2004)

Table 2.3
Health Sector Achievements (1970-2000)

Details	1970	1980	1990	2000
Registered Doctors	6300	28100	68900	110500
Registered Nurses	2900	9900	24100	49000
Hospitals	521	651	823	912.6

(Source: Economic survey 2012 – 13)

Historically, five year plans had played more powerful role as a policy instrument in health sector compare to health policies in Pakistan. The first formal health policy in country was announced in 1990. From about last twenty years (1990-2009), four formal health policies have been announced. A committee was established to implement and make the first health policy successful. It was directed to submit implementation report direct to the Prime

Minister for timely measures. According to the 18th Amendment in the Constitution to dissolve powers of centre, to provinces, health responsibilities were also transferred to provinces to ensure better health services (Economic Survey of Pakistan, 2013)

The First Five-Year Plan (1955-60) based on a comprehensive policy for the health sector, but could not be successfully implement due to absence of qualified and competent personnel and financial mismanagement by delaying disbursement of funds. In the next Plan (1960-65) there was improvement in health performance. It was planned to establish three new medical colleges to increase the number of doctors and nearly 200 Rural Health Centers (RHC) were planned to provide basic health facilities to rural sector. Major achievements were the plan launched to eradicate malaria and remarkable results were achieved against a move for smallpox.

The Third Five-Year Plan (1965-70) was mixed regarding its achievements. The health indicators had shown some improvement but local health service was not very satisfactory on the preventive side

The Fourth Five-Year Plan 1970-78 was consisted on to two parts of (1970 -72) and after 1972. First part was of political as well as of economical instability. However in the second part, the health expenditure increased which caused expansion in the health facilities and contributed in achieving health objectives during the plan period. Health expenditure was increased only 0.25 percent of its GDP from 1970 - 72 to 1977-78. Malaria control program was revived and in 1976, Pakistan was first time declared free from smallpox. To extend the health facilities all over the Pakistan, 9 more medical colleges were established with an increased capacity from 3100 additional enrolments annually. Nurses were also increased to almost double during the plan period. Drug Act was another land mark in the history of Pakistan's health policies. It was introduced in 1976, which also modified the Generic Drug Scheme of 1972.

The Fifth Five-Year Plan was presented in (1978 -83). It was planned to reduce infant mortality rate from three digits to double digits and life expectancy was also plan to increase. But unfortunately both the targets could not achieve. Moreover, efforts to increase the medical related manpower were also not fruitful and restricted the estimates, to be much below the targets.

The Sixth Plan (1983-88) could also not achieve targets. The reason was identified that the health care goals were exaggerated and estimates were not realistic. The next Plan was from 1988 to 93, it introduced targets like controlling infant mortality at birth and increase in life expectancy by

providing better health facilities without any discrimination. But unfortunately, the objective could not fully achieve. However, some gains were made but the plan was not successfully implemented along with a high rate of population growth of around 3% per annum.

The Eighth Five-Year Plan (1993-98) was planned parallel to health policy (1990). Both concentrated on family planning along with maternal health care. However, policy preferred curative care at the cost of preventive health care

The first National Health Policy of Pakistan (1990), showed commitment by raising health expenditure to 5 percent of GDP. The policy focused on basic health requirement such as pure drinking water, sanitation and family planning at universal level. The policy aimed to render health services on equality bases. Maternal health and nutrition also got attention during that period. But the targets could not achieved due to over-estimated targets and financial constraints as the health expenditures did not increase according to the commitments.

The policy of 1990 was declared unsuccessful because it could not deliver basic health facilities equally. Failure of 1990's health policy, gave justification to introduce the new health policy in 1997. The main purpose of this policy was to address ongoing health issues, comprised of AIDS, cancer and diabetes. Moreover, an increasing traffic hazards and economic and social stresses, caused road accidents, mental and social diseases. Several health programs initiated to meet new fronts opened for health care. But unfortunately the policy could not meet the targets and was turned down by the new policy of 2001.

The National Health Policy of 2001 was also based on to deliver equitable health services named health for all. This approach targeted health issues like prevention of child hood diseases, Hepatitis and AIDS and no gender and regional inequalities in health care service. The emphasis was on preventive rather than curative measures for health care. The policy also planned to bring awareness of health care among masses and to meet all these targets and objectives, it was planned to remove weaknesses at managerial and professional level.

The policy was not successfully implemented. Which restricted, it to achieve only limited targets. The extended plan could not be handled properly to get desired results.

In 2004, the five year plan was renamed as Medium Term Development Framework (MTDF) by Planning Commission of Pakistan. The first MTDF was launched in 2005. The main objective of this frame work was to provide health service at grass root level and bring equality among regions. Public health facilities were arranged by respective ministry at federal level and through departments at provincial levels.

Ongoing health policy 2009, planned to deliver better health facilities as well as to remove all those elements creating problem in delivering health service to every individual. To ensure the quality of health service, competent and devoted medical staff were planned to arrange. The emphasis was also laid to provide latest health equipment and technology for better health services. Moreover, financial management along with efficient administration was also planned to make the plan successful.

The National Health Policy of Pakistan 2009's plans and policies are under process to provide an improved health care service to every individual. The authorities are seemed quite committed to deliver it in letter and spirit.

CHAPTER 3

LITERATURE REVIEW

There is a vast literature available on theoretical and empirical studies of economic growth. It has numerous determinants and continuously expanding in different dimensions. It ranges from neoclassical exogenous growth models Solow (1956) and Swan (1956) to endogenous growth model Romer (1994) to empirical estimation. The studies have become more specific and refined by incorporating variety of variables and using advanced estimation techniques.

There is a general perception that economic growth is not possible without accumulation of economic growth. But early growth theories mostly used labor and capital as the main determinants of economic growth. Emphasis on human capital being a determinant of economic growth has started in late 1980's and early 1990's and have further extended to gender neutral and gender specific human capital. We will briefly review the role of gender neutral human capital in growth models.

3.1 GENDER NEUTRAL HUMAN CAPITAL IN GROWTH LITERATURE

Lucas (1988) has emphasized the role of human capital along with labor and physical capital as inputs in his endogenous growth theory. He considered that economic growth could not be achieved without accumulation of human capital and argued that the economic growth rate varied among different countries because the difference in their capital accumulation. In 1998, he developed growth model by using Solow (1956) model based on same assumptions that economy consisted on identical individuals with objective to maximize their life time utilities. He just replaced technology with human capital. While individuals have freedom to allocate their time between acquiring skill to improve their efficiency or they might prefer to work. Lucas proposed the model:-

$$y_t = AK_t^\alpha (u_t h_t L_t)^{1-\alpha} h a_t^\gamma \quad (3.1)$$

U_t indicates that how much time an individual has allocated to work at time t and existing level of human capital at time t has been represented by h_t .

Lucas (1988) has taken primary education as a driving force to accumulate human capital and has considered as an additional determinant of economic growth along with labor and physical capital.

The most promising empirical growth study which has considered human capital as determinant of economic growth is by Mankiw et al. (1992). The model has an empirical implication of Solow (1956) and Swan (1956) theoretical growth model. They have assumed a Cobb-Douglas production function having conventional variables labor and physical capital along with human capital as main inputs. Population growth rate and technological progress have taken as exogenous determinant of economic growth. The general form of augmented human capital given below:-

$$Y_t = K_t^\alpha H_t^\beta (A_t L_t)^{(1-\alpha-\beta)} \quad (3.2)$$

Mankiw et al. (1992) have assumed a production function exhibited constant returns to scale but diminishing returns to production factors. The augmented growth model has better explanatory ability than conventional growth model and has shown higher human capital elasticity of growth compare to other inputs. More importantly, they have found that human capital accumulation has positively affected the level of income per worker and in the transition to the steady state economic growth.

The concept of capital has broadened by including human capital. Similarly, human capital has also extended by including health along with education as components of human capital. Knowles and Owen (1995, 1997) have applied extended human capital in their models based on Mankiw et al. (1992)'s model.

The most promising contribution through empirical research in the literature of human capital and economic growth has been conducted by Barro (1991). His research work on growth theory has not been categorized entirely as an empirical research. He has also derived few theoretical models to support his justification about the variables to be added in the growth model. Though the proxies used for these variables have not been theoretically justified. Barro has discarded the unconditional convergence theory as the evidence has not been supportive of this absolute convergence. As per convergence theory, developing countries have not grown faster than developed economies. Barro (1991) has therefore, developed growth model in which initial income level and initial human capital level, equally influence economic growth. Regression results have supported the model and growth rate has been found positively

related to human capital. Proxy used for human capital is the enrolments at secondary school level.

Bernanke and Gurkanak (2001) have re-examined the Mankiw et al. (1992) framework and has different conclusion. They have also applied OLS method and used a Cobb - Douglas production function having same variables and also have same proxy used for human capital in the Mankiw et al. (1992) framework. The results have not been similar to augmented version of Solow (1956) model developed by Mankiw et al. (1992). It has been found that the growth rate has shown long run relationship with behavioral variables (like saving rates). So the results have ended up in the support of long run endogenous growth theory.

