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STRUCTURE OF THE MALAYSIAN ECONOMY: AN INPUT-OUTPUT ANALYSIS

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Chief Operating Officer's Office
Khazanah Research Institute, Level 25, Mercu UEM
Jalan Stesen Sentral 5, Kuala Lumpur Sentral, 50470 Kuala Lumpur, Malaysia

Fax: +603 2265 0088; email: enquiries@KRInstitute.org

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ABBREVIATIONS

b	: billion
BWL	: Backward linkage
BEC	: Broad Economic Categories
DOSM	: Department of Statistics, Malaysia
E&E	: Electrical and Electronics
EPU	: Economic Planning Unit
EPZ	: Export Processing Zone
ETP	: Economic Transformation Programme
FDI	: Foreign direct investment
FFB	: Fresh fruit bunches
FIZ	: Free Industrial Zone
FWL	: Forward linkage
GDP	: Gross domestic product
GNI	: Gross national income
GST	: Goods and Services Tax
GVC	: Global value chain
HEM	: Hypothetical Extraction Method
IO	: Input-output
HS	: Harmonised System
LMW	: License Manufacturing Warehouse
LNG	: Liquefied Natural Gas
m	: million
MCPA	: Malaysia Classification of Products by Activity
METS	: Malaysia External Trade Statistic
MITI	: Ministry of International Trade and Industry, Malaysia
MSIC	: Malaysia Standard Industrial Classification
NSDC	: National SME Development Council
OECD	: Organisation for Economic Co-operation and Development
PEMANDU	: Performance Management and Delivery Unit
R&D	: Research and development
RM	: Ringgit Malaysia
SAM	: Size-adjusted multiplier
SITC	: Standard International Trade Classification
SME	: Small and Medium Enterprise
UK	: United Kingdom
US	: United States
USD	: United States Dollar

EXECUTIVE SUMMARY

Some key questions addressed in this report:

- **Q: How are the sectors in the Malaysian economy linked together?**
  A: The Manufacturing sector draws on inputs from all sectors, while the Services sector largely depends on other services.
- **Q: What is the true contribution of the trading sector to the economy?**
  A: Net exports contribute an extra RM18b to GDP in 2010 as measured by the import-adjusted approach compared to the conventional approach.

This report aims to give readers an empirical view of the supply side of the Malaysian economy, using an input-output (IO) table approach. The IO table dataset was obtained from the Department of Statistics Malaysia (DOSM) and is published every five years. The table provides comprehensive data on not only the contribution of each sector (using the Malaysia Standard Industrial Classification (MSIC)), but also the interlinkages between sectors.

This report discusses four areas that are pertinent to the assessment of the economy's structure: i) re-evaluation of the contribution of international trade to the economy; ii) detecting interlinkages between sectors of the economy; iii) analysing domestic and foreign value-added in free zones in greater detail; and iv) evaluation of the role of small and medium enterprises (SMEs). For an empirical assessment, the standard IO table is extended to capture the four areas of analysis.

A common theme throughout the chapters of the report is that it aims to depart from conventional methodologies and emphasises sectors that have potential to contribute greater domestic value-added for Malaysia. Hence, the report also gives insights for policymakers to consider when formulating industrial policies.

Key takeaways from Introduction

Basic concepts and Malaysia's economic landscape.

This section explains three different methods of calculating gross domestic product (GDP), which are: (i) expenditure approach; (ii) income approach; and (iii) value-added approach. The IO table methodology looks at the contributors of the economy from the third approach.

Next, this section looks at the contribution of sectors to Malaysia's GDP, focusing on the role of the Services sector. Activities across a production network can cut across many sectors such as the Manufacturing, Agriculture and Services sectors. Admittedly, the IO methodology, while acceptable for policy analysis, does suffer from some bottlenecks. These include the linearity assumption, the fixed prices assumption as well as the demand-driven nature of the analysis.

Key takeaways from Chapter 1: Contribution of International Trade to the Economy

Between 2010 to 2014, the contribution of net exports to GDP is approximately three times larger under the import-adjusted approach compared to the conventional approach.

In conventional practice, the contribution of net exports is derived from subtracting imports from exports. This approach fails to differentiate imported final goods and imported intermediate goods consumed for each domestic final demand component. This report thus uses the import-adjusted approach, which splits intermediate and final imports for each final demand component instead of accumulating them in the trade component.

It is often thought that domestic demand contributes extensively to the Malaysian GDP. However, conventional approaches to measure this contribution may be biased. This is due to the misallocation of import components by overestimating the contribution of domestic demand and underestimating the contribution of net trade to GDP. Therefore, this report raises the observation that the contribution of the export sector could be much larger once appropriate measurements are taken into consideration.

Key takeaways from Chapter 2: Interlinkages in the Malaysian Economy

Choice of appropriate multiplier to estimate economic policy impact depends on the outcome desired: for focus on growth, use the size-adjusted value-added multiplier; for focus on return on investment, use the conventional value-added multiplier.

The principal aim of this chapter is to underscore the various interlinkages between sectors in the Malaysian economy to better understand the structure of the economy. Furthermore, the report finds that growth-inducing effects of sectors differ depending on the perspectives considered, as explained below.

Each sector plays a different role in its contribution to the GDP. As such, by adopting both backward and forward linkages as well as size-adjusted value-added multiplier analyses, this report looks at three perspectives: (i) the overall economy; (ii) the domestic demand component; and (iii) the export component. For example, a sector may be conducive to domestic demand growth, but it potentially has less effect on growth of the export sector. This chapter provides the analyses in detail from these different perspectives.

Furthermore, patterns emerge when comparing size-adjusted value-added multiplier snapshots over the years from 1978 to 2010. For example, Oils and Fats, Wholesale and Retail Trade, and Transport have consistently been included in the top 10 sectors across four decades. This report also provides useful insights for policymakers to understand the linkages of sectors in the economy.

Key takeaways from Chapter 3: Domestic and Foreign Value-added in Free Zones

On average, domestic value added is higher by RM1.3b for manufacturing firms located outside Free Industrial Zones (FIZs) compared to manufacturing firms located inside FIZs.

The Electrical and Electronics (E&E) sector is deemed to be a key sector of the Malaysian economy as it significantly contributes to the country's manufacturing output, employment, investments and exports. In addition, the E&E sector is claimed to create opportunities for local companies to form partnerships, thus allowing local small and medium enterprises to develop their capabilities.

However, what percentage of E&E products is made in Malaysia? The answer to this question will indicate the significance of the E&E sector to the Malaysian economy. Additionally, answering this important question requires a database and analysis that distinguishes trade structures into processing and non-processing trade sectors.

Tradable sectors include activities in Free Industrial Zones (FIZs, processing trade sector) as well as non-FIZs (non-processing trade sector). This report focuses on FIZs in detail and raises the observation that the value-added component to the domestic economy from FIZs could be more inclusive. However, this should be in line with the policy objectives of FIZs. Because the E&E sector makes up a large share of the value of FIZs, this finding is in line with the literature which confirms that the processing trade sector contributes less to the domestic economy in terms of value-added than non-processing ones.

Key takeaways from Chapter 4: The Role of Small and Medium Enterprises

SMEs serve the domestic market more than the export market. The value of inputs that SMEs provide to large firms is RM127.8b, which is of larger value than the output they export (RM 124.2b).

This chapter analyses the linkages between SMEs and large enterprises. Results indicate that small and medium-sized sectors are more dependent on the large-sized sector in acquiring intermediate inputs for their production of output. However, the large-sized sector is less dependent on small and medium-sized sectors since most of the inputs are obtained within the large-sized sector cluster and imports. The weaker industrial networks between small, medium and large-sized sectors may explain why growth in final demand does not bring substantial effects to the domestic economy. Creating greater and more sustainable business cooperation between large firms and SMEs may help to boost the growth of SMEs and the overall economy.

It was also found that output from small-sized sectors is deemed to be highly demanded for private consumption use. This observation differs slightly for medium and large-sized sectors as their outputs are primarily produced for the export market rather than used as intermediate inputs domestically. This also indicates that the small-sized sectors are domestic-oriented, while medium and large-sized sectors are export-oriented. Based on this observation, it is evident that different policies are needed to drive the growth of these sectors since their outputs serve different markets.

Given the structure of small, medium and large enterprises, the interlinkages between them differ respectively. Therefore, depending on the scale, policies could be formulated to account for these different characteristics. For example, a policy that targets a large enterprise may not automatically trickle down to SMEs.

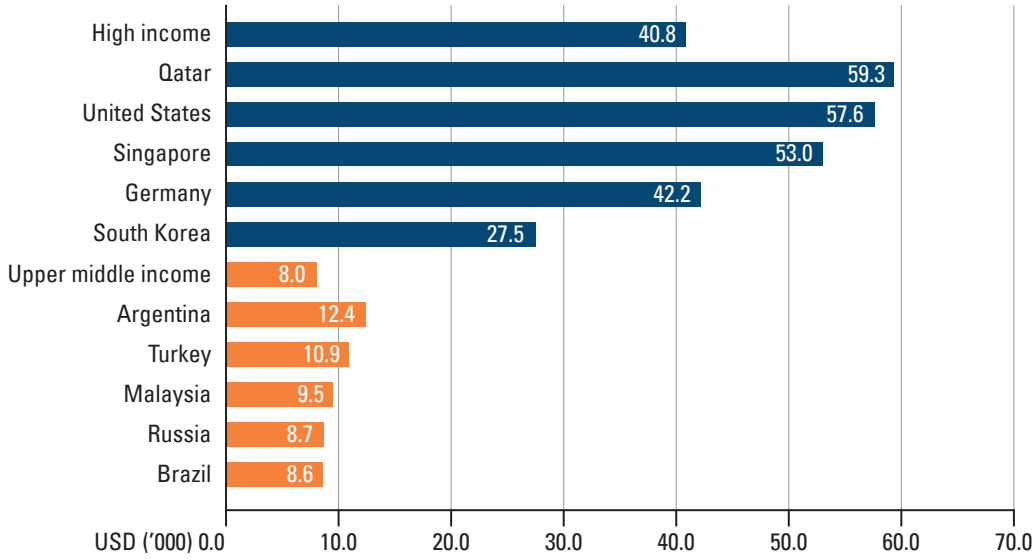
INTRODUCTION

INTRODUCTION

Where does our national income come from?

Malaysia is often described as an upper middle-income country. Our GDP per person places Malaysia in the same category as other countries such as Argentina, Brazil, Kazakhstan, Mexico, Russia and Turkey. Our national income is lower than high-income countries[1] such as Singapore, Switzerland, Germany, Japan, South Korea and the United States (US).

Figure 1: GDP per capita by selected countries, 2016 (USD '000)



Source: World Bank (n.d.)

For many of these countries, one would think one has a reasonable idea of why they are high-income: Germany produces expensive cars and machinery, the US is the home of Apple and many other world leading companies, South Korea has Samsung and produces cars and consumer electronic goods while Qatar has gas. However, what drives the Malaysian economy?

[1] The World Bank defines high-income countries as having a gross national income per capita of USD12,236 or more.

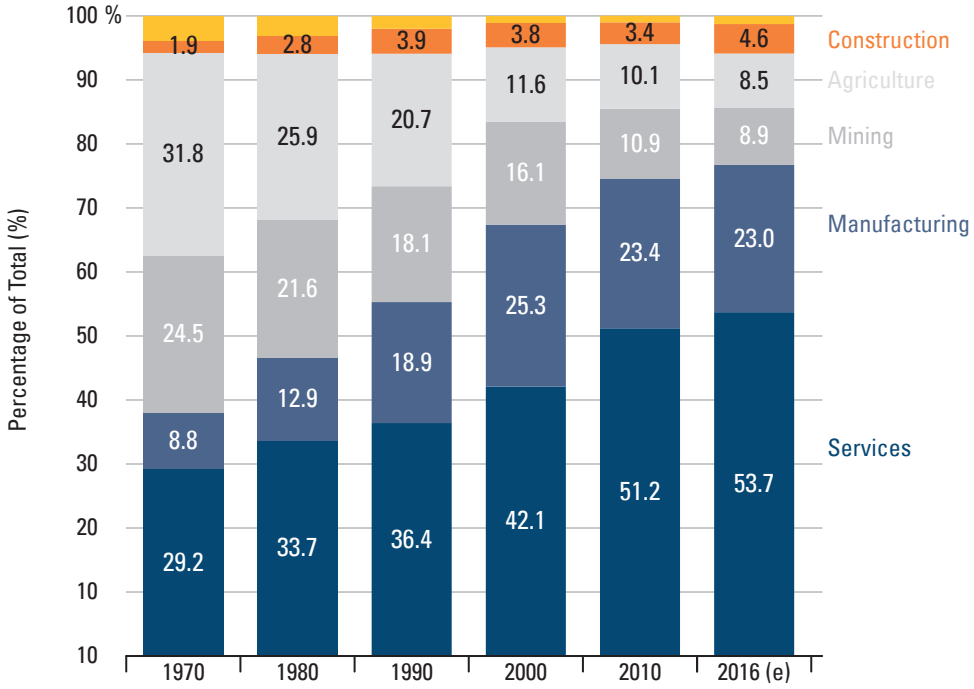
What is national income?

One of the most common ways to measure a country's income is through GDP calculation. GDP is the total value, in monetary terms, of finished goods and services produced within a country's borders at a specific time period. It measures the overall economic activity in a country. Typically, there are three main approaches to calculate GDP:

- *Expenditure approach*: This looks at the total of the components of GDP, which are: private consumption (usually abbreviated as *C*), plus public consumption (*G*), plus investment (*I*) plus net exports (exports (*X*) minus imports (*M*)). The standard formula for this approach is $C + I + G + (X - M)$.
- *Income approach*: This adds up income earned by all the factors of production in an economy. This means the income earned by labour (salaries and wages), land (rent), and capital (interest and profits). The approach adjusts for some items such as indirect business taxes (like sales and property taxes) and depreciation (a reserve that businesses set aside to account for the replacement of equipment that tends to wear down with use) which are added to the national income.
- *Value-added approach*: This adds the sales value of goods and services, after deducting the cost of intermediate goods and services that are consumed in the process, for example, raw materials.

What contributes to GDP?

Figure 2: GDP by types of economic activity, 1970-2016



Source: Adapted from Economic Planning Unit (2016)

The chart above shows the percentage contribution of each sector of the economy to GDP in different years, calculated using the expenditure approach. It is clear that the Malaysian economy has changed structurally from the 1970s. The Mining and Agriculture sectors are less important, whereas the Manufacturing sector has become more significant. The Services sector overtook all other sectors, with more than 50% share of the total contribution to GDP.

It also seems that the current nature of work in Malaysia is different from the colonial Malayan economy. During the British era, Malaya as a colony mainly benefitted economically due to its proximity to the major trade route between Europe and East Asia and geographical factors such as the country's tropical climate and ample natural resources like tin and rubber[2]—economic activities that mostly occur 'outdoors'. However, this is vastly different to today's economy, where it would seem that most of the national income is created 'indoors'—in offices, shops, warehouses and factories.

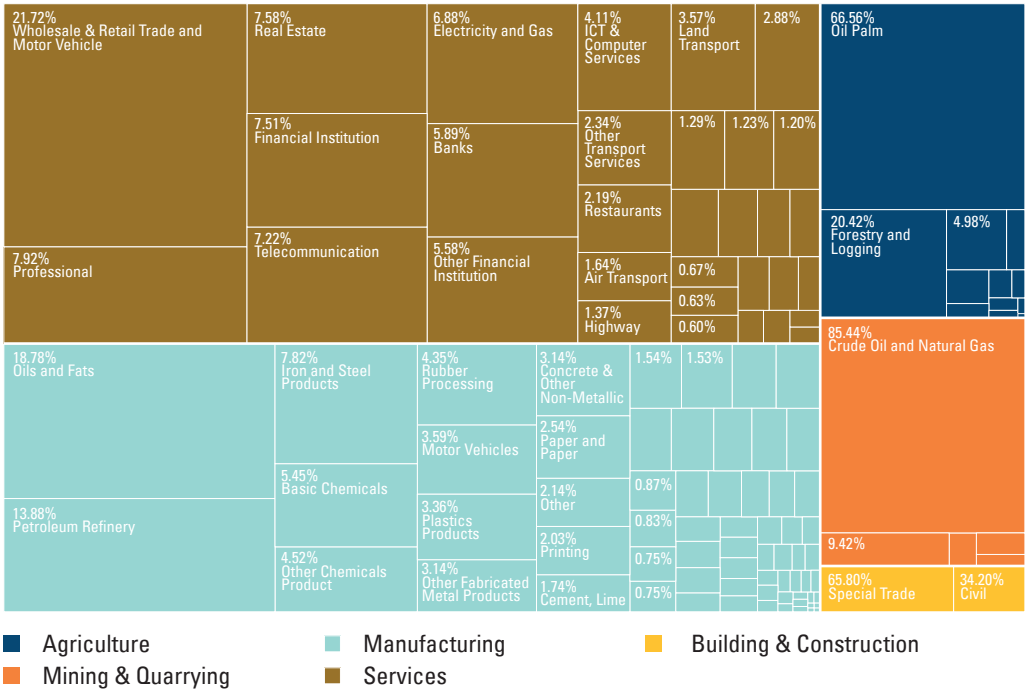
A services economy?

Data suggests that the bulk of Malaysia's GDP comes from the Services sector; with more than half of national income coming from economic agents providing services for each other. But is this really correct? Are we not always told that Malaysia is a big producer of palm oil, oil and gas, and electronics?

Services are generally the most important sector in some high-income countries. For example, for countries such as the US, United Kingdom (UK), Germany and Japan, the Services sector account for more than 60% of total GDP[3]. However, the kinds of services in these high-income countries are broadly called "modern services" (which include financial intermediation, computer services, communication and technical services) as compared to "traditional services" (which include retail and wholesale trade, public administration and defence)[4]. The growth in world exports of computer and information services increased more rapidly than any other Services sector between 1995 and 2014[5]. Figure 3 shows the major components of each economic sector.

[2] Sultan Nazrin Shah (2017)
[3] World Bank (n.d.)
[4] The terms "traditional services" and "modern services" do not have a standard definition. For the purpose of this paper, the authors use the definitions proposed in Eichengreen, et al. (2009)'s *The Two Waves of Service Sector Growth*.
[5] Loungani, et al. (2017)

Figure 3: Sectoral breakdown of output, by broad sectors, 2010



Source: DOSM (n.d.)

We see that for the Services sector in Malaysia, the dominant subsector is Wholesale and Retail Trade; which is considered to be "traditional services". However, "modern services" such as Professional, Financial and Telecommunication services are also not too far behind.

In the Manufacturing sector, the largest subsectors by gross output are those related to petroleum, chemicals, rubber and plastic (RM224.1b), followed by E&E manufacturing (RM223.1b), and then those related to palm oil (RM146.6b).

In fact, palm oil-related activities extend to different sectors of the economy. For example, the harvesting of oil palm fresh fruit bunches (FFB) is considered as part of the Agriculture sector. However, the production of crude palm oil from FFB falls under the Manufacturing sector (the manufacture of vegetable oils and fats). Finally, the selling of palm oil, either domestically or through exports, would be considered as Wholesale and Retail Trade under the Services sector.

As another example, extraction of crude petroleum and natural gas are part of Mining activities. However, converting natural gas into liquefied natural gas (LNG) for export is considered to be under the Manufacturing sector. As with palm oil, wholesaling of edible oils and fats is considered to be part of the Services sector.

Thus, while it may seem that GDP figures indicate that Malaysia is a Services sector-led economy, that is not the full story. We need to dig deeper into what sectors are dominant in the economy, the interlinkages between sectors and how small and medium enterprises (SMEs) can benefit in the process.

CHAPTER

01

CONTRIBUTION OF INTERNATIONAL TRADE TO THE ECONOMY

CHAPTER 1

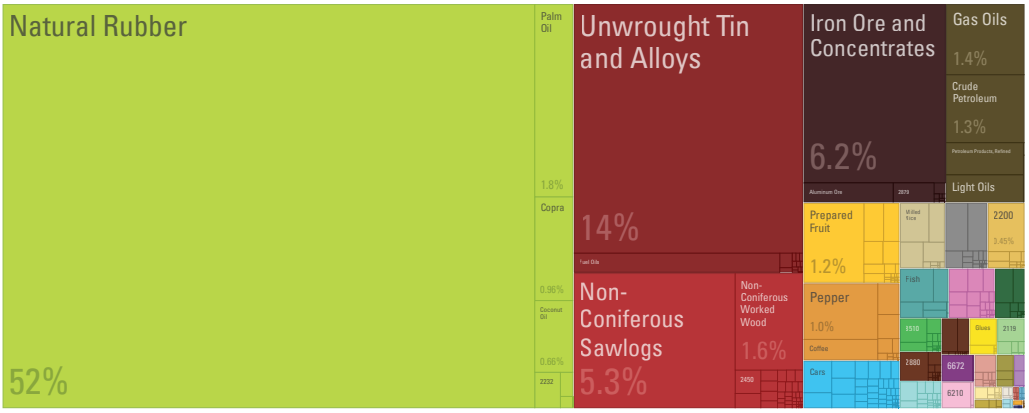
CONTRIBUTION OF INTERNATIONAL TRADE TO THE ECONOMY

Our exports and imports

Malaysia was the 20th largest exporter in the world in 2016[6]. In 2017, the value of exports of goods and services was 71.5% of GDP and imports was 64.5%[7].

Malaysia's exports and imports have changed over time, as shown in the charts below. In 1962, rubber made up more than half of Malaysia's exports, followed by tin and timber. During this time, Malaysia mainly imported oil and gas. By 2016, Malaysia was both big exporters and importers of E&E goods. Furthermore, instead of rubber and tin, we exported palm oil, liquefied petroleum gas and crude oil.

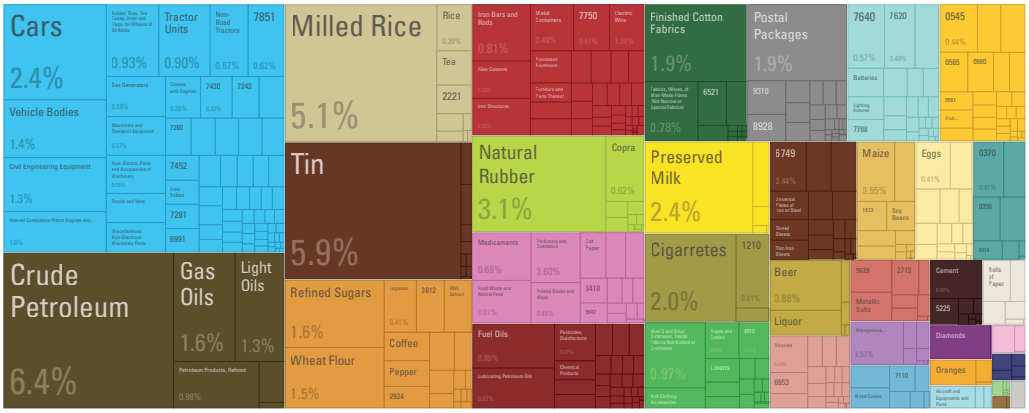
Figure 4: Composition of Malaysian goods exports, 1962



Source: Simoes et al. (2011)

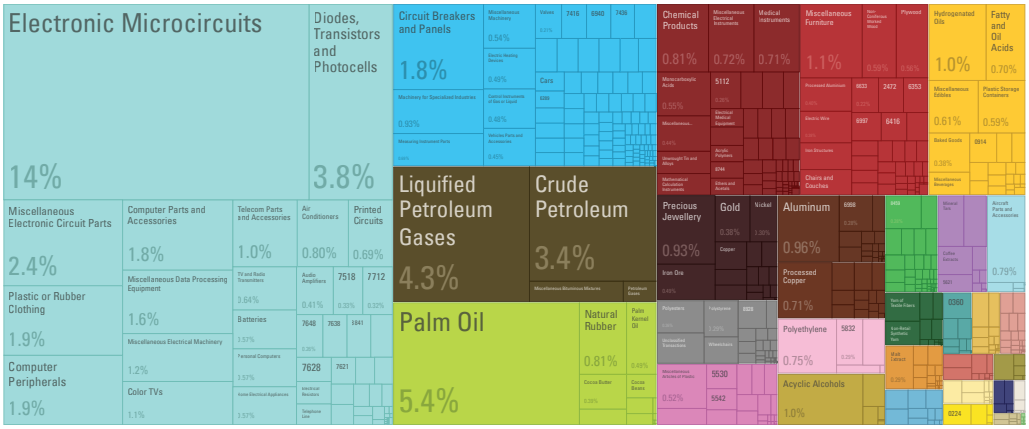
[6] Simoes, et al. (2011)
[7] CEIC Data (n.d.)

Figure 5: Composition of Malaysian goods imports, 1962



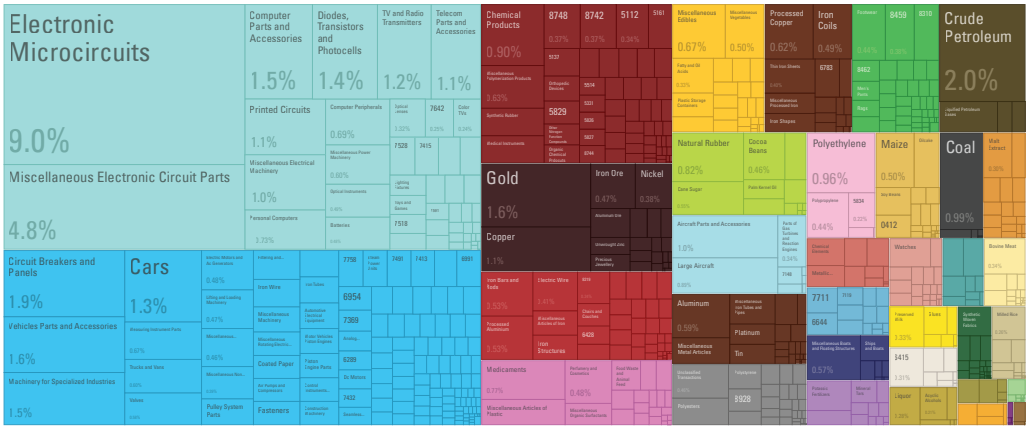
Source: Simoes et al. (2011)

Figure 6: Composition of Malaysian goods exports, 2016



Source: Simoes et al. (2011)

Figure 7: Composition of Malaysian goods imports, 2016



Source: Simoes et al. (2011)

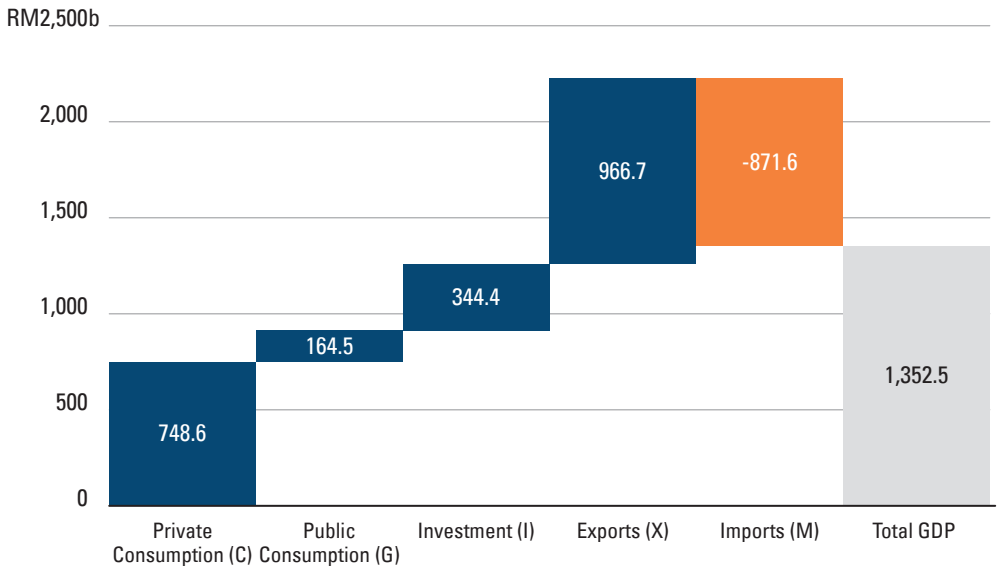
GDP, imports and exports

As we saw earlier, the expenditure approach to GDP is:

$$\text{GDP} = C + I + G + (X - M).$$

Figure 8 shows the breakdown of this approach in the context of GDP in 2017. Private consumption (C) is 55% of GDP, investment (gross fixed capital formation and change in inventories) (I) 26%, public or government expenditure (G) 12% and net exports ($X - M$) 7%.

Figure 8: GDP by type of expenditure, 2017 (current prices)



Source: CEIC Data (n.d.)

This approach puts all exports and imports together. Imports (M), however, have different functions in the economy:

- Imported final consumption goods (m) are imports directly consumed by agents in the domestic economy (e.g. imported clothes); and
- Imported intermediate goods (n) are imports that function as inputs for domestic producers for their own production of goods and services (e.g. imported cloth that is turned into batik shirts and dresses).

If we recognise the difference between final imports (m) and intermediate imports (n), then under the conventional approach:

$$\text{GDP} = C + I + G + (X - m - n)$$

The importance of exports is being understated because it only shows the net amount after deducting imports which are meant for final consumption as well as imports that are used as an input for the production of something else. If we recognise the difference between the two types of imports, we will show that it is possible to have a more accurate 'import-adjusted' method of calculating the GDP, as pointed out by Bank Negara Malaysia[8].

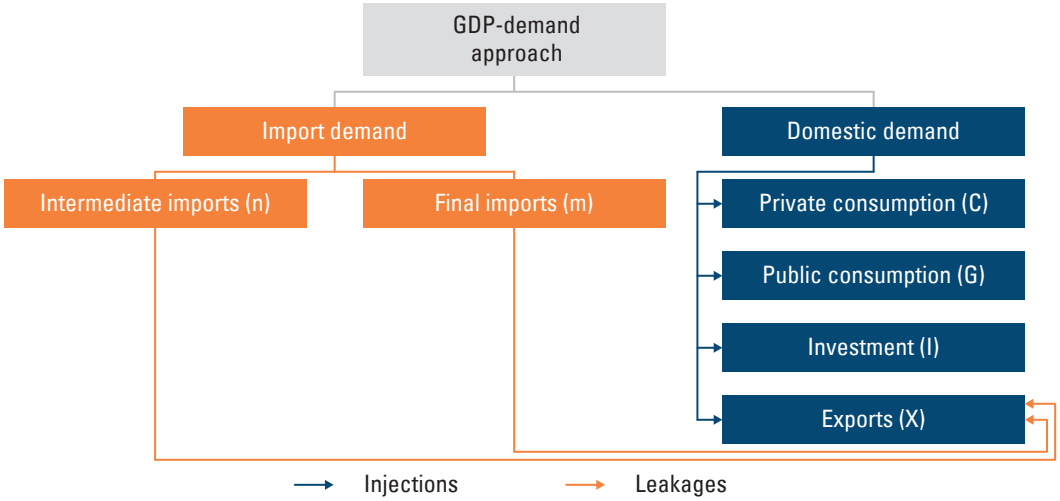
Under the import adjusted approach, GDP is calculated as follows:

$$\text{GDP} = (C - m_C - n_C) + (I - m_I - n_I) + (\text{G} - m_G - n_G) + (\text{X} - m_X - n_X)$$

Where m represents final imports and n the intermediate imports. Figures 9 and 10 visualise the difference between these two approaches. Box 1 and Appendix 1 explain the import-adjusted methodology in detail.