Wang and Yao (2001) have found that China's sustained growth has not an outcome of just accumulation of factors of production but also caused by total factor productivity (TFP) growth in the post reform period of 1978 to 1999. This study has applied growth accounting technique by taking growth of all inputs labor, capital and human capital but growth in TFP has been represented by the residual. An average year of schooling has taken as a proxy for human capital. They have concluded that during the pre-reform period (1953 to 1977) TFP has negative effect on growth and factors accumulation have contributed in growth. But post reform growth has not been only due to factor accumulation, it has also been supported by TFP growth.

Duma (2007) has analyzed the sources of growth in Sri Lanka. His study has comprised on annual data from 1980 to 2006. His has applied growth accounting technique at augmented growth model. The total output as a proxy of growth, has taken as an explained variable. While, explanatory variables have been growth of all inputs such as labor, physical capital and human capital. Moreover, the unexplained variations as total factor productivity in the model have been represented by residual in the equation. Author has not taken, average years of schooling as a proxy for human capital but has constructed a variable with different process and have concluded that it has a very little contribution in economic growth. The study over the period from 1980 to 2006 has represented that after the major contribution of unexplained variations of 46 percent, growth of physical capital has contributed 27 percent in economic growth. While, labor has contributed 17 percent and human capital has contributed only 10 percent in economic growth. The findings have been supported by the reality that mechanization in early 80's, have replaced the labor intensive production techniques with capital intensive ones.

Abbas and Foreman-Peck (2008) have estimated the effect of human capital on economic growth of Pakistan by using co-integration techniques

from 1961 to 2003. In this study, they have used two separate proxies for human capital, one is the secondary school enrolment and another is health expenditure have been taken as a percentage of GDP. They have concluded that physical and human capital has positive influence on economic growth with higher investment on health.

Madsen et al. (2008) have a study on Indian growth using a data set from 1950 to 2005. They have used augmented production function to find an evidence of endogenous growth in India. Their endogenous growth hypothesis has not strongly supported by findings that the TFP and research activity have no long run relationship. They have also identified an international influence on Indian economy.

Qadri and Waheed (2011) have used composite human capital. Their study has supported the finding that human capital has long run positive relationship with economic growth in Pakistan. They have used health expenditure and primary enrolment as proxy for human capital in their study and concluded positive influence of human capital on economic growth. The focus of their study has been to address the health and education sectors of the economy simultaneously.

Rehman et al. (2012) have tried to fill the gap in literature regarding role of human capital in economic growth of Pakistan. They have used two separate proxies, health and education for human capital. Results have shown the strong evidence of positive relationship between human capital and economic growth. They have therefore, recommended to spend more on human capital to achieve a sustained economic growth in Pakistan.

3.2 GENDER SPECIFIC HUMAN CAPITAL IN GROWTH LITERATURE

Female and male education and health have been used in number of micro studies to analysis their social impact. According to Blau (1986), Cain and Weininger (1973), fertility has been decreased due to increase in female education. Educated and healthy mothers have positive influence on the health and education and welfare of the next generation of their children (Behrman and Deolalikar, 1988, Schultz, 1988 and Behrman et al., 1999). Fall in fertility rate has caused increase in average life expectancy and lowered infant mortality rate (Blau, 1986, Behrman and Deolalikar, 1988). As per Psacharopoulos and Patrinos, (2002), rate of return's analysis in Microeconomic has also supported the benefits of female education. The study

has concluded positive returns to education, while female education returns relatively higher than male.

Benavot (1989) has realized the shortcoming of the literature that models developed to find the effect of education on economic growth have not properly addressed the gender issues. Barro and Le (1994) has an extensive often cited research on role of human capital on economic growth. They have found that, economic growth has not an identical influence of both male and female human capital. Male education has influenced positively economic growth, while in contrary, female influenced economic growth negatively. The finding has implied that investment on female education would lower the economic growth.

Stokey (1994) has suggested an alternative explanation for this puzzling result. Lorgelly and Owen (1999) have tested the validity of Stokey's finding empirically. Barro and Lee (1994) model has not been constructed on detailed diagnostic testing to know authenticity of the model and reliability of the coefficient.

Barro (1996a, 1996b) and Barro and Sala-i-Martin (1995) have used Barro and Lee (1994) model, with its variations by employing variety of variables for the proxies of human capital. They have used secondary and higher education for male and female separately along with life expectancy for human capital. They have similar results as concluded by Barro and Lee (1994) that male education (secondary and higher) has positive and significant coefficient, while the female education (secondary and higher) have negative and significantly coefficient. Moreover, the later contribution of Barro and Lee (1996) and Barro (1997, 1998, 1999), with revised updated data have surprisingly different results showing that the female education has not even significantly related to the growth.

Barro and all his supporters have agreed on the notion that the economic growth would fall in case of increase in female education. At the same time few others economists Birdsall et al. (1997) in this regard, have totally different findings. While some others have found quite opposite. Caselli et al. (1996) have identified an inconsistent estimation in gender specific human capital literature. Their working has based on augmented Solow (1956) growth model, following Mankiw et al. (1992) and in line with Barro and Lee (1994).

Caselli et al. (1996) have concluded that the female education has affected human capital growth and fertility rate. It has been documented that an adverse female education and fertility rates relationship and fertility rate and growth rate have also equally strong negative relationship. While male

education has only human capital effect. They have therefore, openly admitted that no theory has consistency regarding signs for male and female human capital.

Dollar and Gatti (1999)'s finding has supported the argument of gender inequality to be harmful for growth. Their study has used different proxies of education as a human capital and has used the percentage of female and male population for whom primary or in some cases secondary school education is the highest level of educational attainment. They have estimated the relationship between genders based human capital and economic growth for less developed and more developed countries and the whole sample. They have found weak and negative male education and weak but positive female education coefficients in estimating, the growth equation for the full sample. More developed economies have negative and not significant coefficient for male secondary education. While positive and significant coefficient have been estimated for female education. It has led them to conclude that the gender inequality is harmful for growth, entirely opposite of Barro and Lee (1994)'s findings. They have suggested for more investment on female education and health to achieve higher economic growth in developing countries.

Sufficient literature is not available regarding the impact of gender specific (female and male) health index on economic growth. The reason may have been the limited access to the health related data for male and female separately. The data available may have not been from some authentic source. In nutshell, very few studies have considered the role of aggregate health in promoting economic growth. The proxies used to measure health indicator include life expectancy, infant and adult mortality.

Lorgelly (1999), has followed the proxies used by Knowles and Owen (1995, 1997), for the female and male health capital index. They have considered average life expectancy of male and female at birth. Lorgelly(1999) however, has admitted the problem of high correlation between female and male health capital measures. She has also shown her reservation about the quality of gender-separate data. Sen (1990) has also expressed the similar concerns about the reliability of the data on female life expectancy. So it would create problem in making some conclusion from working based on such data.

Cooray and Mallick (2011) in their study have concluded that the female human capital stock is influencing economic growth negatively similar to the results in Barro(2001) and have suggested that it has imperative for South Asia to encourage the skill levels and education opportunities for females, in order to maximize the effect of FDI on economic growth. High priority therefore, should be given to female education to maximize the effect of FDI on

economic growth. The female human capital stock has not sufficient threshold required for the transfer of technology through FDI.

Chaudhary et al. (2012) have analyzed that the gender discrimination and an inequality has a negative impact on the growth of an economy of Pakistan. They used composite gender inequality index including educational index, labor participation index and survival index by assigning equal weighting to all three indexes. The results have shown that all variables are significant. While, the factors input labor force, investment on physical capital and globalization have healthy but an adverse effect of gender inequality on economic growth of Pakistan.

Thus the variations in conclusions have kept the issue of gender specific human capital as a determinant of economic growth to make evolve further.

CHAPTER 4

THEORETICAL FRAMEWORK ECONOMETRIC METHODOLOGY AND DATA SOURCES

4.1 THEORETICAL FRAMEWORK

Numbers of model were developed to incorporate the impact of human capital on economic growth. Lucas (1988) stated that the role of human capital was very vital in economic growth of developing economies. Because the physical capital restrained to flow from developed countries to poor countries due to their relatively poor endowments of complementary human capital. This kept the level of economic growth low in developing economies.

The growth models were therefore, extended to study the impact of human capital on economic growth. Romer (1990) and Barro (1991) considered human capital the major factor influencing economic growth of a country. While Benavot (1989) investigated, gender based impact of human capital on economic growth and found that both female and male primary enrolment rates have a positive and significant effect on development. Barro and Lee (1996) widened the measure of human capital by including both education and life expectancy as the proxy of human capital. They had also contributed in gender separate human capital (education) and its effect on economic growth.

The focus of this study is to analyze the effects of female human capital on economic growth of Pakistan. Growth model is constructed with segregated human capital (male and female) as explanatory variables. The female human capital and male human capital are composite averages of education index and health index (Construction details are given at appendix B).

Economic growth is the dependent variable and the most commonly used proxy, gross domestic product is used for economic growth in this study. Similarly, the gross fixed capital formation is used proxy for physical capital input. While data for total labor force is used to incorporate the labor input.