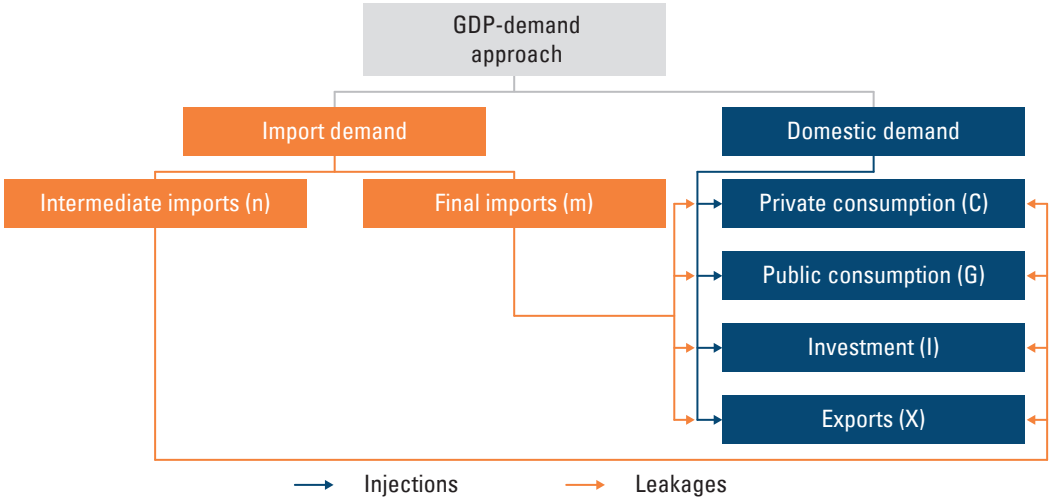
[8] Bank Negara Malaysia (2013)

Figure 9: Conventional method of calculating GDP



Source: Authors' illustration

Figure 10: Import-adjusted method of calculating GDP



Source: Authors' illustration

Applying the import-adjusted approach to Malaysia's GDP

The import-adjusted approach is a method for measuring the actual performance of foreign and domestic sectors in the economy. To do this, an IO model is combined with trade statistics and national account statistics.

The results are presented in Figure 12[9], which compares the contribution of domestic demand (summation of private consumption, public consumption and investment) and exports on GDP for the periods 2010 – 2014. Findings show that the conventional approach tends to overestimate the contribution of domestic demand and underestimate the contribution of net trade to GDP. The results are also tabulated in Table 1 below.

Table 1: Contribution to GDP, 2010 – 2014 (RM b)

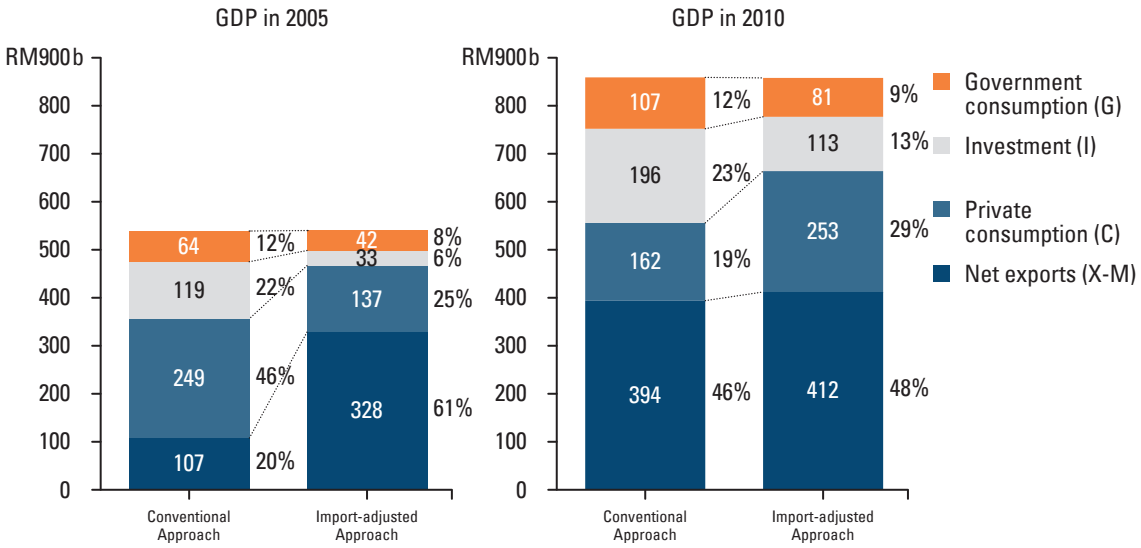
Approach	2010	2011	2012	2013	2014
A. Conventional Approach					
• Net exports (X-M)	130	144 (10.8%)	106 (-26.4%)	82 (-22.6%)	101 (23.2%)
• Domestic demand	684	759 (11.0%)	862 (13.6%)	942 (9.3%)	1,016 (7.9%)
B. Import-adjusted Approach					
• Net exports (X-M)	350	397 (13.4%)	378 (-4.8%)	358 (-5.3%)	380 (6.1%)
• Domestic demand	464	506 (9.1%)	590 (16.6%)	666 (12.9%)	737 (10.7%)

Source: DOSM (n.d.-d) for conventional approach and authors' computation for import-adjusted approach.

Note: Total GDP for 2010 in Table 1 and Figure 11 are not equal because the former is derived from national account statistics while the latter is obtained from 2010 benchmark IO table. GDP calculated using an IO table is valued at basic prices while that of national account statistics is expressed in purchaser prices. The figures given in parentheses are the annual growth of net exports and domestic demand from 2010 – 2014.

[9] Results in Figure 12 and Figure 13 for 2010 are not similar but very close to each other. The figures in Figure 12 are calculated based on the 2010 benchmark IO table while the results in Figure 13 are calculated based on the IO model combined with trade statistics and national account statistics. Another source of deviation is GDP calculated based on the IO table (as depicted in Figure 12) is valued at basic prices (value-added less taxes on products, plus subsidies on products) while annual GDP produced in the national accounts (as presented in Figure 13) is valued at purchaser prices (producer's price plus supplier's retail and wholesale margins, separately invoiced transport and insurance charges and non-deductible taxes on products payable by the purchaser).

Figure 11: Conventional versus import-adjusted approaches (RM b)



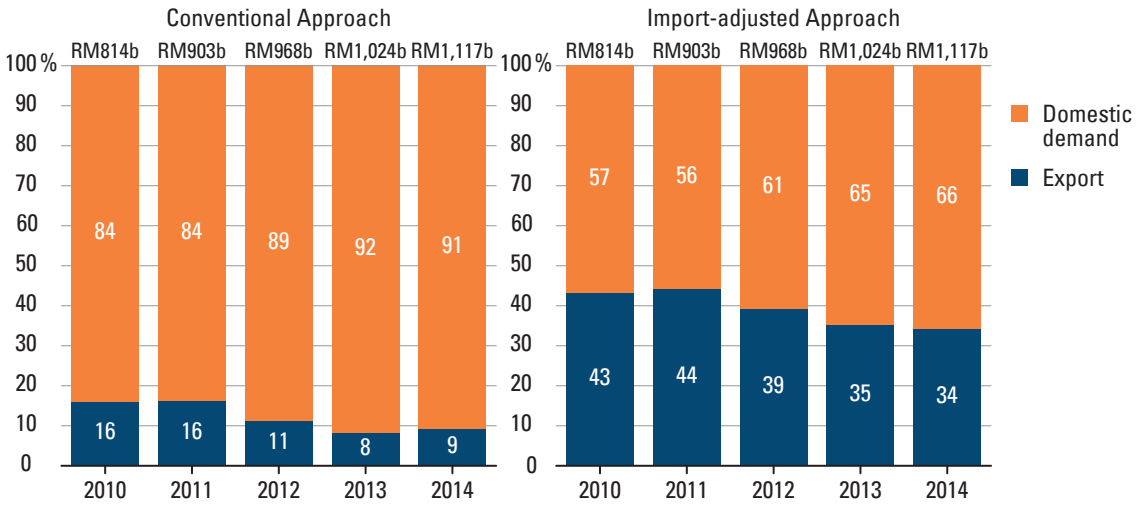
Source: DOSM (n.d.), Authors' calculations

Note: Total GDP for 2010 in Table 1 and Figure 11 are not equal because the former is derived from national account statistics while the latter is obtained from 2010 benchmark IO table. GDP calculated using an IO table is valued at basic prices while that of national account statistics is expressed in purchaser prices.

A detailed accounting of the difference between the two approaches is illustrated by using the IO tables for 2005 and 2010 in Figure 11, which shows the breakdown of GDP in 2005 and 2010 into its final demand components, expressed in Malaysian Ringgit. Both approaches provide similar findings for total GDP, RM540b in 2005 and RM859b in 2010[10]. However, the percentage contribution of each final demand component to total GDP is vastly different. For example, the contribution of net exports to GDP under the conventional approach in 2010 is 19.0% whereas under the import-adjusted approach the contribution is 48.0%. The conventional approach tends to overestimate the contribution of domestic demand to total GDP.

[10] These GDP figures, derived from the IO tables, are different from the GDP figures that are usually reported. Standard GDP figures use purchaser prices, whilst IO tables are quoted in basic prices. See United Nations, et al. (2009) for a more complete definition.

Figure 12: Contribution to GDP, 2010 – 2014 (percentage of GDP)



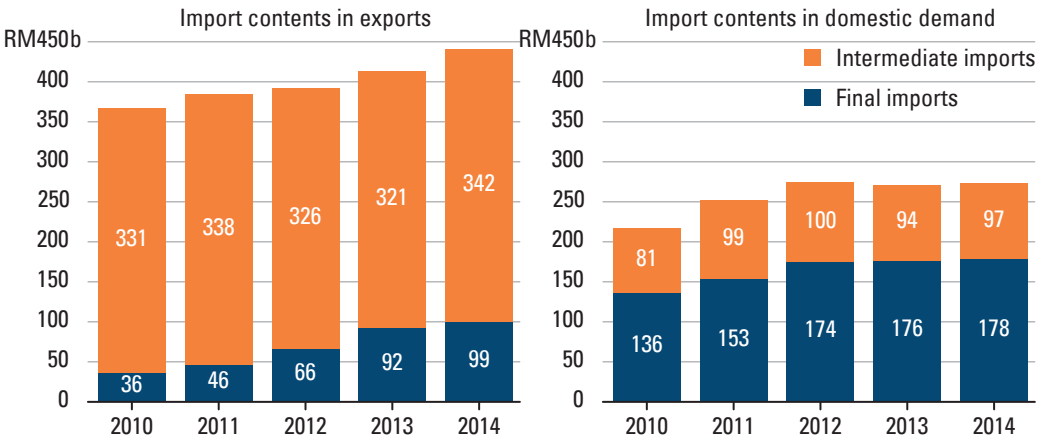
Source: DOSM (n.d.), Authors' calculations

Moreover, under the import-adjusted approach, Figure 12 shows that the percentage contribution of exports to GDP reduced by nine percentage points from 42.7% in 2010 to 33.7% in 2014. The decrease can be explained by the following forces:

i) Total domestic demand grew faster than exports. Between 2010 and 2014, domestic demand expanded at an average growth rate of 8.3% compared to only 2.7% for exports.

ii) The imported final goods component for export goods is large and has been increasing at an average growth rate of 22.7% between 2010 and 2014. These imported final goods which are exported again are called 're-exports', as the nature of the product is fundamentally unchanged. The value-added of these products could come from logistics, transportation, maintenance and various other supply chain and distribution activities, including specialised services such as engineering or professional business services.

Figure 13: Import contents in final demand, 2010 – 2014 (RM b, current prices)



Source: DOSM (n.d.), Authors' calculations

Imported final goods for re-export and processing trade activities

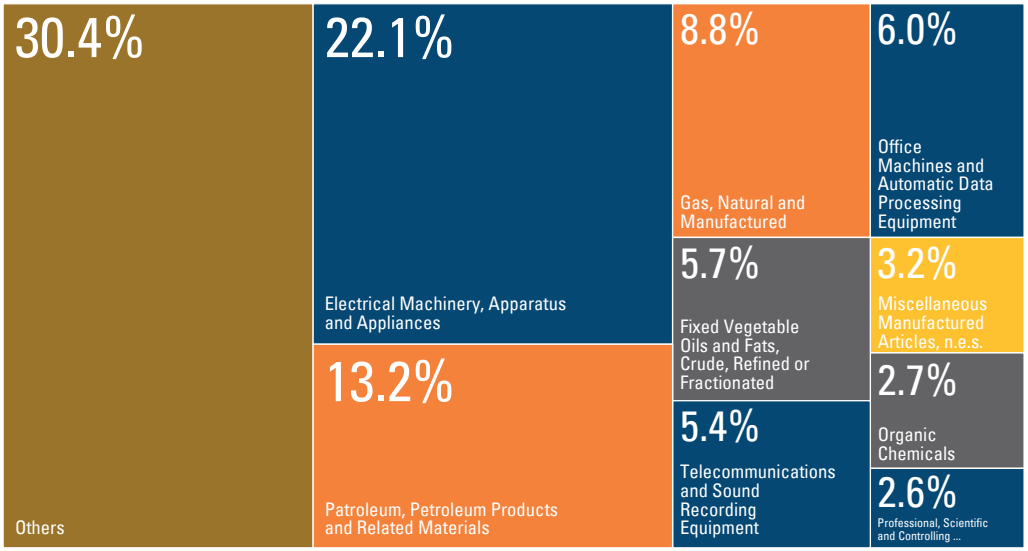
Imported final goods for re-export are goods that are imported and then re-exported again without any change in the form or substance of the product, as defined by DOSM. For example, packaging, re-bulking and grading are not considered as changing the form of the products.

Processing trade activities can, for example, result in import-for-re-export activities if only slight packaging and assembling are performed on the products that are imported before they are exported. There has been a rapid expansion in processing trade activities especially in the E&E industry (electronic processors, controllers, semi-conductors and other electrical components) and the Petroleum Refinery sector (petroleum, fuel and gas oil related products) which contribute significantly to the share of re-export products.

Between 2010 and 2014, re-exports for E&E products increased by 37.4% per annum and 73.7% for Petroleum Refinery products. Export values have increased from RM8.0b in 2010 to RM28.4b in 2014 for E&E products, and from RM3.9b to RM35.9b for Petroleum Refinery products. Consequently, the

share of these two products to total re-exports increased from 33.0% in 2010 to 65.0% in 2014. The increment may be partially explained by the active participation of processing trade activities in Free Industrial Zones, which will be explored in greater detail in Chapter 3 of this report.

Figure 14: Composition of top 10 export products as reported by the Malaysia External Trade Statistics (METS), 2014



Source: DOSM (n.d.-d)

In 2014, total exports for Malaysia amounted to RM765.0b. Figure 14 above divides these into the top nine categories plus a 10th category for 'Others'. The top nine can be broadly grouped as follows:

- Oil and Gas related, 22.0% (13.2% Petroleum, Petroleum Products and Related Materials and 8.8% Gas, Natural and Manufactured);
- Manufactured E&E related goods, 36.1% (22.1% Electrical Machinery, Apparatus and Appliances, 6.0% Office Machines and Automatic Data Processing Equipment, 5.4% Telecommunications and Sound recording equipment, 2.6% Professional, Scientific and Controlling Instruments and Apparatus);

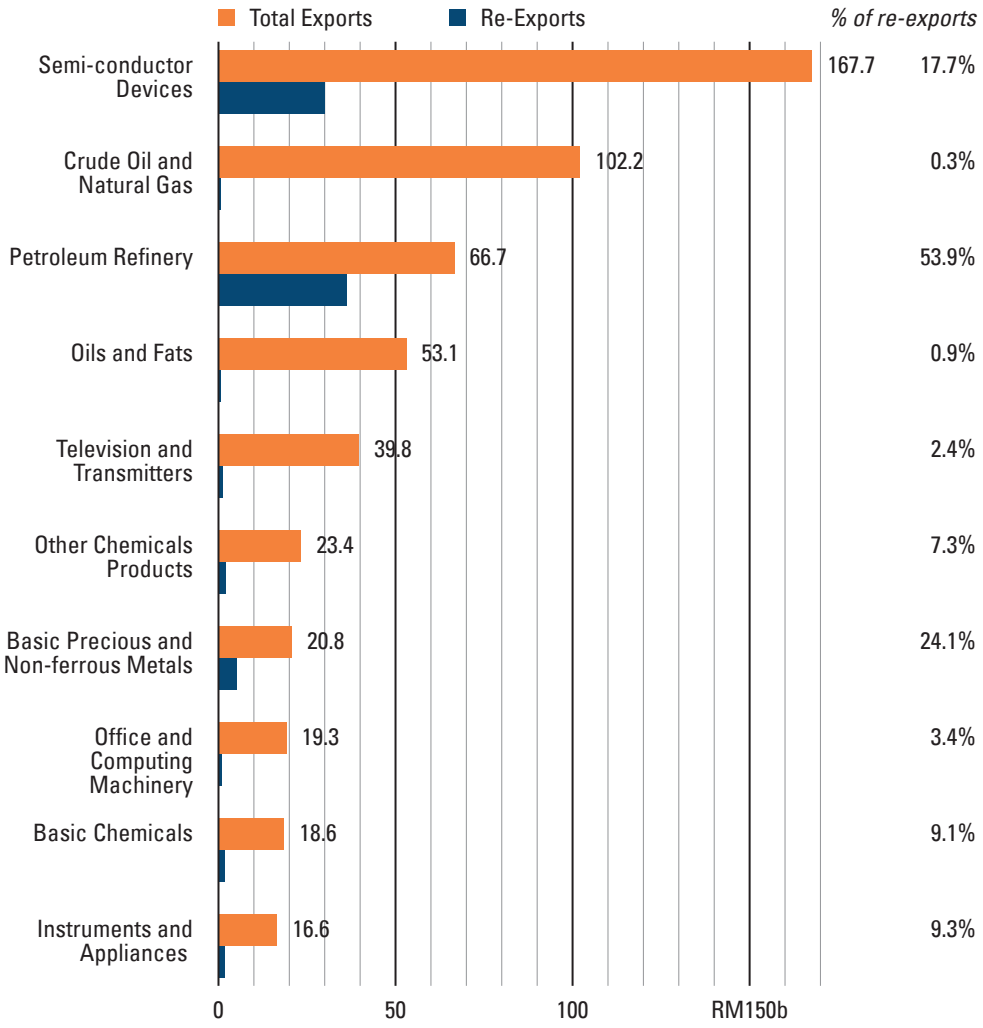
- Palm Oil related, 8.4% (5.7% Fixed Vegetable Oils and Fats, Crude, refined or fractionated, 2.7% Organic Chemicals); and
- Miscellaneous manufactured articles, 3.2%.

However, how much of our exports are actually re-exports? The more it is of the latter, then the less it really contributes to the domestic economy. If most of our exports are essentially repackaged goods that we have imported, then the domestic value-added would not be high.

To find this out, we had to map the data we have for the goods that Malaysia exports, which are classified according to the Standard International Trade Classification (SITC), to our data on the sectors of the economy that produce these goods, which are classified by MSIC.

Figure 15 illustrates the top 10 export sectors according to the MSIC classification by export value. It can be seen that whilst Semi-conductor Devices comprise the largest component of Malaysia's exports, 17.7% of this value are actually re-exports. Furthermore, more than half (53.9%) of the exports from Petroleum Refinery were actually re-exports. At first glance, it may seem that re-exports overstate the actual value-added contribution of Malaysia's exports in the national accounts. However, the value-added from re-export activities could spill-over to the wider value chain, affecting other industries and sectors.

Figure 15: Composition of exports and re-exports by sector, 2014



Source: DOSM (n.d.-d), Authors' calculations

Conclusion

It is often thought that domestic demand contributes extensively to the Malaysian GDP. However, this contribution may be overstated by the misallocation of import components to the export sector. In conventional practice, the contribution of imports is subtracted from exports to compute the contribution of net exports. Therefore, this report raises the observation that the contribution of the export sector could be much larger once this assumption is dropped.

This section discussed the 'import-adjusted' approach to GDP accounting, whereby the allocation of imports is attributed to each demand component (such as government spending, private consumption and investment) instead of the external trade (exports) sector. Essentially, the import-adjusted approach splits intermediate and final imports for each final demand component instead of accumulating them in the trade component.

In doing so, the report shares two advantages of the import-adjusted approach for policymakers. First, it provides a clearer picture of the actual performance and contribution of domestic demand and exports to Malaysia's GDP. The conventional approach tends to overestimate the contribution of domestic demand and underestimate the contribution of net exports. As a result, the conventional approach skews the determination of sources of growth in the economy. For example, it was found that the contribution of net exports to GDP under the conventional approach in 2010 is 19.0% whereas under the import-adjusted approach this contribution is 48.0%. Therefore, this report raises the observation that the contribution of the export sector could be much larger once appropriate measurements are taken into consideration.

Second, this approach provides greater detail behind the mechanics of certain final demand components. The report finds that imported final goods component for exports is large and has been increasing at an average growth rate of 22.7% between 2010 and 2014. These imported final goods that are exported again are called

're-exports', as the nature of the product is fundamentally unchanged. However, the value-added of these products could come from logistics, transportation, maintenance and various other supply chain and distribution activities, including specialised services such as engineering or professional business services.

Box 1: Harmonising trade data and separating imports by final demand

In harmonising the SITC trade data to MSIC, there are several stages that we have to follow. First, the SITC needs to be converted into Harmonised System codes (HS codes). HS codes of tariff nomenclature is a standard international classification system of traded commodities developed by the World Customs Organization. Since the Malaysia Classification of Products by Activity (MCPA) only provides the conversion of HS codes to MSIC, it is essential to convert the SITC to HS codes before it can be converted to MSIC. Then, MSIC will help us to classify the commodities that produce (i.e. exports) and use (i.e. imported inputs) in the IO table framework. The flowchart and example of SITC and MSIC harmonisation scheme is presented in Figure 16 and Table 2.

Figure 16: Flowchart of harmonisation process from SITC to MSIC

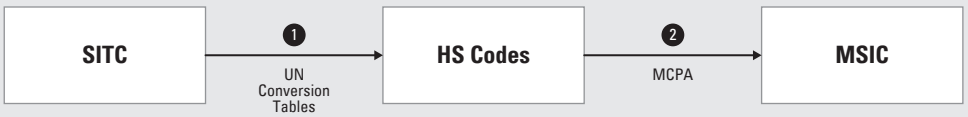


Table 2: Example of harmonisation of SITC 4 to MSIC 2008

SITC 4	MSIC 2008	SITC 4 Description	MSIC 2008 Description
04210	01120	Rice: in the husk, (paddy or rough rice)	Growing of paddy
05771	01263	Nuts; Edible nuts, excluding nuts chiefly needed for the extraction of oil, fresh or dried, whether or not shelled or peeled, coconuts	Growing of coconut
05453	01131	Vegetables; Cabbage and similar edible *brassicas*, fresh or chilled	Growing of leafy or stem vegetables
05711	01210	Fruits; Oranges, fresh or dried	Growing of grapes
00141	01461	Live animals; Poultry, (i.e., fowls of the species *gallus domesticus*, ducks, geese, turkeys and guinea fowls), weighing not more than 185g	Raising, breeding and production of chicken, broiler

Appendix 1: Estimation procedures for the import-adjusted approach

The approach that is introduced in this study is supported by data that is publicly available. The aim is to provide a practical approach that reduces man-hours for data development but still obtain satisfactory findings. Table 3 presents the data types and estimation procedures that are necessary to apply the import-adjusted approach.

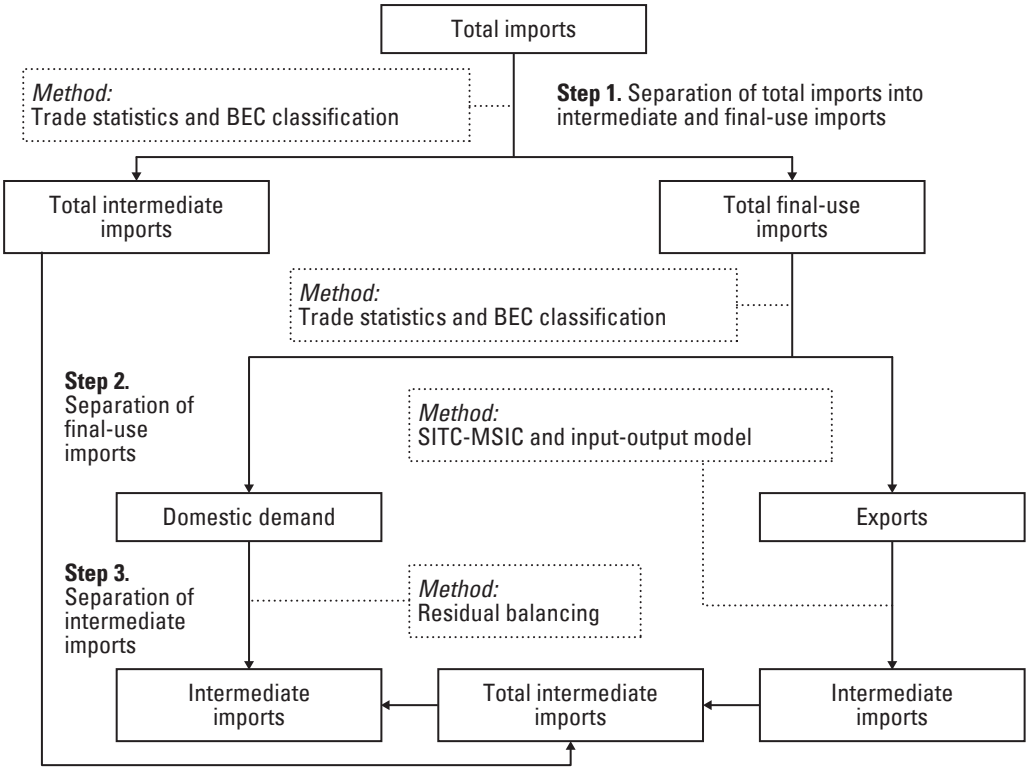
Table 3: Data types and estimation

Final demand components (1)	Level of aggregation (2)	Separation between domestic and imports		
		Domestic (3)	Final imports (4)	Intermediate imports (5)
Private consumption	Aggregated/ limited disaggregation	Residual	BEC	Cannot be determined
Public consumption	Aggregated/ limited disaggregation	Residual	BEC	Cannot be determined
Investment	Aggregated/ limited disaggregation	Residual	BEC	Cannot be determined
Exports	Detailed by commodities	Harmonised SITC-MSIC	Harmonised SITC-MSIC	Estimated by input-output model

Notes:
BEC = Broad Economic Categories; SITC = Standard International Trade Classification; MSIC = Malaysia Standard Industrial Classification.

Meanwhile, Figure 17 summarises estimation procedures for separating imported intermediate and final-use goods consumed by domestic demand and exports. It can be divided into three main steps.

Figure 17: Separation of imports by final demand components



Source: DOSM (n.d.)

- Step 1 separates total imports into imported intermediate and final-use goods

  Data for total imports are provided in the national accounts statistics but separation between imported intermediate and final-use goods is not available. Import statistics by products are available and separation between the imported intermediate and final-use goods can be estimated by applying the Broad Economic Categories (BEC) coding system[11].

- Step 2 estimates imported final-use goods consumed by final demand components

  Data for all the four final demand components at the aggregate level are available in the national accounts statistics. Then, aggregate consumption by each final demand component needs to be separated by consumption on domestically produced goods and consumption on imported goods. The easiest way to separate them is by first estimating consumption on imported goods. Then, consumption on domestically produced goods is obtained by taking the difference between total consumption and consumption on imported goods. Estimation of consumption on imported goods is performed by applying the BEC coding system. From the total imported final-use goods, the BEC coding system is able to further differentiate the final-use imports that are attributed to the private consumption, government consumption and investment components.

[11] See United Nations Statistics Division, Classification by Broad Economic Categories. The BEC coding system is the standard procedure used by national statistics offices for all countries when separating imports into final and intermediate goods. Estimation of the World Input-Output Database (WIOD) also applies similar procedures (see for example, Dietzenbacher, et al. (2013)).

- Step 3 estimates imported intermediate goods content in the consumption of domestically produced goods

  These imported intermediate goods are the raw materials and services that are required in the production of domestic goods. The most extensive data for sectoral breakdown are exports, which are detailed by various goods classified according to the SITC. Because sectors in the IO tables are grouped according to the MSIC, the trade data must be harmonised. Once exports are harmonised at each individual sector, we estimate the intermediate import content in exports by applying the following equations:

$$\mathbf{m} = \hat{\mathbf{h}}(\mathbf{I} - \mathbf{A})^{-1}\mathbf{e} = \hat{\mathbf{h}}\mathbf{L}\mathbf{e} \quad (1)$$

  Where $\hat{\mathbf{h}}$ contains the import coefficients expressed in the form of diagonal matrix, $(\mathbf{I} - \mathbf{A})^{-1}\mathbf{e}$ is the Leontief inverse matrix, $\mathbf{e}$ represents the vector of exports and $\mathbf{m}$ denotes the vector of intermediate imports. Provided that the total imported intermediate goods are known, imported intermediate goods required for exports can be determined. Finally, the imported intermediate goods that are contained in domestic final demand components (i.e. private consumption, public consumption and investment) can be obtained residually.

The import-adjusted approach is a methodology used to measure the actual performance of foreign and domestic sectors in the economy. However, limited data availability is a major constraint to apply this approach. For example, the IO table is published with a lag of every five years. However, data for total final demand components are available annually at the aggregate level. Considering all the data constraints, this study provides the import-adjusted approach to measure the actual contribution of foreign and domestic sectors on an annual basis. The approach proposed is sufficient to achieve satisfactory findings.

CHAPTER 02

INTERLINKAGES IN THE MALAYSIAN ECONOMY

CHAPTER 2

INTERLINKAGES IN THE MALAYSIAN ECONOMY[12]

At an aggregate level, the final demand components—namely consumption, investment, government expenditure and net exports—utilise goods and services produced by various sectors in the economy. If one assumes that the economy is perfectly reactive to any changes in demand, it follows that if any changes in final demand were to happen—say, private consumption increases—the perfectly reactive economy would supply additional amounts of goods and services to cater this extra demand. The question this chapter will delve into is: what are the spill-over effects of an increased demand for a particular good or service, keeping in mind the production of this good or service uses outputs from other sectors as its inputs? In other words, how would an additional demand for a product reverberate throughout the entire economy via interlinkages of all sectors in the economy?