Production function is thus specified where, economic growth is denoted by (GDP) is assumed to be a function of physical capital (Cap), labor force (Lab), female human capital (Fhc) and male human capital (Mhc).

$$GDP_t = A_t (Cap_t^{\beta_1}) (Lab_t^{\beta_2}) (Fhc_t^{\beta_3}) (Mhc_t^{\beta_4}) (e^{et}) \quad (4.1)$$

GDP_t = Economic Growth at time t

Cap_t = Physical Capital at time t

Lab_t = Total labor force at time t

Fhc_t = Female Human Capital at time t

Mhc_t = Male Human Capital at time t

e^{et} = Error term

Equation (2) is a linear expression of equation (1) by taking log on both sides. Log of GDP is denoted by lower case variable lgdp. Similarly log of Cap, Lab, Fhc and Mhc are denoted by lcap, llab, lfhc and lmhc respectively.

$$\lg dp_t = b_0 + b_1 lcap_t + b_2 llab_t + b_3 lfhc_t + b_4 lmhc_t + e_t \quad (4.2)$$

where b_0 is constant, b_1, b_2, b_3 and b_4 show that how much economic growth will change due to change in factors input Physical capital, labor force, female and male human capital respectively.

4.2 DATA AND DATA SOURCES

The data for study is a time series data covering the time period from 1972 to 2012. It starts from 1972 due to structural break of Pakistan's economy by separation of East Pakistan.

The explained variable is gross domestic product denoted by GDP. It is a proxy for economic growth. It has gross value added by all domestic producers in the economy. Data for GDP is in local currency of Pakistani rupees and collected from World Bank (2013) at constant price.

Gross fixed capital formation is a proxy for explanatory variable physical capital (Cap). It has included all physical assets as plant, machinery and equipments. Data for Cap is in local currency of Pakistani rupee and collected from World Bank (2013) at constant price. Another explanatory

variable is labor force (Lab), represents the total number of people in working age group, who are willing to work in a particular year.

Female human capital (Fhc) and male human capital (Mhc) are also explanatory variables. They represent composite human capital comprising of education and health. It is an average value of education index and health index. The ratio of weighted school enrollment at different education level and life expectancy are used as proxies of education and health index respectively. Minimum and maximum values (goal posts) are set in order to transform the indicators into indices from 0 to 1. Construction detail of female and male human capital is given at appendix B.

Data for enrollment (male and female) at different level of education is collected from various issues of Pakistan economic issues and life expectancy for male and female for required time period is collected from World Bank (2013).

4.3 ECONOMETRIC METHODOLOGY

The objective of study is to seek long run dynamics and short run dynamics of long run equilibrium between female human capital and economic growth. The time series analysis is therefore, used to capture and examine these dynamics. For this purpose study employs time series econometrics such as cointegration and Error Correction Model (ECM). These techniques examine stationarity of trended data before establishing any long and short run relationship between the variables included in the data.

Most of the macroeconomic time series are non-stationary and are categorized trended. The problem with such data have trend and is non-stationary gives spurious results. The standard regression procedures give unreliable and incorrect results.

4.3.1 Unit Root Test

Standard time series econometrics methodologies assume that the variables included in the econometric model are stationary. Otherwise, the usual statistical inferences are inappropriate and misleading.

The classical regression analysis with non-stationary series is not valid and meaningless. Therefore, it is called spurious. This method of unit root assumes that mean and variance of variable is constant over time but in case of

non-stationary variables mean and variance don't remain constant. They have unit root problem.

The augmented version of Dickey Fuller (ADF) is performed to detect the number of unit roots in each variable. ADF test is based on different regression equations and take the following forms:

1. Without trend and intercept

$$\Delta y = \beta y_{t-1} + \sum_{i=1}^p \gamma_i \Delta y_{t-1} + \varepsilon_t \quad (4.3)$$

2. With Intercept

$$\Delta y_t = \alpha_o + \beta y_{t-1} + \sum_{i=1}^p \gamma_i \Delta y + \varepsilon_t \quad (4.4)$$

3. With Trend and Intercept

$$\Delta y_t = \alpha_o + \beta y_{t-1} + \sum_{i=1}^p \gamma_i \Delta y_{t-1} + \varepsilon_t \quad (4.5)$$

The ADF test for testing stationarity is a one sided test and can use the hypothesis.

$$H_0: \beta = 0 \text{ (} y \text{ } t \text{ is non-stationary)}$$

$$H_a: \beta < 0 \text{ (} y \text{ } t \text{ is stationary)}$$

Reject the null hypothesis if the test statistics is less than the critical value. It implies that the time series is stationary at level. If the hypothesis is not rejected than the time series is non-stationary at level and it requires to take first or higher order difference to establish stationarity.

4.3.2 Johanson Co-integration

After testing and confirming the order of integration regarding stationarity of the variables, the next step is to estimate whether there is a long run relationship between the variables included in the model. In case, the variables in the model are more than three, the Johansen cointegration approach has been applied to investigate the long run relationship.

Johansen (1988) and Johansen and Juselius (1990) have developed a maximum likelihood testing method on the number of cointegrating vectors. It also includes testing procedures for linear restrictions on the cointegrating parameters, for any set of variables. This cointegration is applied by using Vector Auto Regressive (VAR) model.

A general unrestricted VAR model with k lag is presented below:-

$$Z_t = \mu + A_1 Z_{t-1} + \dots + A_k Z_{t-k} + \varepsilon_t \quad t = 1, 2, 3, \dots \quad (4.6)$$

where Z_t is an $(n \times 1)$ vector, μ is $(n \times 1)$ vector of constant terms, $A_1, \dots, A_k$ are $(n \times n)$ matrices of parameters and ε_t is $(n \times 1)$ vector of usual error term and it is independent from all independent variables.

The general VAR model presented in equation (4.5) can be reformulated alternatively in the form of VECM:

$$\Delta Z_t = \mu + \sum_{i=0}^{p-1} \Gamma_i \Delta Z_{t-i} + \Pi Z_{t-1} + \varepsilon_{2t} \quad t = 1, 2, 3, \dots \quad (4.7)$$

where Z_t is an $(n \times 1)$ vector of p variables, μ is an $(n \times 1)$ vector of constant terms, ε_{2t} is $(n \times 1)$ vector of usual error term, Γ and Π represent coefficient matrices and Δ is a difference operator. The coefficient matrix Π is known as the impact matrix and contain the information about long run. Whereas coefficient matrix Γ captures short run impact.

The Johansen's cointegration proposed two test statistics through VAR model. They are used to identify the number of cointegrating vector, namely the trace test statistics and the maximum eigen-value test statistics. The trace statistics tests the null hypothesis that the number of distinct cointegration relationship is less than or equal to ' r ' against the alternative hypothesis that of more than ' r ' cointegrating relationships. The maximum eigen value statistics for testing the null hypothesis of at most ' r ' cointegrating vector against the alternative hypothesis of at most ' r ' cointegrating vectors.

According to Granger (1986), the Error Correction Model (ECM) produces better short run forecasts and provides the short run dynamics necessary to obtain long run equilibrium. The speed of adjustment from the short-run equilibrium to the long-run equilibrium state is indicated by ECM. Its purpose is to show the speed and the direction of adjustment. The VECM has cointegration relations built into the specification so that it restricts the

long run behavior of the endogenous variables to converge to their co integrating relationship, while allowing for short-run adjustment dynamics. The cointegration term is known as the error correction term (ECT). If there is any deviation from long-run equilibrium, it is corrected gradually through a series of partial short-run adjustments. The dynamic specification of the VECM allows the deletion of the insignificant variables, while the error correction term is retained. The size of the error correction term indicates the speed of adjustment of any disequilibrium towards a long-run equilibrium state.

4.3.3 Granger Causality

The usual Granger (1969) causality test for inferring leads in spurious regression results if variables are not stationary at the same levels. After ensuring the stationarity of all variables and establishing the long run relationship among the variables included in the model of study, the Granger's pair wise causality test is applied to establish the direction of causality among these variables. The Granger causality test for the case of two variables Y_t and X_t involves the estimation of the following Vector Autoregressive (VAR) model:

$$y_t = a_1 + \sum_{i=1}^n \beta_i X_{t-i} + \sum_{j=1}^n \gamma_j Y_{t-j} + \varepsilon_{1t} \quad (4.8)$$

$$X_t = a_1 + \sum_{i=1}^n \theta_i X_{t-i} + \sum_{j=1}^n \delta_j Y_{t-j} + \varepsilon_{2t} \quad (4.9)$$

There will be four possible outcomes of Granger Causality test. The first expected outcome may be that both variables X and Y Granger cause each other. Which, we call bidirectional causality. The next possible outcome can be that one variable Granger cause other but not vice versa like, X granger cause Y but Y does not Granger cause X . Similarly, Y Granger cause X but X does not Granger cause Y . This will be called unidirectional causality. The last possibility is neither variable (neither X nor Y) Granger cause each other.

CHAPTER 5

EMPIRICAL RESULTS

In this chapter, we present empirical results of our study. Before analyzing the short and long run dynamics, the unit root test is applied to ensure the stationarity of data and investigate the order of integration. The study is then, proceeded further for cointegration and causality tests.

5.1 ORDER OF INTEGRATION

ADF unit root test is employed to check the stationarity of logarithmic form of GDP (lgdp), CAP (lcap), LAB (llab), Fhc (lfhc) and Mhc (lmhc) at level as well as at first difference. Results with respect to intercept and with intercept and trend are given in table 5.1.