This chapter dives into analyses on the impact of increased final demand on various sectors and the interlinkages between them, from the perspective of conventional output growth as well as growth in value-added terms. As shown in Figure 18, the sectoral interlinkages are examined from three perspectives:

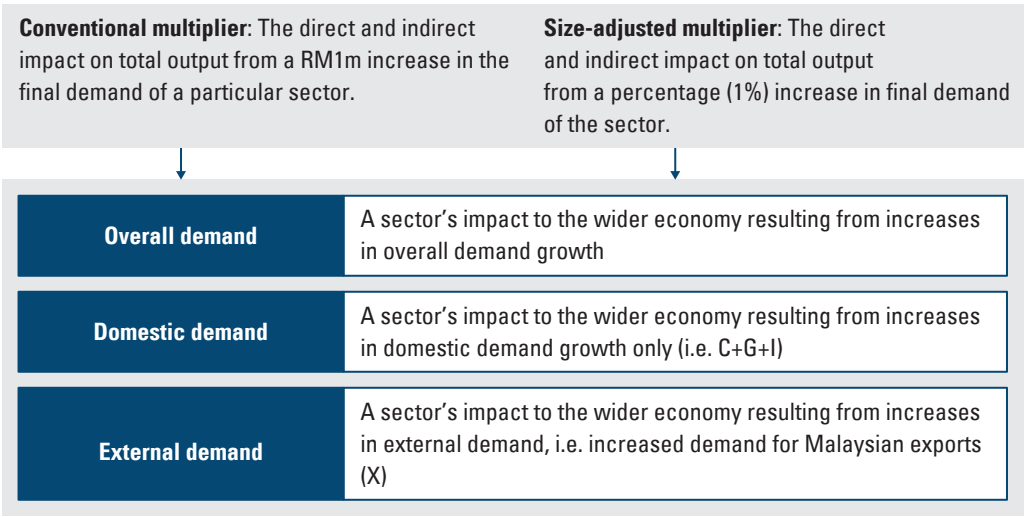
(i) A sector's impact to the wider economy resulting from increases in overall demand growth;

(ii) A sector's impact to the wider economy resulting from increases in domestic demand growth only; and

(iii) A sector's impact to the wider economy resulting from increases in external demand, i.e. increased demand for Malaysian exports.

[12] As part of this report, a journal paper was written by the authors. See Saari, M. Yusof et. al. (2017). This chapter is an updated and expanded version of that journal paper.

Figure 18: Interlinkages can be examined through different perspectives



Source: Authors' illustration

Sectors that provide strong feedback effects to other sectors in the economy could potentially be key in creating demand and spreading growth throughout the economy[13]. Identifying sectors that exhibit these characteristics is useful when thinking about the implications of how economic events impact the economy differently. On top of this, conducting these analyses on the Malaysian IO tables over the years provide a clearer picture of structural changes in Malaysia's economy.

Let's first look at how IO tables work. The Malaysian economy is broken down into 124 sectors, following DOSM's classifications in its IO tables. A simpler version of the 2010 IO table is presented in Table 4, with three main sectors: (i) Agriculture; (ii) Industry—which includes sectors such as Manufacturing and Mining—and (iii) Services—which includes sectors such as Financial Services, Telecommunications and Construction. Box 2 explains how IO tables are constructed.

[13] Temurshoev, et al. (2014)

The IO table shows the flow of goods and services as they are purchased and sold in the economy. It also provides a consistent link between the expenditure approach and the value-added approach of calculating GDP. On the expenditure side, GDP can simply be calculated by summing up the total expenditure on private consumption (RM387.1b), government consumption (RM106.5b), gross fixed capital formation (RM182.6b), changes of stock (RM13.8b), and exports (RM744.0b) minus imports (RM582.0b). On the value-added side, GDP is equal to the total amount of value-added plus other primary inputs (essentially, wages, profits, indirect taxes and subsidies). In Table 4, both approaches of calculating GDP amount to RM852.1b.

Using the Agriculture sector as an example:

- Reading across its row shows how much Agriculture **output** is consumed by other sectors.
- Reading down its column shows the contribution of output by other sectors that are taken as **inputs** for the Agriculture sector.
- Therefore, to produce RM123.9b of Agricultural output, we need RM7.8b worth of output from the Agriculture sector itself, RM14.1b from the Industry sector and RM15.2b from the Services sector. And so on for the remaining sectors.

The IO analysis is fundamentally demand-driven. Supply-side variables are endogenously affected by demand. These variables, such as value-added and imports, are affected by changes in output induced by changes in final demand.

Demand, however, is an exogenous variable that is determined outside the IO model. The final demand components—private consumption, government consumption, gross fixed capital formation, change in inventories and exports—are taken as given and inserted into the model, which then determines the level of output produced by the economy.

Admittedly, the IO methodology, while acceptable for policy analysis, does suffer from some bottlenecks. As discussed in Box 3, these include the linearity assumption, the fixed prices assumption as well as the demand-driven nature of the analysis.

Table 4: Simplified input-output table for Malaysia, 2010

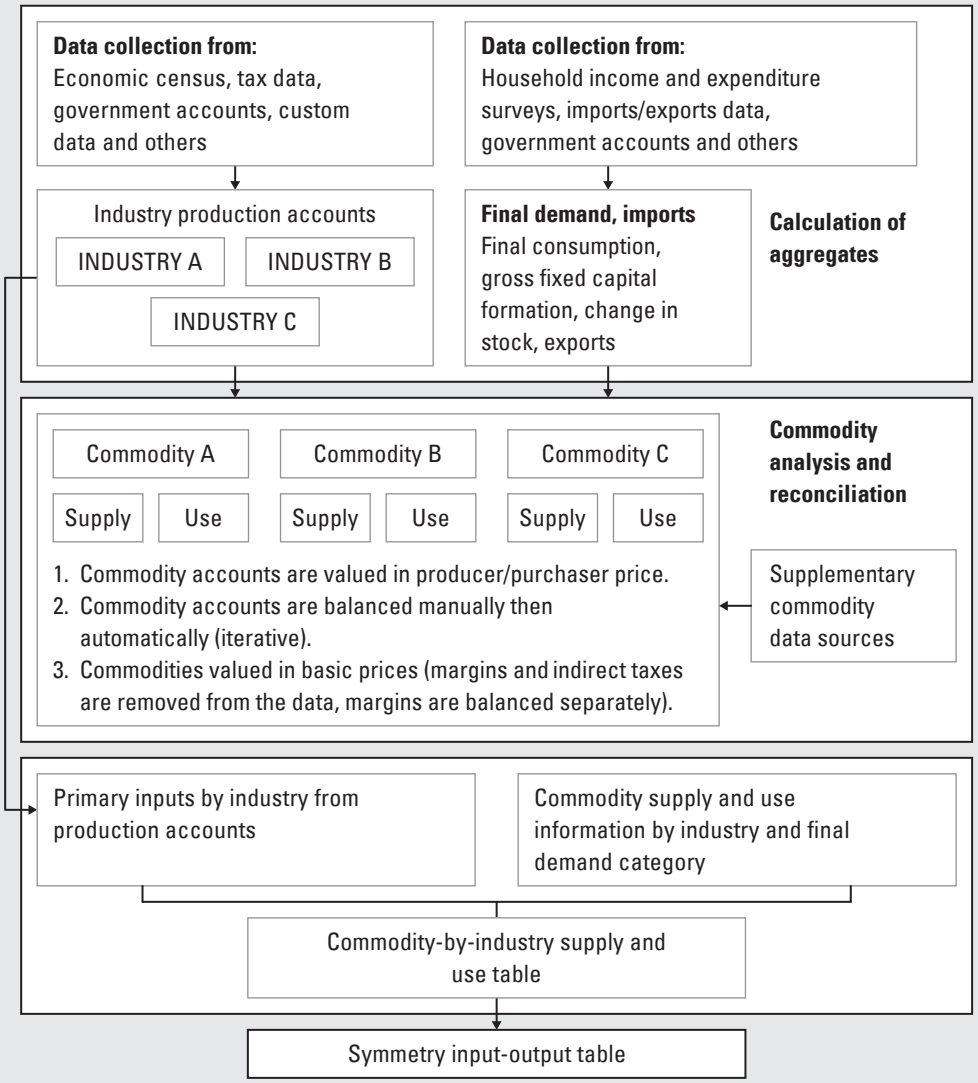
		OUTPUT			
INPUT	RM million	Agriculture	Industry	Services	Total Intermediate Demand
	Agriculture	7,766	73,852	6,171	87,789
	Industry	14,096	246,983	110,149	371,228
	Services	15,179	124,335	263,698	403,212
	Total Intermediate Input	37,041	445,170	380,018	862,229
	Imported Commodities	11,180	284,463	107,413	403,056
	Other Primary Inputs	949	5,230	6,604	12,784
	Value Added	74,695	268,495	452,912	796,102
	Total Input	123,865	1,003,358	946,948	2,074,171

Source: DOSM (2014)

OUTPUT					
Private Consumption	**Government Consumption**	**Gross Fixed Capital Formation**	**Change in Inventory**	**Exports**	**Total Output**
19,645	-	3,427	430	12,574	123,865
84,435	-	20,266	7,276	520,153	1,003,358
252,491	101,380	75,903	2,155	111,807	946,948
356,571	101,380	99,597	9,861	644,534	2,074,171
56,083	5,161	78,064	3,973	35,658	581,995
25,508	6	4,923	-	63,842	56,047
					796,102
387,145	106,547	182,584	13,834	744,034	3,508,314

Box 2: Data collection process for IO table construction

Figure 19: Summary of the IO table methodology



Source: Saari, M. Yusof et. al. (2014)

Figure 19 summarises the data generating process and inputs employed in the construction of an IO table. Based on the standard IO framework, three major parts are involved:

i) Production matrix: Captures the sales and purchases of intermediate goods and services involved in the production of final output between sectors. The matrix provides intermediate input and output structures for every sector.

ii) Primary input: Captures the endogenous variables that include primary input components such as imports, indirect taxes and value-added (which comprises of compensation of employees and operating surplus or profit).

iii) Final demand: Captures the exogenous variables that include demand components such as private consumption, government consumption, change in inventory, gross fixed capital formation and exports.

The Malaysian Economic Censuses are primary datasets collected by DOSM. These censuses, which are normally conducted and published in five-year intervals, are required in order to construct an IO table. Thus, IO tables also follow these publication intervals.

When assembled, the IO table is designed to provide a snapshot representing the flow of goods and services purchased and sold in the economy. The Malaysian IO table is composed of five broad sectors, with a total of 124 subsectors. These five broad sectors are Agriculture, Mining and Quarrying, Manufacturing, Construction and Services. With a symmetric 124-by-124 table representing the flow of goods and services between 124 subsectors, the IO table is a representation of economic interdependencies that exist as a result of the interaction between these sectors within that particular year.

The next five sub-sections detail the analyses that support our results. The first subsection details the measures used to identify a sector's linkages and value-added impact on the rest of the economy. The second subsection presents the 'size-adjusted value-added' multipliers in detail. The third subsection provides some context of the linkages and multipliers concepts in relation to where various sectors are located in the value chain. The fourth subsection looks into the evolution of size-adjusted value-added multipliers of various sectors over four decades. The fifth subsection identifies the key sectors for the Malaysian economy based on the linkages and multipliers measures. Finally, the last section discusses potential sectors for future growth.

Box 3: Limitations of the IO model

The limitations of the model

The IO analysis technique used in this report is known as the 'quantity' model or the 'Leontief' model (after the economist Wassily Leontief, whose work in this field earned him the Nobel Prize in Economics in 1973). The model shows how changes in one sector—a demand shock in this model's case—have knock-on effects on other sectors in the economy.

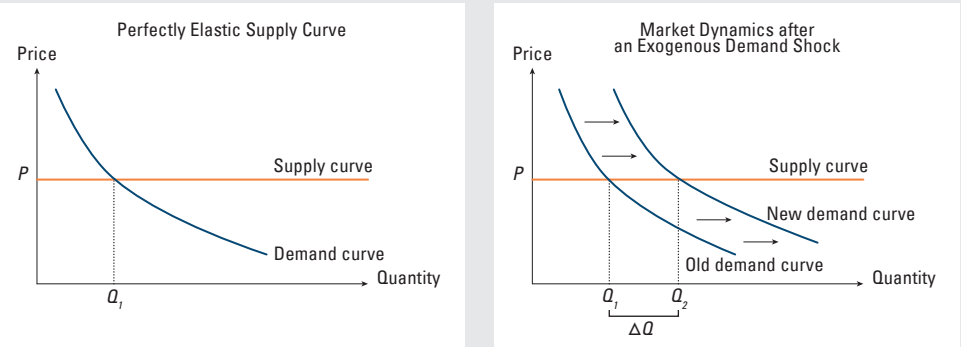
Despite its usefulness, the model has limitations from both theoretical and applied perspectives, which should be borne in mind when interpreting its results. A key limitation of this study is that IO analyses are based on the latest publicly available IO table, as of 2010. Therefore, the analyses in this report assumes that the structure of the economy has not changed significantly since 2010. Nevertheless, it should be noted that Malaysia's GDP was RM821.4b in 2010 and RM1,352.5b in 2017[14]. Since 2010, Malaysia has also experienced a fall in commodity prices.

[14] CEIC Data (n.d.)

Other main limitations lie in the assumptions used to build the model and constraints due to the lack of sufficiently comprehensive and detailed data:

- **Perfectly elastic supply curve**: The supply side is assumed to be perfectly reactive to any demand shocks without any changes in price—if there are any changes to the amount of goods or services demanded by the consumers, producers are able to supply this demand of the goods or services without adjusting their prices. This is more reflective of short-run market conditions where price stickiness do not allow any valuation adjustments to take place. Figure 20 shows the dynamics of demand and supply before and after an exogenous demand shock[15], as assumed in the IO analysis. As a result, the IO model fails to capture potential effects of inflation or currency fluctuations when the economy is running at full capacity.

Figure 20: Market dynamics under a perfectly elastic supply curve



Source: Authors' illustration

[15] Exogenous variables are the external forces that determine the level of output produced by the economy. They are usually referred to as the final demand components (i.e. private consumption, government consumption, change in inventory, gross fixed capital formation and exports). In contrast, endogenous variables, such as value-added and imports, are affected by the change in output driven by demand.

- **Fixed production structure**: Constant returns to scale implies fixed composition of input used in the production of a particular good or service. For example, if it takes one worker and one sewing machine to produce a shirt in an hour, it would take two workers and two sewing machines to produce two shirts per hour. Mathematically, if the producer follows a production function of $f(K,L)$, where K is capital and L is labour input, then doubling the inputs, $f(2K,2L)$, would double the outputs, $2f(K,L)$, i.e. $f(2K,2L) = 2f(K,L)$. Again, this is reflective of the short-run feature of the model, which does not incorporate either increasing or diminishing returns from increased scale in factor of production (economies of scale), specialisation or technological improvements.
- **Heterogeneity in interlinkages of individual industries over time**: A sector in an IO table comprises a number of economic activities that potentially differ in terms of scale and linkage networks. Although the strength of interlinkages in a sector could remain similar over time on an aggregate level, this does not necessarily imply that individual economic activity would follow the same production pattern of the sector as it evolves over time.
- **Interdependencies across countries**: The database and formulation of IO analyses in this study is unable to capture production interdependencies between sectors in different countries. What has been largely missing is a comprehensive and detailed picture of the network structures of the global economy. How Malaysian producers are linked to and specialised within the global value chains (GVCs) are not captured in this study. To capture such analysis, the Malaysian IO table must be integrated with a global one.

Albeit the associated weaknesses of the IO methodology (especially the linearity assumptions and fixed prices), it is still regarded to be acceptable for policy analysis. However, these strong assumptions are relaxed in applied general equilibrium modeling, an approach that could be considered for future analysis of the Malaysian economy.

Measuring sectoral interlinkages

In the field of economic development and planning, economic drivers are identified based on two commonly used measures—multipliers and linkages[16]. Multipliers measure economy-wide impact on specific economic variables as a result of growth in output of a sector. In IO analysis, the output growth for a sector is determined exogenously by the growth in final demand of the sector. For example, the output multiplier measures the direct and indirect impact on total output for a sector that are potentially generated by each additional Ringgit of final demand. This additional Ringgit implies an increase in output that would need to be produced to meet the demand. This increase in output stimulates supply-side variables such as value-added, employment and imports. The methodological approach for multipliers and linkages is provided in Appendix 2.

A second criterion, which is based on linkages, must be established as a complement measure for multipliers. Linkages measure the extent of how growth of sectors with high multipliers could bring benefits to other sectors. A sector may have high multipliers, but that does not tell policymakers whether that sector is actively sending impulses to other sectors. Consequently, the existence of high multipliers, without further information, does not imply that the particular sector can be considered as a driver of the economy. It may be the case where growth in a sector benefits itself rather than supporting the growth of other sectors. The appendices of this chapter present the detailed approach in measuring these linkages.

For ease of understanding, linkages analysis simply provides information on how a sector extracts resources from another sector and at the same time, provides support for the growth of other sectors. In detail, linkages can be defined as the following:

- **Backward linkages:** Measure the inter-connections among input suppliers for an economic sector. If one sector increases its output, there will be increased demand from other industries (as a supplier) whose goods and factors of production are used as inputs for the production of that particular sector.

[16] For some examples, see Morrissey, et al. (2013) and Atan, et al. (2012)

- **Forward linkages:** Measure the inter-connections among buyers for the output produced by an economic sector. That is, additional output of products is available to be used as inputs by other sectors for their own production and consumption.

Figure 21 below illustrates the backward and forward linkages for the major economic sectors of Malaysia in 2010. As an example of a backward linkage, it is seen that to produce the Manufacturing output (on the right-hand side), then inputs from nearly all the sectors, namely; Services, Manufacturing, Agriculture, and Mining and Quarrying; are needed. Therefore, producing Manufacturing output requires a lot of different sources of inputs from the whole economy, which can be considered as having high backward linkages.

Similarly, forward linkages can be seen by looking at the figure from the left-hand side. Again, using the Manufacturing sector as an example, the Manufacturing output is used as input for many of the economic sectors, with the bulk of the inputs flowing back into the Manufacturing sector, some into the Services sector, and the remaining in all other sectors. Therefore, we can say that Manufacturing input has high forward linkages, as it produces inputs for all of the sectors in the economy.

Figure 21: Backward and forward linkages of five broad sectors of the Malaysian economy, 2010

Source: DOSM (2014), Authors' illustration

In this report, an above average backward linkage index (equivalent to 1 or higher) indicates that the sector has strong inter-connections with its input suppliers. As mentioned earlier, this is favourable from a growth perspective as a demand shock in one sector can bring forward growth for many other sectors. However, it must be noted that choosing a sector associated with high backward and forward linkages needs to consider where this sector lies in a production network (such as in a GVC). This is explained later, in the section on 'linkages and multipliers in context'.

Size-adjusted value-added multipliers

A literature review on the use of IO analysis to identify sectoral multipliers have largely used output measures as its yardstick for multiplier gains[17]. In identifying growth drivers, the 'value-added' measure is more relevant to be evaluated by policymakers. To recap, value-added of a firm captures the difference between the total sales revenue of the firm minus its production costs. As such, the value-added measure provides more useful information on the economic contribution of a sector as compared to the output measure which includes imports that contain foreign countries' shares. In this study, multiplier and linkages measures are calculated in value-added terms instead of output for two main reasons:

i) It is not necessarily the case that sectors with higher output will also have substantial value-added returns. Output measures include imports and thus sectors that are associated with higher leakages imply lower value-added (although it might be the case that output linkages are higher).

ii) Current government development plans have emphasised the promotion of high value-added activities that may help to achieve targeted growth. Thus, analysing the value-added linkages provide useful information for policymakers in Malaysia.

Furthermore, there are different types of multipliers used in this report, and it is important to note that they complement each other. We will use the multipliers according to the different questions we ask. The following explains the distinction in measurement between them:

i) **Conventional multiplier**: The direct and indirect impact on economy-wide output from a RM1m increase in the final demand of a particular sector. This is the standard definition of multipliers in economics textbooks.

ii) **Size-adjusted multiplier**: The direct and indirect impact on economy-wide output from a percentage (1%) increase in final demand of the sector.

[17] For examples, see Bekhet (2009) and Sabiroglu, et al. (2012)

In this study, we will focus on size-adjusted multipliers over conventional multipliers. Specifically, this report will focus on **size-adjusted value-added multipliers** (as opposed to a size-adjusted output multiplier). This measures the direct and indirect impact on economy-wide **value-added** from a percentage (1%) increase in final demand of the sector.

Depending on the questions to be answered by policymakers, different multiplier measures will be applied. For example, if the question is to find the key sectors that can maximise the economic growth in the short-term, then the size-adjusted multiplier could be applied. It has two advantages over the conventional measure that does not adjust for sectoral sizes:

i) **Targeted growth**: Interpretation of the conventional measure is untargeted and implicitly assumes that growth effects of each final demand component are equal. For example, an output multiplier for the Agriculture sector with a value of 1.50 indicates that for every Ringgit increase in any final demand, this generates RM1.50 output to the total economy. It is equally important to note that each final demand component impacts the economy differently and each sector contributes differently to final demand.

ii) **Ignoring size effects**: The conventional measure may be highly relevant for private investment decisions whereby the policy interest is to gain returns on investment. However, if the policy decision is to maximise overall growth, the conventional measure is less relevant because it ignores the economic size of a particular sector. In other words, the conventional measure has to be complemented by additional measures. The larger the size of the sector, the higher the intensity and degree of the impact.

If the question is to find which potential sectors are to be further developed for the medium and long-term, and what their considerable impact are on the returns of investment, then the conventional multiplier should be applied. A sector might have a considerable multiplier impact on the economy, but it may also have limitations in supporting growth of other sectors due to its smaller size. There is no doubt that the sector can be a new source of growth for the future if proper development policies for the sector are designed.

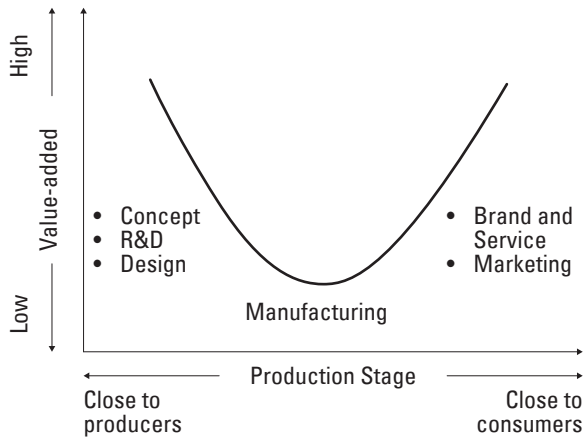
It should be stressed that the introduction of size-adjusted multipliers does not mean that the conventional multipliers are obsolete. In this case, both measures can be used to achieve different objectives. If the main intention of the policymakers is to drive the growth of infant industries or for investment purposes, then the conventional multipliers may be the best choice. On the contrary, if policymakers are looking for new sources of growth to be promoted, size-adjusted multipliers may be a better choice as it will take into account the relative sizes of the sectors.

Therefore, this study provides two views with respect to the key sectors. First, we provide sectors which could be promoted by the government to maximise growth in the short-term. Second, we provide results indicating the sectors that have potential for further development in the medium and long-term as well as providing high returns on investment. The time horizon used (medium and long-term) is based on the Malaysia Plan (MP) report produced by the Economic Planning Unit (EPU).

Linkages and multipliers in context

The various production stages and the corresponding value-added

Figure 22: Production stages involved in a production network



Source: Authors' illustration based on Shih (1996)

Figure 22 above describes the different production stages involved in a GVC or production network. The vertical axis measures the extent of the activities' value-added, whilst the horizontal axis is the distance to final consumers. At the pre-production stage, there are typically research and development (R&D) activities, and in GVCs they tend to be carried out in more advanced economies[18]. In terms of linkages, it is clear that R&D has significant forward linkages (FWL) but close-to-none backward linkages (BWL).

Moving along the curve, we find that mass manufacturing of products usually result in low value-added activities—these typically include processes such as the assembly of parts. However, at this production stage, it can be seen that this industry may bring significant growth to other sectors due to its high backward and forward linkages. Finally, the activities that are closer to the final consumers

[18] International Bank for Reconstruction and Development, et al. (2017)

include branding, marketing, logistics and after-product servicing[19]. These activities require extensive market knowledge which also bring high value-added returns and high backward linkages, but low forward linkages.

Table 5 explains further how sectors are interlinked with the rest of the economy depending on where they are placed on the value chain, and whether the sector is used mainly for exports or domestic consumption from the calculations for backward and forward linkages analysis for the year 2010. For example, in the case of the Semi-conductor Devices, Tubes and Circuits sector, its position in the value chain is in the middle; mainly involving the assembly of parts, which is associated with low value-added returns. It can be highlighted that the sector does relatively well for export demand growth, however, it does not do well to serve the domestic demand growth. A one percent rise in its final demand (RM954.5m) leads to a size-adjusted multiplier (SAM) of RM342.4m in overall demand.

Conversely, the Telecommunications sector will generally fall under the very right of the curve, as this sector involves substantial services-related operations, with high value-added and high backward linkages. Think of companies such as Digi, Maxis, Astro and Telekom Malaysia—these companies market their products to the domestic consumers, which may explain why they do not do well in generating export demand growth. Its size-adjusted multiplier is relatively lower compared to the other two sectors—where a per cent increase in its final demand leads to RM207.5m in overall demand. Furthermore, some examples of its backward linkages are the utilities and construction sectors that are required for its infrastructure.

Lastly, the Petroleum Refinery sector, has considerably high backward and forward linkages across overall demand growth, domestic demand growth and export demand growth. Its size-adjusted multiplier is also higher than the other two sectors in generating overall demand growth. This is no surprise as the Oil and Gas industry in Malaysia has historically generated significant domestic revenues. The numbers also say that any demand shock will increase demand for both downstream and upstream activities.

[19] Ibid.

Table 5: Analyses of sectors with three examples

Sectors	Semi-conductor Devices, Tubes and Circuit Boards (E&E)	Petroleum Refinery	Telecommunications
Description	Includes the manufacture of electronic components and boards	Includes the manufacture of coke oven products, refined petroleum and biodiesel products	Includes wired, wireless and satellite telecommunications activities
Approximate position in the production stage	Middle	Left	Right
BWL, FWL and SAM in Overall Demand Growth	BWL: 1.60 FWL: 0.85	BWL: 2.88 FWL: 1.61	BWL: 1.47 FWL: 1.41
	SAM: RM342.41m 1% of Final Demand: RM954.52m	SAM: RM452.65m 1% of Final Demand: RM619.10m	SAM: RM207.47m 1% of Final Demand: RM277.40m
BWL, FWL and SAM in Domestic Demand Growth Transport	Not in Top 10	BWL: 0.34 FWL: 0.41	BWL: 0.97 FWL: 0.52
		SAM: RM139.03m 1% of Domestic Demand: RM190.16m	SAM: RM191.35m 1% of Domestic Demand: RM255.84m
BWL, FWL and SAM in Export Demand Growth	BWL: 1.03 FWL: 0.76	BWL: 1.16 FWL: 0.46	Not in Top 10
	SAM: RM327.77m 1% of Export Demand: RM913.72m	SAM: RM313.61m 1% of Export Demand: RM428.94m	

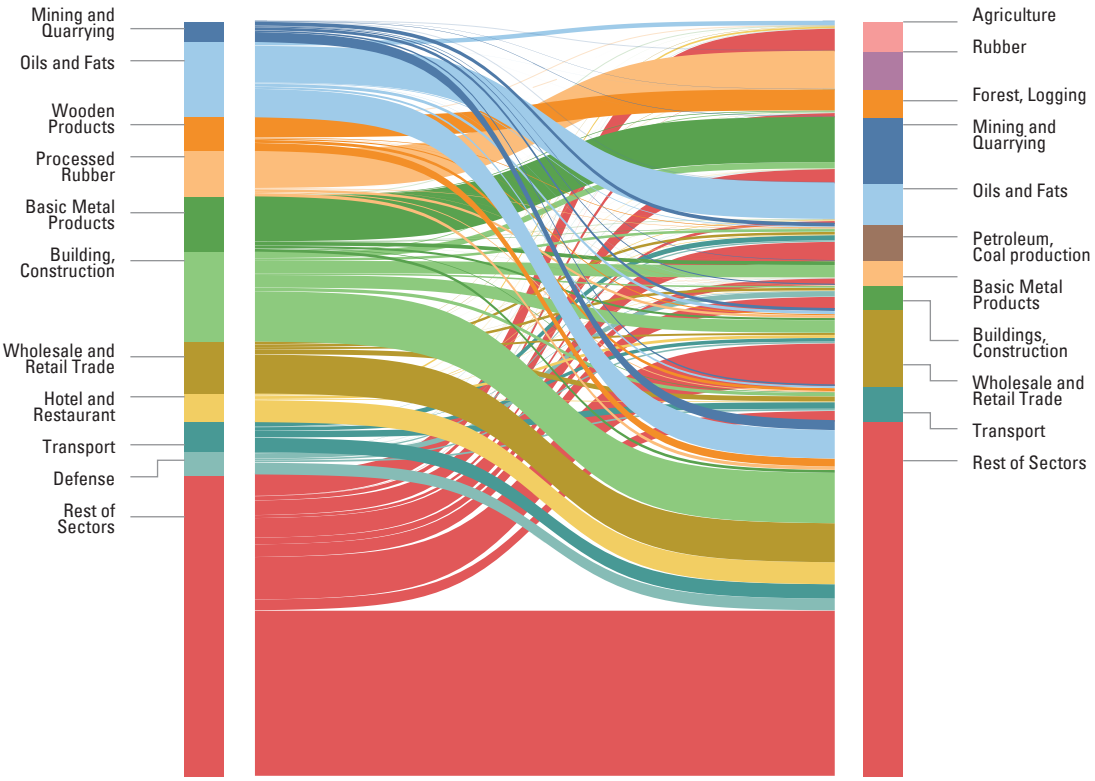
Source: Authors' calculations
Note: BWL = backward linkage; FWL = forward linkage; SAM = size-adjusted multiplier.

Size-adjusted value-added multipliers through the years

To better visualise backward and forward linkages of some subsectors of Malaysia, Figures 23 – 26 represent the production matrix of the top 10 subsectors for the years 1978, 1991, 2000 and 2010, which are years when the IO table data were made available. It is worth noting that as years passed, the classifications of sectors also evolve to include new sectors or to further define an existing sector. Therefore, the sectors that are included in the IO tables for the years 1978 – 2010 are not identical; in fact, in 1978 the IO table had 58 subsectors, and in 2010 this expanded to 124 subsectors. Therefore, to make the IO tables comparable, a harmonisation process was required to re-estimate the contribution of each subsector. This process segmented the subsectors to match the year 1978 (with 58 subsectors).