As per results given in table 5.1, the p value of all series except log of male human capital (with intercept) are statistically insignificant and cannot reject the null hypothesis of non stationarity at 5% level of confidence. It indicates that all other variables are non-stationary at level and these variables have unit root problem. The ADF test is than applied at first difference of each variable. The null hypothesis of non-stationary series is rejected at first difference. Therefore, the higher order of integration is not required since log of male human capital (with intercept) at level and all other variables are stationary at first order of integration I(1). The multivariate cointegration test for long run analysis can now be applied.

Table 5.1(a)
Augmented Dickey Fuller (ADF) Test for Unit Root

Variable at Level	With Intercept	P Value	With Intercept and Trend	P Value
Lrgdp	-2.669	0.088	-0.810	0.955
Lcap	-2.028	0.274	-1.492	0.815
Llab	0.041	0.948	-1.808	0.682
Lfhc	-2.099	0.246	-1.761	0.703
Lmhc	-4.354*	0.001	-1.592	0.775

Table 5.1(b)

Variable at First Difference	With Intercept	P Value	With Intercept and Trend	P Value
$\Delta \lgdp$	-4.410*	0.001	-4.862*	0.001
$\Delta \lgcap$	-3.817*	0.006	-4.220*	0.009
$\Delta \lglab$	-6.743*	0.000	-6.662*	0.000
$\Delta \lgfhc$	-6.808*	0.000	-9.221*	0.000
$\Delta \lgmhc$	-7.238*	0.000	-9.604*	0.000

Source: Author's calculations based on Schwarz information criterion (SIC)

* indicates the rejection of null hypothesis of non-stationary at 5% significance level

Diagrammatic expression of log variables and log variables at their first difference after being stationary are given at Appendix-A from Figures A.1 to A.5 and from A.6 to A.10 respectively.

5.2 OPTIMAL LAG LENGTH

Akaike Information Criteria (AIC), Schwarz Information Criteria(SIC) and Hannan – Quinn (HQ)Information all suggest optimal log length of 1 (table 5.2). Thus lag length 1 is used in this study.

Table 5.2
VAR Lag Order Selection Criteria

Lag	FPE	A/C	SC	HQ
0	1.23e-09	-6.32553	-6.11251	-6.24901
1	4.06e-4*	-16.6577*	-15.3781*	-16.19867*

*Indicates lag order by the criterion

FPE: Final Prediction Error

AIC: Akaike Information Criterion

SC: Schwartz Information Criterion

HQ: Hannan-Quinn Information Criterion

5.3 EMPIRICAL RESULTS FOR LONG RUN AND SHORT RUN DYNAMICS

5.3.1 Long Run Dynamics

Johansen co integration is applied to check the long run dynamics between Economic Growth, Physical Capital, Labor Force, Female Human Capital and Male Human Capital. The results of the Johansen co integration test by using the λ trace statistics are given in table 5.3.

Table 5.3
Unrestricted Cointegration Rank Test (Trace)

Hypothesis H_0	Alt. Hypothesis H_a	Trace Statistics	0.05 Critical value	Probability**
$r = 0^*$	$r \geq 1$	130.777	69.818	0.0000
$r \leq 1^*$	$r \geq 2$	59.960	47.856	0.0025
$r \leq 2^*$	$r \geq 3$	30.415	29.797	0.0424
$r \leq 3$	$r \geq 4$	8.979	15.495	0.3672
$r \leq 4$	$r \geq 5$	0.046	3.841	0.8299

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

The results of Johansen's co integration based on λ_{trace} given above in table 5.3 is used to check the co integration vector hypothesis from no co integration vector to higher co integration vectors are tested. As per result of Trace statistics value have reported three co integrating vectors and have rejected null hypothesis no co integration ($r = 0$), at most one co integration ($r \leq 1$) and at most two co integration ($r \leq 2$) against the alternative that $r = \geq 1$, $r \geq 2$ and $r \geq 3$ because test statistics of trace are greater than critical values at 5% significance level. Thus the analysis of data confirms the presence of three co integration vectors and we can conclude that the long run relationship exists between economic growth, physical capital, labor force, female and male human capital.

Table 5.4
Unrestricted Cointegration Rank Test (Max. Eigen value)

Hypothesis H_0	Alt. Hypothesis H_a	Max. Eigen Statistic	0.05 Critical value	Prob.**
$r = 0^*$	$r = 1$	70.816	33.877	0.0000
$r \leq 1^*$	$r = 2$	29.545	27.584	0.0277
$r \leq 2^*$	$r = 3$	21.435	21.131	0.0453
$r \leq 3$	$r = 4$	8.938	14.264	0.2917
$r \leq 4$	$r = 5$	0.046	3.841	0.8299

Max-eigen value test indicates 3 cointegrating eqn.(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

The results of Johansen's co integration based on $\lambda_{\max.eign}$ given above in table 5.4 is used to check the co integration vector hypothesis from no co integration vector to higher co integration vectors are tested. As per result Maximum Eigen value have also reported three co integrating vectors and have rejected null hypothesis of no co integration ($r=0$), at most one co integration ($r \leq 1$) and at most two co integration ($r \leq 2$) against the alternative that co integration is equal and greater than one ($r \geq 1$), $r \geq 2$ and $r \geq 3$ because test statistics of trace as well max. eigen value are greater than critical values at 5% significance level.

Thus the analysis of data confirms the presence of three cointegration vectors and we can conclude that the long run relationship exists between economic growth, physical capital, labor force, female and male human capital.

Table 5.5
Long Run Relationship
Dependent Variable LGDP

	Coefficient	t-statistics	Prob.
C	7.464768	7.135265	0.0000
LCAP	0.325870	4.541037	0,0001
LLAB	0.923998	8.793186	0.0000
LFHC	0.216622	2.625741	0.0130
LMHC	0.046665	1.368120	0.1805
AR(1)	0.502956	5.696728	0.0000

F-Statistics 2384.110 Prob. (F- Stat.) 0,0000

R-Squared 0.9972

Adjusted R-squared 0.9968

As the co integration exists between the variables under consideration, thus the results Obtained from OLS and reported in table 5.4 are reliable. To remove the problem of auto correlation AR(1) the Cochrane test approach has been applied. The result indicates that female human capital is statistically significant and has positive impact on economic growth. The estimates represent that on average 1 percent rise in female human capital brings 0.21 percent rise in economic growth. Similarly physical capital and labor force are statistically significant and 1 percent increase in physical capital as well as in labor force raise 0.33 percent and 0.92 percent economic growth respectively. Whereas, male human capital is statistically insignificant but has a positive impact on economic growth. The estimates indicate that 1 percent increase in male human capital brings 0.05 percent rise in economic growth.

5.3.2 Short Run Dynamics

The Least Square estimation is used under specification of Error Correction Model (ECM), for short run dynamics of long run equilibrium between economic growth, physical capital, labor force, female human capital and male human capital. The preferred Parsimonious result is given in table 5.6.

Table 5.6
Results of ECM for Short Run Dynamics

Variables	Coefficient	t-statistic	Prob. value
C	0.0332	3.0894	0.0045
$\Delta \lgdp(-1)$	0.4174	2.0267	0.0523
$\Delta lcap$	0.1445	2.4262	0.0220
$\Delta lcap(-1)$	-0.1021	-1.4969	0.1456
$\Delta llab(-1)$	-0.1760	-0.7452	0.4623
$\Delta lfhc$	0.0318	0.4694	0.6424
$\Delta lfhc(-2)$	-0.0502	-1.8635	0.0729
$\Delta lmhc$	0.0159	0.7877	0.4375
ECT(-1)	-0.3964	-2.1778	0.0380
R squared 0.3838 R squared 0.2077 F-statistic 2.1801 Prob(F-statistic)0.060			

In the Parsimonious ECM Specification, the coefficient of lag error correction term ($ECT_{(t-1)}$) is significant and carries the negative sign. The negative sign of coefficient of $ECT_{(t-1)}$ indicates the convergence of short run disequilibrium to long run equilibrium. While the value of coefficient shows the speed of adjustment toward the long run equilibrium. The significant coefficient of $ECT_{(t-1)}$ suggests that on average there is 0.39 percent adjustment in the current period (t) to the disequilibrium in the previous period ($t-1$).

The coefficient of physical capital is positive and significant while the coefficients of Female Human Capital and Male Human Capital are positive but insignificant. It implies that on average 1 percent increase in physical capital leads 0.14 percent increase in Economic growth while 1 percent increase in Female Human Capital and Male Human Capital bring .032 percent and .016 percent rise in Economic Growth respectively. Similarly one year lagged Economic Growth also has a positive and significant impact on Economic Growth.