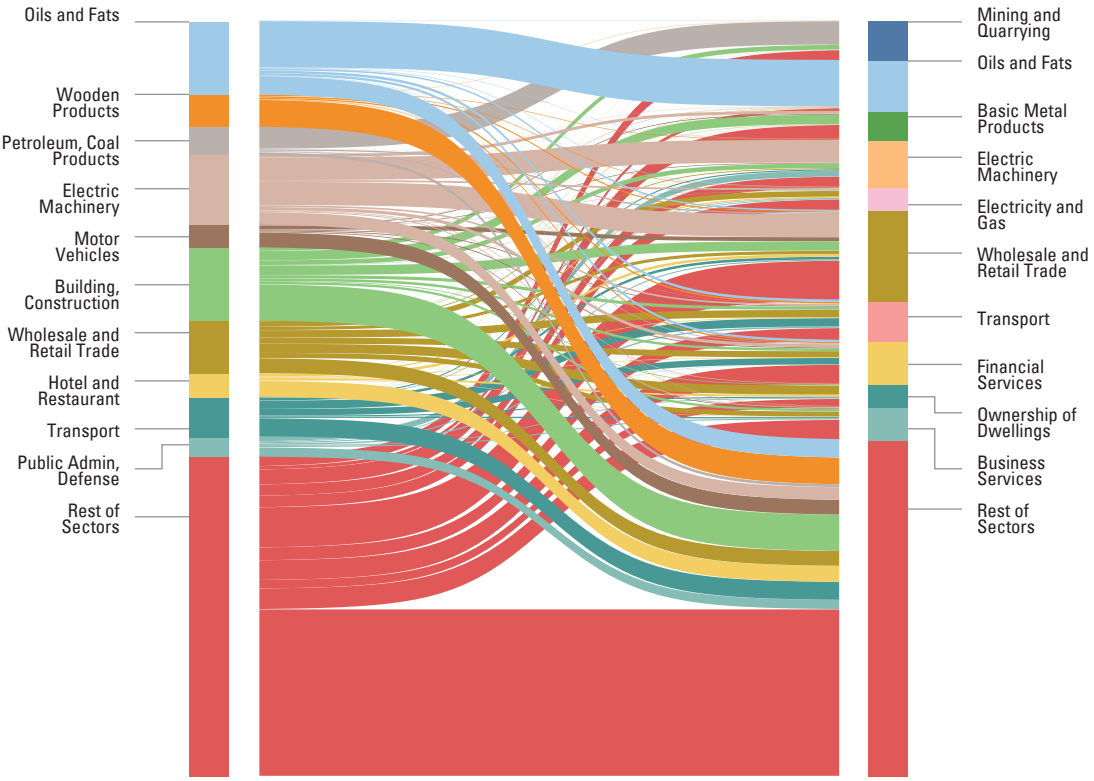
The figures are to be read as follows. As explained earlier, the bar chart on the left represents intermediate inputs while the bar on the right represents intermediate outputs. The flow curves in the middle represent how one sector is linked to another. For example, to understand backward linkages in Figure 26, Oils and Fats on the output side (right-hand side) pulls resources mostly from the following subsectors —Oils and Fats (its own self), Oil Palm Primary Products and Wholesale and Retail Trade. On the contrary, the Oils and Fats on the input side (left-hand side) produces output for its own sector as well as the Rest of Sectors. By examining such linkages, the extent to which growth in a sector may bring benefits to other sectors can be estimated.

Figure 23: Top 10 subsectors production matrix, 1978



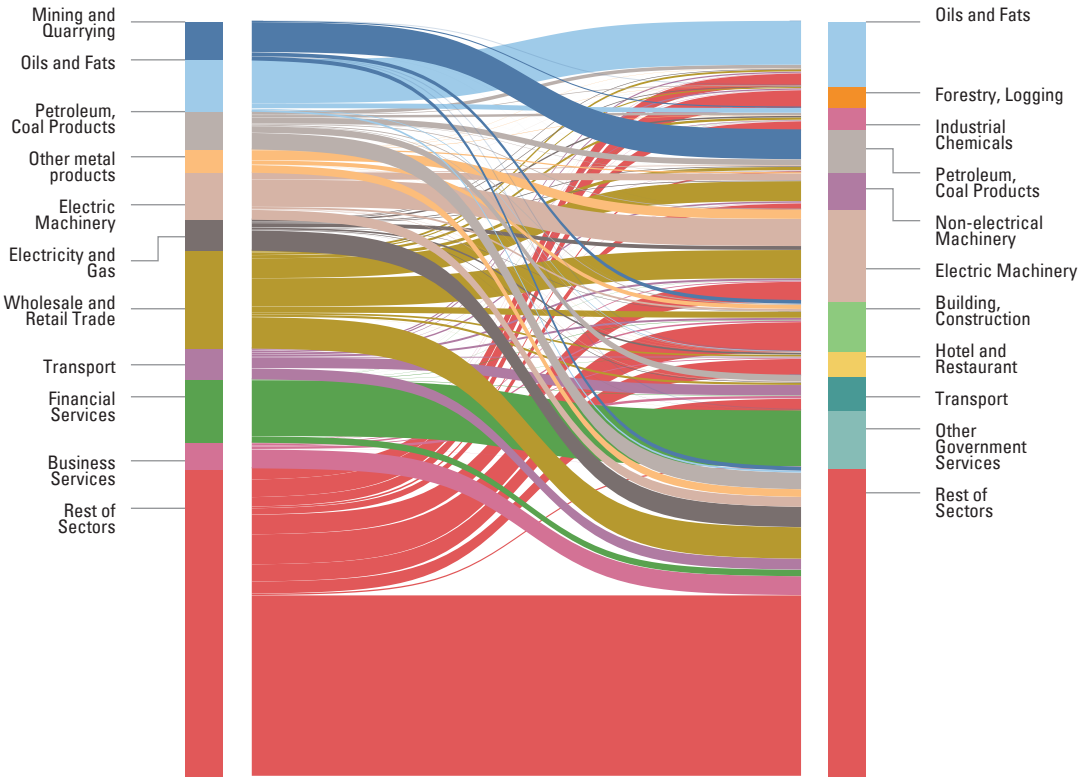
Source: DOSM (n.d.-a), Authors' illustration

Figure 24: Top 10 subsectors production matrix, 1991



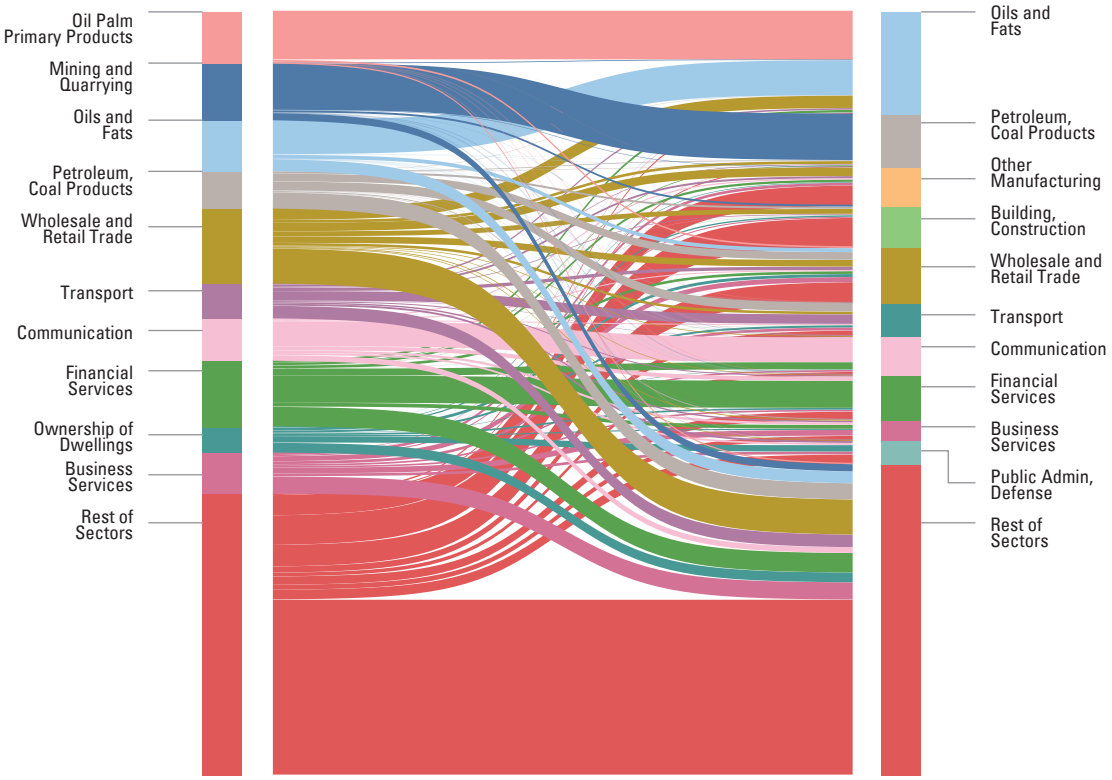
Source: DOSM (n.d.-a), Authors' illustration

Figure 25: Top 10 subsectors production matrix, 2000



Source: DOSM (n.d.-a), Authors' illustration

Figure 26: Top 10 subsectors production matrix, 2010



Source: DOSM (n.d.-a), Authors' illustration

Furthermore, across Figures 23 – 26, several notable observations can be made. Firstly, Oils and Fats, Wholesale and Retail Trade, and Transport have consistently been included in the top 10 (in terms of highest size-adjusted multiplier impact) sectors across the four decades. Secondly, the Oils and Fats subsector, although quite a dominant subsector, produces output mainly for its own consumption, as can be shown by the relatively thick bar that flows from Oils and Fats back to its own industry. This contrasts to the patterns observed in the Wholesale and Retail Trade subsector—a large portion of its output is consumed by a variety of other sectors, which makes it a highly integrated sector in the economy.

Table 6: Sectors that have appeared in the top 20 sectors with the highest size-adjusted value-added multiplier from the 1983, 1991, 2000 and 2010 IO tables

Sector[20]	2010	2000	1991	1983
Accommodation and Restaurant	✓	✓	✓	✓
Building and Construction	✓	✓	✓	✓
Education	✓	✓	✓	✓
Electric Machinery	✓	✓	✓	✓
Health	✓	✓	✓	✓
Mining and Quarrying	✓	✓	✓	✓
Oils and Fats	✓	✓	✓	✓
Real Estate and Ownership of Dwellings	✓	✓	✓	✓
Transport	✓	✓	✓	✓
Wholesale and Retail Trade	✓	✓	✓	✓
Industrial Chemicals	✓	✓	✓	
Non-electricity Machinery	✓	✓	✓	
Petroleum and Coal Products	✓	✓	✓	
Financial Services	✓	✓		✓
Business Services	✓	✓		
Communication	✓	✓		
Other Manufactured Products	✓	✓		
Recreation and Culture	✓		✓	
Furniture and Fixture	✓			
Insurance	✓			
Wooden Products		✓	✓	✓
Motor Vehicles		✓	✓	
Other Private Services		✓		
Agriculture Products			✓	✓
Forestry and Logging Products			✓	✓
Processed Rubber			✓	✓
Rubber Products			✓	
Basic Metal Products				✓
Fisheries				✓
Grain Mill Products				✓
Meat and Dairy Products				✓
Preserved Food				✓

Source: DOSM (n.d.-a), DOSM (n.d.-b), DOSM (n.d.-c), DOSM (2014)

[20] Sector classifications from older IO tables differ from the more recent ones. To provide comparability, micro-level industries are aggregated to 58 higher-level sectors. Sectors are arranged alphabetically, with the most prevalent ones being ranked higher, i.e. the sectors with more tick marks are ranked higher.

From Table 6 above, we can observe several patterns emerging from the sectors with the highest size-adjusted value-added multiplier based on the IO tables of 1983, 1991, 2000 and 2010. There are several sectors that have consistently appeared in the top 20 size-adjusted value-added multipliers (see rows Accommodation and Restaurant to Wholesale and Retail Trade). Then, we can observe sectors that have started to become prominent in recent decades (see rows Industrial Chemicals to Insurance). Finally, we can see sectors slowly dropping out of the picture, such as rubber and other agricultural sectors.

It is easy however, to focus too narrowly on which sectors have the strongest multiplier effect on the economy for a given year. IO tables are snapshots of goods and services flows between sectors in the economy in the given year. However, over the years, all sectors are subject to varying economic conditions such as business cycles and long-term trends of growth. Hence, by taking into account a longer time period, the structure of the economy could be viewed differently as compared to looking at the economy for a particular year. A later section on 'structural changes' looks into which sectors played a more prominent role in the economy between 2005 and 2010.

Box 4: Economic diversification

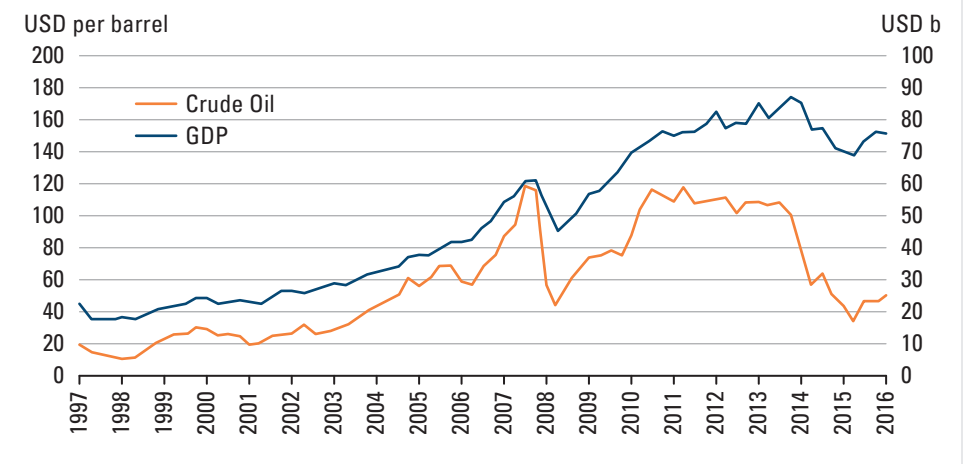
The body of literature on economic diversification is a rich one and has brought out a number of different angles to which one can study this topic. The one that is most relevant to this chapter concerns economic diversification with respect to the country's reliance on a number of sectors to generate economic returns, particularly commodities-based sectors, which may be subject to price and volume fluctuations or secular declines[21]. Diversification provides the economy with the stability and reliability needed in times of economic downturns or periods of wild volatility for individual sectors, as well as building up human capital and institutional capacity for a more robust long-run growth[22]. That is, in the short-run, whenever a sector is adversely affected by a shock, the economy would have other avenues to rely on as sources for growth to make up for the shortfall. In the long-run, productivity gains from human capital and technological advancements become relatively more important compared to economic rent obtained from resource-extraction activities.