5.3.3 Diagnostic Tests

Diagnostic tests have under taken to check the consistency of the estimation of short run model with the standard assumptions of OLS. The results are reported in Table 5.7

Table 5.7
Diagnostic Tests

Tests	F statistics	Probability
Normality Test Jarque Bera statistics	3.1560	0.2064
Serial correlation Breusch – Godfrey LM test	2.3231	0.1373
Hetroskedasticity White Test	1.8797	0.1008
Model Specification Ramsey RESET Test	0.4906	0.9760
ARCH Auto Regressive	0.0009	0.97601

The Jerque Bera test for normality does not reject the null hypothesis of errors, as the test statistics is not significant and indicating that the residuals from parsimonious short run are normally distributed. The estimates of Breusch – Godfrey also confirms that there is no significant evidence of the serial co relation in residual of short run model. The white test of hetroskedasticity rejects the presence of hetroskedasticity in short run model by not rejecting the null hypothesis of error that there is no evidence of hetroskedasticity. The Ramsey’s RESET test’s results have suggested that the model specification is quite appropriate and the parameters of the model are stable. This is a general test for omitted variables and to test the viability of functional form of the model. ARCH test statistics confirm that there exists no autoregressive serial correlation in short run model.

5.3.4 Granger’s Pair wise Causality

After ensuring the long run relationship among the variables under consideration of this study, the Granger’s pair wise causality test is applied to establish the direction of causality among these variables. The Granger causality test examines the direction of causality among two variables. The results of Granger causality test of are reported in table 5.8.

Table 5.8
Granger Pair Wise Causality Test

Null Hypothesis	F-statistics	Probability
lfhc does not granger cause lgdp lgdp does not granger cause lfhc	0.3232 22.023	0.7260 8.4E-07
lmhc does not granger cause lgdp lgdp does not granger cause lmhc	0.5080 16.7075	0.6062 8.8E-06
lfhc does not granger cause lcap lcap does not granger cause lfhc	3.0656 9.9669	0.0600 0.0004
lmhc does not granger cause lcap lcap does not granger cause lmhc	2.5716 13.3990	0.0912 5.1E-05
lfhc does not granger cause llab llab does not granger cause lfhc	0.0599 4.5087	0.9419 0.0186
lmhc does not granger cause llab llab does not granger cause lmhc	0.3076 8.4216	0.7372 0.0012
lfhc does not granger cause lmhc lmhc does not granger cause lfhc	9.2156 3.3269	0.0483 0.0007

Results indicate that unidirectional causality exists between female human capital(lfhc) and male human capital(lmhc) with economic growth rate(lgdp). It implies that any improvement in economic growth will cause betterment in female and male human capital. While improved female and male human capital will not cause any increase in economic growth. Similarly fixed capital investment and labor force both have positive and significant relationship with female human capital and male human capital. So policies to encourage fixed capital investment will bring improvement in female and male human capital. While improved female and male human capital will not encourage fixed capital investment and labor force as they are not granger caused by fixed capital investment and labor force. However, female human capital and male human capital have bidirectional causality.

CHAPTER 6

CONCLUSION AND POLICY RECOMMENDATIONS

6.1 SUMMARY AND CONCLUSION

The study has been conducted to provide empirical evidence concerning the short run and long run dynamics of female human capital and economic growth. For this purpose, data on gender specific human capital along with labor force and physical capital as inputs to workout male and female human capital contribution separately in the economic growth of Pakistan have been used.

Pakistan is a developing economy. Its economic growth rate has been low and inconsistent. Female segment has been neglected in the society and has been denied fair access to social and economic opportunities. They are mostly deprived of acquiring education and skill. Their health status has also kept their efficiency low. Pakistan's gender inequality indices show extreme gender discrimination with respect to health, education and economic opportunities.

In Pakistan, Public Policies regarding education and health have not been very successful to achieve the desired targets due to poor planning, bad governance and defected implication. Budget allocation, have also been extremely meager resulting in very little contribution to forming human capital.

Relevant literature on the subject examined in this study has supported the positive contribution for gender neutral human capital in economic growth. However, regarding female human capital the literature has been controversial. Mostly education and health indices have been used as proxies for human capital.

The methodology used for long run dynamics of female human capital on economic growth of Pakistan is Johanson's cointegration and parsimonious Error Correction Model for short run dynamics. The Granger's pair wise causality test is used to test the nature of causality among the variables used in this study.

The unit root test based on ADF indicates that all the variables included in model are non-stationary at level and became stationary at their first difference. The variables are therefore, integrated of same order 1(1) Johanson cointegration test indicates that the long run relationship exists among the variables included in the model. Female human capital is significant and positively related to economic growth. The results of this study are consistent with the findings of Caselli et al. (1996) and have not supported the Barro and Lee (1994)'s finding that female human capital is insignificant and negatively related to economic growth.

The results of short run dynamics of ECM parsimonious have suggested that female human capital is a long run phenomena. It is positively related to economic growth but insignificant in short run. The results of Granger's pair wise causality indicates that unidirectional causality exists between economic growth and female human capital. Only economic growth Granger cause female human capital. While, female human capital does not Granger cause economic growth as it is not significant in short run. It may implied that female human capital has not reached thrash hold level where it may cause economic growth.

6.2 POLICY IMPLICATIONS

The suggestions based on above findings indicated that female human capital plays a positive role in economic growth. Public policies should be made to bring gender equality and enhance female contribution in economic growth. Primarily social, economic and political empowerment of women is very important to make their role more effective in economic growth. If female are empowered to make their decision independently they will be able to contribute more in economic and social uplift of the nation.

In this regard it is suggested that equitable employment opportunities should be made available for females. Guidance and counseling services should be made available to acquaint female labor force on the range of jobs for which they can apply and the skill required for opportunities available in the market. There should also be complete elimination of gender discrimination in remunerations to female workforce.

In Pakistan there is no uniform education system at school, college and university level. Different systems are available for different economic classes of the society. There is an English medium, Urdu medium and Madras's for religious teaching. This **practiis** further dividing the nation into segments. So the uniformity of system without gender discrimination will bring equality and

improve the quality of human capital. Similarly another important component of human capital is health. In Pakistan there is also no uniformity regarding provision of health facilities. Public health facilities have been deteriorating over time and private health facilities are unaffordable for the middle and lower income group

History of education and health policies have been critically examined in this study and observed that lack of long term planning and unrealistic targets were the major causes of policy failures. This study has supported that the formation of human capital relies on long term planning and not a short term phenomena. The results have implied that economic growth improves female human capital formation. While formation of female human capital does not influence economic growth.

6.3 FURTHER AREA OF RESEARCH

This study has opened further areas of research such as:

Regional disparities prevail in developing societies. So the role of female human capital in economic growth can be extended to regional level. In this regard, regional ranking of female human capital index can be constructed to identify the areas or regions, where female human resource is not up to the mark and not contributing much for the economic uplift of the area.

Education and health are the important components of human capital. In this study, we have used both education and health as a composite gender separate human capital to identify their role in economic growth. The study can also be extended to use the model based on health and education as a separate explanatory variables to quantify their independent role in economic growth of the country.

Different authors have used different proxies for human capital according to their interests and availability of data. No uniformity is therefore, in their outcomes and results. The study can also be extended to a comparative economic growth study. This study should use different proxies to construct human capital index and analyze the most appropriate proxy for human capital which have greater influence on economic growth of a country.

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APPENDIX-A

Figures from A.1 to A.5 show the evolution of variables over the period under consideration from 1972 to 2011.

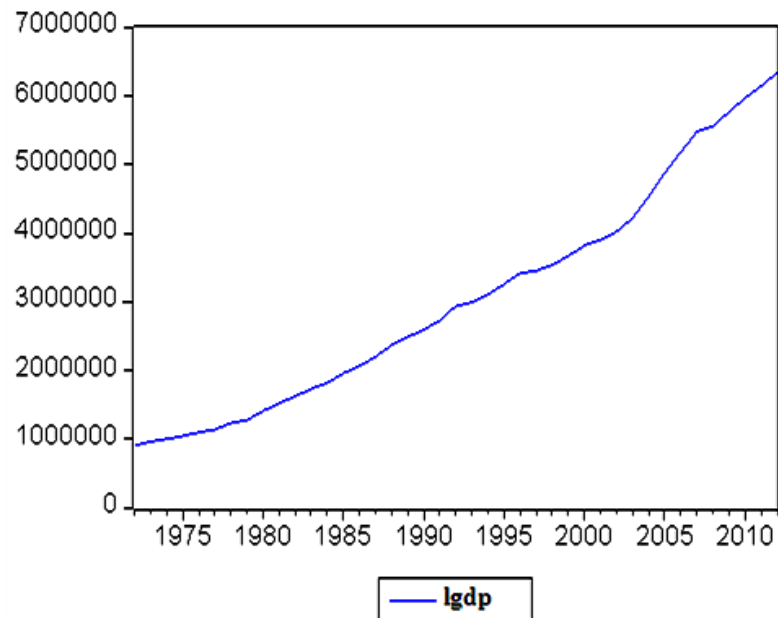


Fig. A.1: Real Gross Domestic Product (GDP)

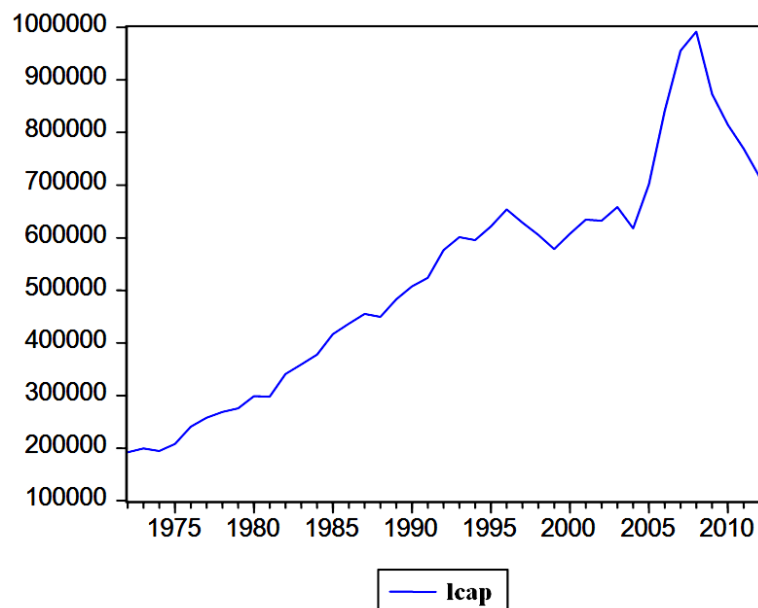


Fig. A.2: Capital (CAP)

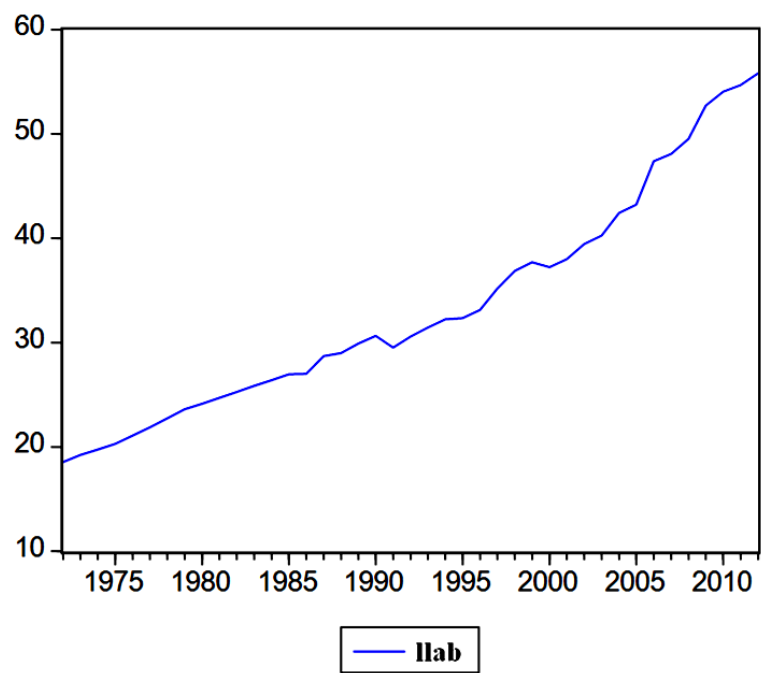


Fig. A.3: Labor (LAB)

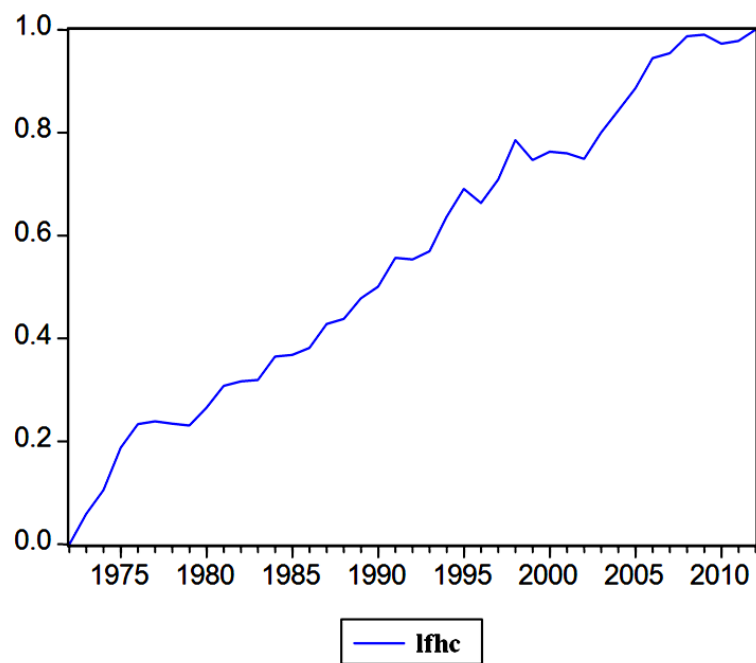


Fig. A.4: Female Human Capital (FHC)

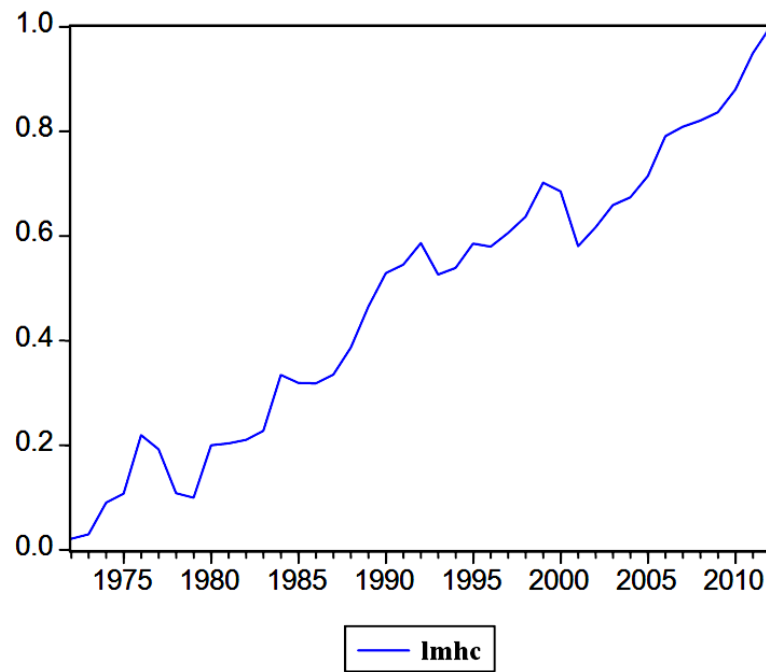


Fig. A.5: Male Human Capital (MHC)

Figures from A.6 to A.10 show the evolution of log variables at their first difference after being stationary.

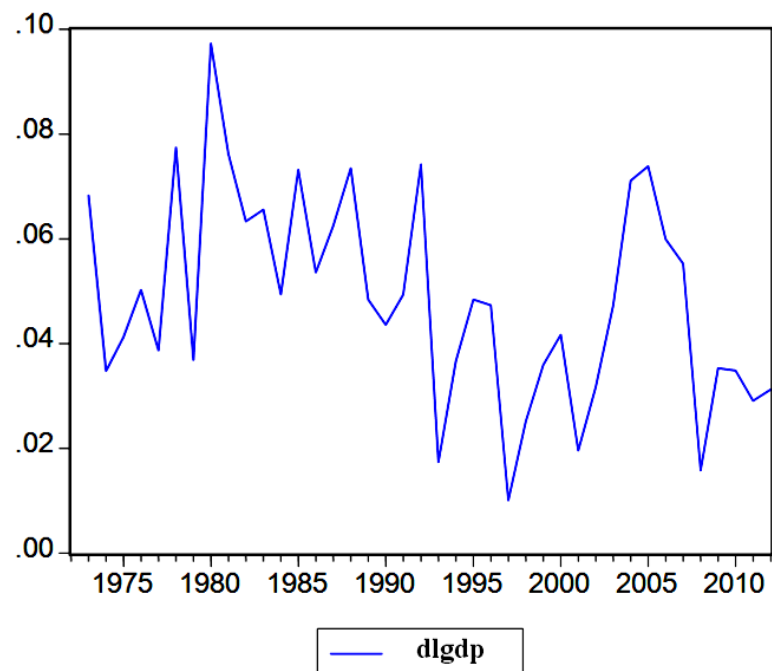


Fig. A.6: Real Gross Domestic Product at First Difference (DGDP)

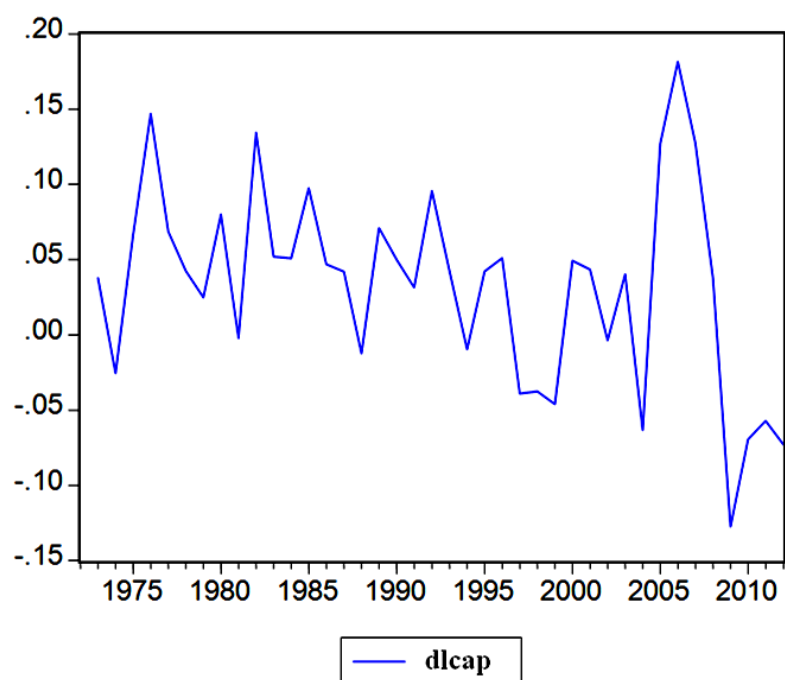


Fig. A.7: Capital at First Difference (DCAP)

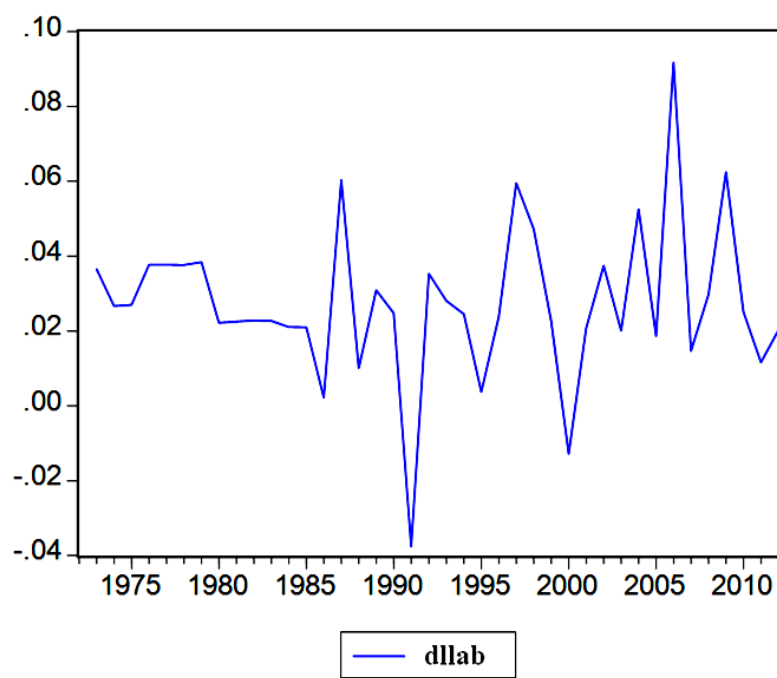


Fig. A.8: Labor at First Difference (DLAB)

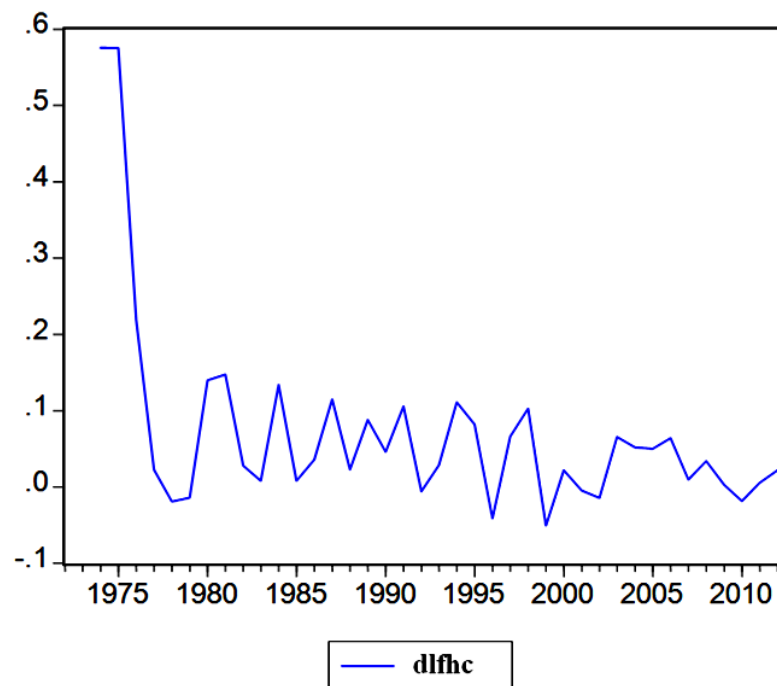


Fig. A.9: Female Human Capital at First Difference (DFHC)

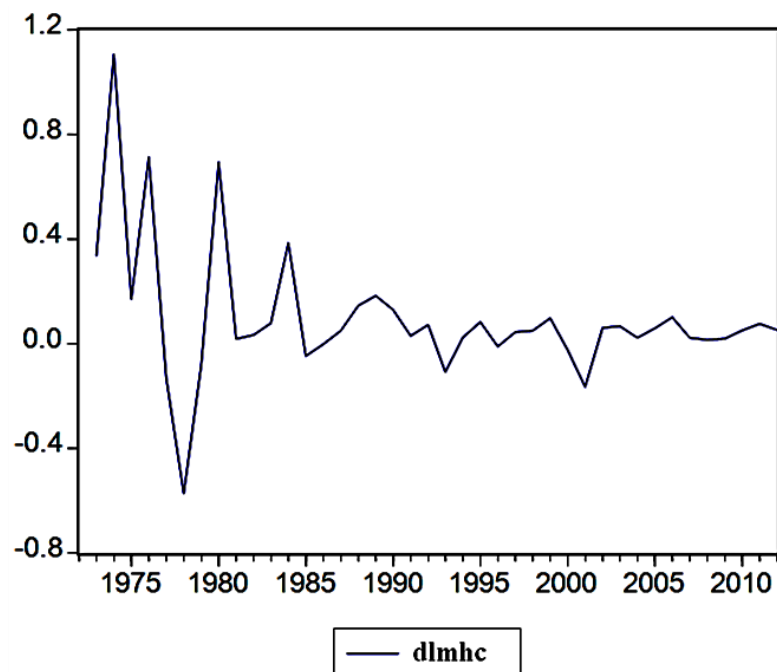


Fig. A.10: Male Human Capital at First Difference (DMHC)

Table A.1
Time Series Data

Years	GDP (Rs. in Million)	CAP. (Rs. in Million)	Labor Force (in Million)
1972	90594.57	19204.97	18.94
1973	96994.41	19945.59	19.61
1974	100428.2	19446.01	20.12
1975	104657.7	20779.88	20.64
1976	110054	24068.34	21.54
1977	114398.6	25778.77	22.48
1978	123606	26898.44	23.46
1979	128251.7	27575.99	24.49
1980	141353.5	29870.92	25.07
1981	152549.7	29805.35	25.65
1982	162522.7	34089.22	26.27
1983	173539.1	35908.3	26.91
1984	182329.2	37780.46	27.45
1985	196171.8	41652.18	28
1986	206964.5	43650.49	28.05
1987	220318.6	45523.9	29.6
1988	237118.5	44961.87	29.93
1989	248879	48271.57	30.87
1990	259975.5	50751.34	31.82
1991	273134.3	52374.96	31.83
1992	294181.8	57631.76	32.48
1993	299352.8	60125.89	33.01
1994	310540.8	59551.38	33.87
1995	325951.7	62117.33	34.18
1996	341749.2	65366.45	35.01
1997	345215.9	62870.44	37.45
1998	354019.8	60549.28	39.17
1999	366977.3	57825.34	40.08
2000	382610.9	60741	40.38
2001	390196.1	63442.3	41.23
2002	402777.7	63213.4	43.01
2003	422297.6	65807	43.88
2004	453414.9	61773.1	45.95
2005	488179.6	70139.2	46.82
2006	518337.1	84097.7	50.5
2007	547794.8	95514	50.78
2008	556537.5	99171.8	52.23
2009	576547	87312.8	55.76
2010	596996	81463.3	57.22
2011	614642.4	76938.9	58.14
2012	6341572.0	715311.0	59.33

Sources: WDI (2013) World Bank and Pakistan Economic surveys(Various issues)

Table A.2
Enrollment of Female and Male at Different Levels of Education

Female Enroll. (000)

Year	F. Prim	F. mid	F.h.sch	F.Art Sci.	F.Prf.	F.uni
1972	1,110	196	83	49	5	4
1973	1,270	232	98	47	5	4
1974	1,368	247	102	53	7	4
1975	1,432	279	114	59	8	5
1976	1,549	294	115	53	9	5
1977	1,591	309	124	66	10	9
1978	1,598	317	131	72	11	7
1979	1,629	327	133	75	12	6
1980	1,676	345	132	78	13	6
1981	1,782	359	137	87	14	7
1982	1,896	389	143	94	15	8
1983	2,010	389	149	100	16	8
1984	2,174	424	154	111	9	8
1985	2,252	446	168	117	10	9
1986	2,365	516	186	126	14	9
1987	2,532	554	209	125	14	10
1988	2,673	593	230	135	15	10
1989	3,096	697	271	143	17	10
1990	3,342	771	297	165	19	11
1991	3,675	842	285	211	19	12
1992	3,714	858	285	232	19	13
1993	3,696	994	357	151	100	15
1994	4,123	1,123	421	149	100	19
1995	4,708	1,347	514	166	110	21
1996	4,590	1,270	480	179	120	23
1997	5,350	1,357	520	191	128	25
1998	5,861	1,532	605	201	134	25
1999	5,149	1,586	639	234	140	25
2000	5,660	1,615	653	263	149	27
2001	5,559	1,706	675	283	150	37
2002	5,871	1,506	644	285	148	102
2003	6,132	1,551	658	306	158	128
2004	6,606	1,737	709	338	163	179
2005	7,642	1,885	780	141	220	196
2006	7,710	2,191	905	444	210	213
2007	7,848	2,264	905	473	224	256
2008	8,032	2,279	905	452	227	342
2009	8,144	2,298	905	508	247	356
2010	8,320	2,337	905	495	76	426
2011	8,574	2,421	905	408	64	521
*2012	8,839	2,477	905	389	49	702

Table A.2 (contd....)**Male Enroll. (000)**

Year	M.pri.	M.mid	M.h.sch.	M.art & sci.	M.prof	M.uni
1972	3100	767	323	137	31	14
1973	3190	809	351	140	31	14
1974	3445	850	357	132	36	15
1975	3548	917	391	150	37	17
1976	4170	953	409	158	47	18
1977	4020	989	424	157	47	25
1978	3417	987	407	149	51	34
1979	3502	973	380	158	55	33
1980	3537	1,046	379	175	59	36
1981	3692	1,053	412	183	64	36
1982	3818	1,105	445	189	67	39
1983	4169	1,105	478	197	68	41
1984	4686	1,306	505	244	47	43
1985	4576	1,359	534	256	49	51
1986	4729	1,394	540	274	55	51
1987	5107	1,469	565	262	51	52
1988	5286	1,460	604	285	59	56
1989	6158	1,697	672	285	57	59
1990	7058	1,835	724	304	57	56
1991	7162	1,979	719	419	57	50
1992	7022	2,123	794	398	57	53
1993	6575	2,046	811	271	181	53
1994	6775	2,182	894	256	170	58
1995	7192	2,469	1,011	256	171	59
1996	7067	2,335	967	261	174	60
1997	7738	2,369	1,001	266	177	67
1998	8321	2,500	1,053	277	184	69
1999	9730	2,512	1,064	275	172	66
2000	10124	2,497	1,073	299	168	87
2001	8546	2,053	890	299	156	88
2002	8689	2,315	930	297	152	175
2003	8962	2,367	931	319	162	204
2004	9601	2,584	1,091	353	166	245
2005	10548	2,727	1,156	166	233	276
2006	10047	3,131	1,283	447	146	308
2007	10145	3,167	1,468	469	156	350
2008	10328	3,148	1,579	508	157	399
2009	10324	3,116	1,920	566	183	447
2010	10452	3,167	1,951	671	402	509
2011	10584	3,223	2,006	780	697	586
2012*	10732	3,240	2,112	902	966	712

Source: Pakistan Economic Survey (Various issues)

Table A.3
Population (000) and Life Expectancy
(Female and Male)

Year	M. Pop.	F. Pop.	F. Life exp.	M. Life exp.
1972	32,979	29,772	54	54
1973	33,886	30,666	55	55
1974	34,846	31,611	56	55
1975	35,866	32,617	56	56
1976	36,947	33,686	57	56
1977	38,089	34,816	57	57
1978	39,294	36,009	58	57
1979	40,565	37,268	58	57
1980	41,901	38,592	58	58
1981	43,301	39,979	59	58
1982	44,761	41,426	59	58
1983	46,274	42,926	59	58
1984	47,832	44,469	60	59
1985	49,425	46,046	60	59
1986	51,054	47,657	60	59
1987	52,714	49,298	61	59
1988	54,384	50,949	61	60
1989	56,038	52,583	61	60
1990	57,660	54,185	61	60
1991	59,231	55,739	62	60
1992	60,760	57,251	62	61
1993	62,278	58,752	62	61
1994	63,833	60,288	63	61
1995	65,458	61,889	63	61
1996	67,168	63,569	63	62
1997	68,944	65,312	63	62
1998	70,735	67,073	64	62
1999	72,467	68,794	64	62
2000	74,091	70,431	64	62
2001	75,588	71,970	64	63
2002	76,981	73,426	64	63
2003	78,306	74,834	65	63
2004	79,621	76,240	65	63
2005	80,966	77,680	65	63
2006	82,350	79,163	65	64
2007	83,766	80,679	65	64
2008	85,219	82,224	66	64
2009	86,709	83,785	66	64
2010	88,237	85,356	66	64
2011	89,808	86,937	66	65
2012	92,271	88,440	66	65

Source: World Bank (2013), Pakistan Economic Survey (Various issues)

Table A.4
Composite Human Capital Index
(Female)

Year	Educat. Index	Health Index	Composite
1972	0	0	0
1973	0.0433	0.0714	0.057
1974	0.0624	0.1429	0.103
1975	0.0818	0.2857	0.184
1976	0.0941	0.3571	0.226
1977	0.1038	0.3571	0.230
1978	0.0956	0.3571	0.226
1979	0.0897	0.3571	0.223
1980	0.0878	0.4286	0.258
1981	0.0996	0.5000	0.300
1982	0.1155	0.5000	0.308
1983	0.1202	0.5000	0.310
1984	0.1383	0.5714	0.355
1985	0.1438	0.5714	0.358
1986	0.1682	0.5714	0.370
1987	0.1876	0.6429	0.415
1988	0.2057	0.6429	0.424
1989	0.2787	0.6429	0.461
1990	0.3194	0.6429	0.481
1991	0.3656	0.7143	0.540
1992	0.3596	0.7143	0.537
1993	0.3891	0.7143	0.552
1994	0.4571	0.7857	0.621
1995	0.5701	0.7857	0.678
1996	0.5180	0.7857	0.652
1997	0.6035	0.786	0.695
1998	0.6806	0.857	0.769
1999	0.6077	0.857	0.732
2000	0.6517	0.857	0.754
2001	0.6454	0.857	0.751
2002	0.6376	0.857	0.747
2003	0.6669	0.929	0.798
2004	0.7494	0.929	0.839
2005	0.8329	0.929	0.881
2006	0.9458	0.929	0.937
2007	0.9639	0.929	0.946
2008	0.9753	1	0.988
2009	0.9815	1	0.991
2010	0.9467	1	0.973
2011	0.9576	1	0.979
2012*	1	1	1

Table A.4 (contd....)
(Male)

Year	Educat. Index	Health Index	Composite
1972	0.038404	0	0.019
1973	0.053822	0	0.027
1974	0.088322	0.1	0.094
1975	0.118923	0.1	0.109
1976	0.231237	0.2	0.216
1977	0.182272	0.2	0.191
1978	0.029934	0.2	0.115
1979	0	0.2	0.100
1980	0.000175	0.4	0.200
1981	0.006695	0.4	0.203
1982	0.019063	0.4	0.210
1983	0.049793	0.4	0.225
1984	0.151752	0.5	0.326
1985	0.124099	0.5	0.312
1986	0.122971	0.5	0.311
1987	0.152305	0.5	0.326
1988	0.156382	0.6	0.378
1989	0.29577	0.6	0.448
1990	0.41111	0.6	0.506
1991	0.439977	0.6	0.520
1992	0.423831	0.7	0.562
1993	0.334775	0.7	0.517
1994	0.357867	0.7	0.529
1995	0.442557	0.7	0.571
1996	0.359244	0.8	0.580
1997	0.407332	0.8	0.604
1998	0.464257	0.8	0.632
1999	0.563291	0.8	0.682
2000	0.574072	0.8	0.687
2001	0.286395	0.9	0.593
2002	0.344286	0.9	0.622
2003	0.368031	0.9	0.634
2004	0.480199	0.9	0.690
2005	0.556728	0.9	0.728
2006	0.605917	1	0.803
2007	0.639715	1	0.820
2008	0.662062	1	0.831
2009	0.713481	1	0.857
2010	0.796645	1	0.898
2011	0.904306	1	0.952
2012*	1	1	1.000

Source: Author's Calculations

APPENDIX-B

Human Capital (H)

Female human capital = Female education index + Female health index / 2

Male human capital = Male education index + Male health index / 2

Education Index (Female and Male)

According to the Pakistani education system, the number of enrolment at different levels of schooling years are taken in five categories. First one is the primary level consist at five years of schooling, middle stage consist at eight years of schooling. Then secondary and higher secondary consist on ten and twelve years of schooling respectively. Professional and university level of education cover sixteen years of education. The following formula has been used to construct a weighted education index for male and female separately.

$$\text{Education Index} = (5H1t + 8H2t + 10H3t + 12H4t + 16H5t) / POPt$$

Ht stands for enrolment (female and male) at time t and POP for total population (female and male) at time t . Education Index is further standardized by taking maximum and minimum values (goalposts) in order to transform the indicator into indices from 0 to 1.

$$\text{Education Index} = \frac{\{(\text{actual} - \text{minimum}) \text{ Education Index}\}}{\{(\text{maximum} - \text{minimum}) \text{ Education Index}\}}$$

Health Index (Female and Male)

Life expectancy is a proxy used as a health index. It is further standardized by taking maximum and minimum values (goalposts) in order to transform the indicators into indices from 0 to 1.

$$\text{Health Index} = \left\{ \frac{(\text{actual} - \text{minimum}) \text{ life expect}}{(\text{maximum} - \text{minimum}) \text{ life expect}} \right\}$$