For example, looking at Figure 27, which graphs crude oil (UK Brent) prices and Malaysia's GDP, the co-movement between these two variables may lead one to think that there is a dependency on this particular sector in generating GDP. A simple correlation test on differences in quarterly data[23] shows a correlation coefficient of 0.58[24]. Does this mean that Malaysia is too dependent on oil? The impact on Malaysia's economy following the shock in oil price—when crude oil prices halved over the course of the second half of 2014—tells a different story as seen in Figure 27. Malaysia's economy was,

[21] Hvidt (2013)
[22] Gelb (2010)
[23] This calculation was done using data on quarterly Malaysian GDP and quarterly crude oil prices and measures the correlation between the changes in quarterly GDP with the changes in quarterly average price of UK Brent crude oil.
[24] First difference is used as a way to remove potential co-integration between the time series. In other words, it is an attempt to measure the correlation in the changes in the data rather than in the levels in the data. Quarterly data from fourth quarter of 2008 and first quarter of 2009 were also removed in order to remove the skewing effect due to the Global Financial Crisis. Despite this, this simple correlation coefficient should not be taken as the definitive link between GDP and crude oil prices and further investigation is required if one were to prove or disprove a causal link between the two variables.

by and large, able to cope with the steep drop in oil prices and was relatively stable compared to the adverse impacts that hit countries such as Saudi Arabia[25] and to a more severe degree, Venezuela[26], which are primarily oil-exporting countries. Therefore, when viewed from this lens, we may also think that the Malaysian economy is a relatively diversified one, capable of deploying automatic stabilisers when faced with prolonged periods of low oil prices.

Figure 27: Quarterly movements in crude oil prices and Malaysian GDP in USD, 1997 – 2016



Source: CEIC Data (n.d.)

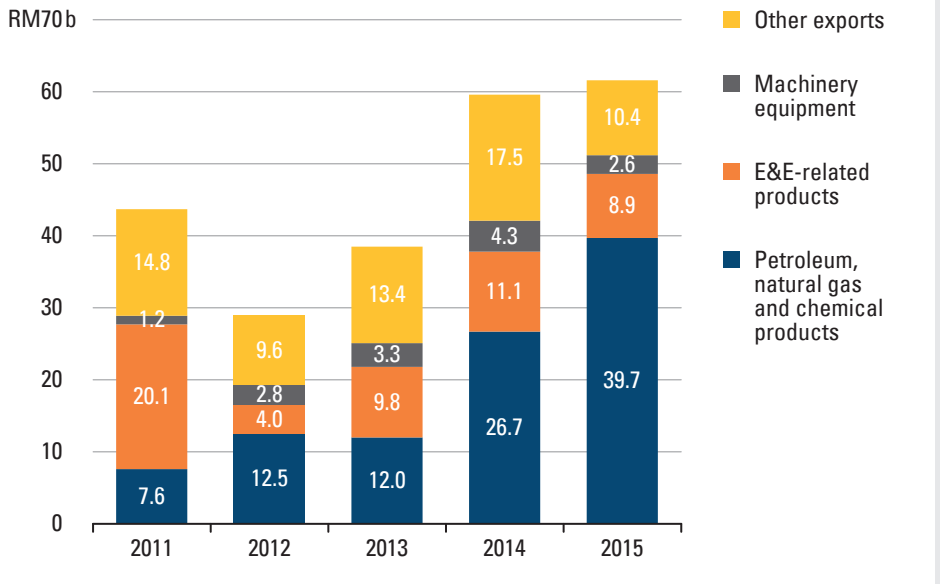
From a macroeconomic perspective, looking at the interlinkages between sectors in the Malaysian economy would shed some light on the question of economic diversification. A high dependence on a sector would mean that the bulk of the economy comprises of that sector's output and a bulk of fiscal revenue is potentially derived from it. This could imply that the 'true' dependence on the sector is much higher because other sectors rely on this sector's spending to keep the economy running[27]. Therefore, looking at interlinkages between

[25] Gladstone (2015)
[26] Fisher, et al. (2017)
[27] Gelb (2010)

sectors gives us some bearings on the economic network and potential ripple effects from a shock to any of these sectors.

In the case of Malaysia, although the country has substantive economic activities in resource-based sectors, these industries have significantly developed across its value chain, such as in export-oriented industries on top of the E&E sector that has progressively shifted towards higher value-added manufacturing activities[28]. These activities are associated with higher intensity of value-added contribution, larger degree of interconnectedness and stronger capacity to generate as well as stimulate growth throughout the economy.

Figure 28: Investment approvals for the export-oriented Manufacturing sector, 2011 – 2015



Source: Bank Negara Malaysia (2016)

[28] Bank Negara Malaysia (2016)

Multiplier impact on value-added from size-adjusted demand shocks

Recall that IO analysis is essentially a demand-driven model. That is, the final demand components are sources of growth and are treated as exogenous in the multiplier model. In this section, the final demand is treated as a variable to examine the sectoral linkages and size-adjusted value-added multipliers by separating the analysis into:

- Impact from overall growth (i.e. the total final demand);
- Impact from domestic demand growth; and
- Impact from external demand growth.

Multiplier impact on value-added from size-adjusted overall demand growth

Table 7 shows the size-adjusted value-added multipliers and linkages values resulting from overall demand growth for each respective sector. Results are presented for the top 10 sectors with the highest value-added impact. For the identification of key sectors, the outcome from the multipliers are matched with the linkages indices for the sectors. Thus, sectors that show high multiplier impact along with strong magnitude of backward and forward linkages (as shown in Figure 29) are considered as important sectors in pulling and supporting growth in the economy.

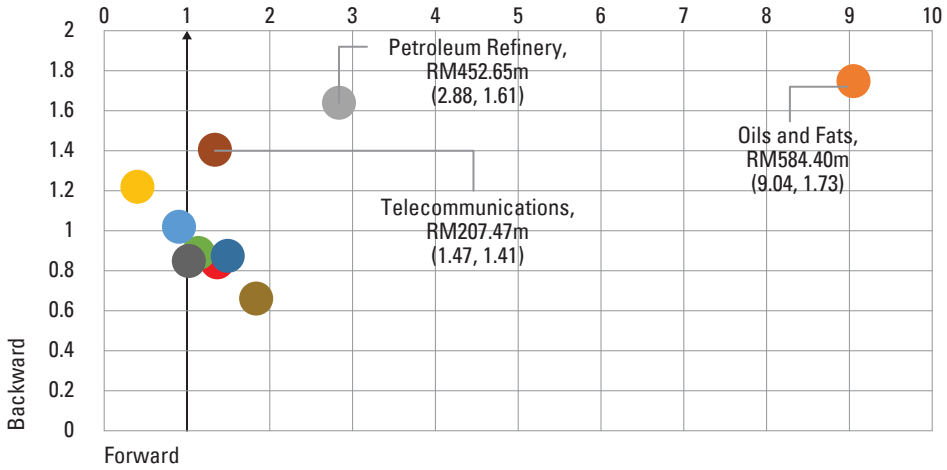
Table 7: Overall demand growth: Sectors with the highest size-adjusted value-added multipliers, 2010

Rank	Sector	Sectoral Grouping	Multiplier impact (RM m) (1)	Final demand (RM m) (2)	Linkages	
					BWL (3)	FWL (4)
1	Wholesale and Retail Trade and Motor Vehicle	Wholesale and Retail Trade	920.72	1,176.95	0.95	1.01
2	Oils and Fats	Oil Palm-based	584.40	720.79	9.04	1.73
3	Petroleum Refinery	Petroleum-based	452.65	619.10	2.88	1.61
4	Crude Oil and Natural Gas	Petroleum-based	383.46	418.98	0.52	1.22
5	Semi-conductor Devices, Tubes and Circuit Boards	Electrical and Electronics	342.41	954.52	1.60	0.85
6	TV, Radio Receivers and Transmitters and Associated Goods	Electrical and Electronics	328.24	688.53	1.26	0.88
7	Restaurants	Tourism	227.46	291.47	1.67	0.87
8	Tele-communications	Transport and Communication	207.47	277.40	1.47	1.41
9	Ownership of Dwellings[29]	Real Estate	182.85	191.03	1.15	0.85
10	Non-residential	Construction	165.78	246.79	1.94	0.65

Note:
Column (1) refers to size-adjusted value-added multipliers derived through a simulation of 1% increase in final demand.
Column (2) refers to the increment value in Ringgit for 1% increase in final demand.
BWL in column (3) and FWL in column (4) refer to backward and forward linkages.

[29] 'Ownership of Dwellings' is the service provided by owner-occupiers and individuals/firms who let out their residential properties. Owner-occupiers are regarded as operating a business that generates a gross operating surplus (profit).

Figure 29: Overall demand growth: Sectors with the highest size-adjusted value-added multipliers, 2010



Note:
X-axis details the backward linkages index and Y-axis details the forward linkages index.
The monetary value refers to the value-added multiplier and values in parentheses () are the backward and forward linkages.
Sectors that have above average (equal to 1 and above) backward and forward linkages are considered to have the potential to pull and support the growth of other sectors.

Using the size-adjusted value-added multiplier measure, recall that the impact on value-added and linkages are calculated based on a 1% increase in final demand in each sector. Based on the analysis, several sectors have above average backward and forward linkages (equal to 1 and above), indicating the potential to pull and support the growth of other sectors. For example, sectors with above average backward and forward linkages, ranked according to the value of size-adjusted value-added multiplier are:

i) Oils and Fats[30];
ii) Petroleum Refinery; and
iii) Telecommunications.

[30] The Oils and Fats sector involves the manufacturing of crude palm oil, refined palm oil, palm kernel oil, crude and refined vegetable oil, coconut oil, compound cooking fats and animal oils and fats.

Among these sectors, Oils and Fats, which is an Oil Palm-based sector is found to be the main sector in the economy due to its strong capability to pull and support growth of other sectors as proven by its high multiplier impact and linkages measure. For the total of 1% (RM720.8m) increase in the demand of this sector, it can potentially generate RM584.4m of value-added to the whole economy. Furthermore, the high backward linkage of this sector signals its close connection to the domestic sectors in acquiring the production inputs. Petroleum Refinery and Telecommunications are also identified as the prominent sectors since these sectors have the potential to generate high spill-over effects to the economy. Both sectors show high multiplier impact of RM452.7m and RM207.5m respectively from only 1% increase in their final demand. Although the Wholesale and Retail Trade and Motor Vehicle subsector exhibited the largest multiplier impact in the economy, this sector may not be regarded as a key sector. The underlying factor for this outcome is the backward linkage measure is below the average (index lower than 1). This outcome indicates that this sector has a lower integration with domestic sectors that act as its input suppliers and it also shows that it depends more on the imported inputs for the production activities.

Multiplier impact on value-added from size-adjusted domestic and external demand growth

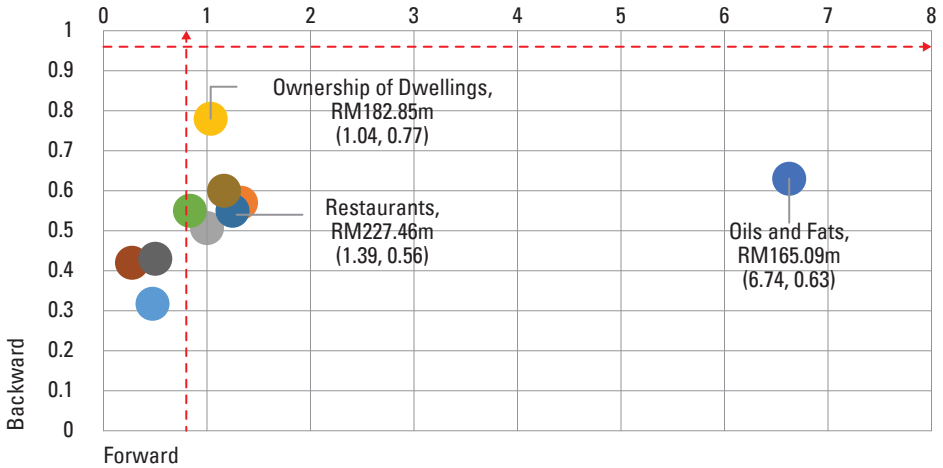
Previously, we have examined the sectors in the economy as a whole. This section further examines the analysis to sectors that have high linkages for domestic demand and exports. Table 8 presents the size-adjusted value-added multipliers and linkages (backward and forward) for domestic demand growth and Table 9 presents for export growth. For both tables, results are presented for the top 10 sectors with the highest value-added impact.

Table 8: Domestic demand growth: Sectors with the highest size-adjusted value-added multipliers, 2010

Rank	Sector	Sectoral Grouping	Multiplier impact (RM m) (1)	Domestic demand (RM m) (2)	Linkages	
					BWL (3)	FWL (4)
1	Wholesale and Retail Trade and Motor Vehicle	Wholesale and Retail Trade	495.07	632.85	0.50	0.31
2	Restaurants	Tourism	227.46	291.47	1.39	0.56
3	Tele-communications	Transport and Communication	191.35	255.84	0.97	0.52
4	Ownership of Dwellings	Real Estate	182.85	191.03	1.04	0.77
5	Oils and Fats	Oil Palm-based	165.09	203.62	6.74	0.63
6	Insurance	Finance and Insurance	153.82	167.50	0.85	0.55
7	Non-residential	Construction	153.70	228.81	1.27	0.53
8	Petroleum Refinery	Petroleum-based	139.03	190.16	0.34	0.41
9	Banks	Finance and Insurance	132.85	143.80	0.59	0.43
10	Civil Engineering	Construction	126.94	200.09	1.22	0.60

Note:
Column (1) refers to size-adjusted value-added multipliers derived through a simulation of 1% increase in final demand.
Column (2) refers to the increment value in Ringgit for 1% increase in domestic demand.
BWL in column (3) and FWL in column (4) refer to backward and forward linkages.

Figure 30: Domestic demand growth: Sectors with the highest size-adjusted value-added multipliers, 2010



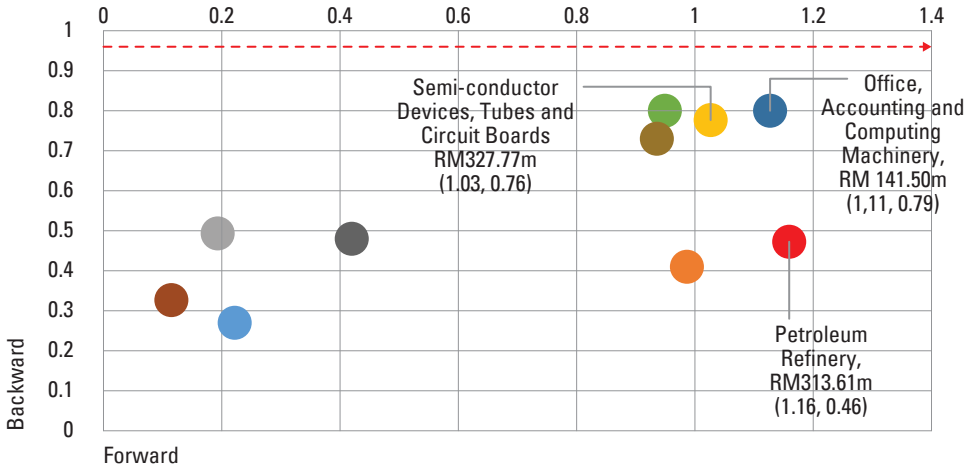
Note:
X-axis details the backward linkages index and Y-axis details the forward linkages index.
The monetary value refers to the value-added multiplier and values in parentheses () are the backward and forward linkages.
Sectors that have above average (equal to 1 and above) backward and forward linkages are considered to have the potential to pull and support the growth of other sectors.

Table 9: Export demand growth: Sectors with the highest size-adjusted value-added multipliers, 2010

Rank	Sector	Sectoral Grouping	Multiplier impact (RM m) (1)	Export (RM m) (2)	Linkages BWL (3)	Linkages FWL (4)
1	Wholesale and Retail Trade and Motor Vehicle	Wholesale and Retail Trade	425.65	544.10	0.23	0.28
2	Oils and Fats	Oil Palm-based	419.31	517.17	0.99	0.42
3	Crude Oil and Natural Gas	Petroleum-based	386.26	422.04	0.21	0.49
4	Semi-conductor Devices, Tubes and Circuit Boards	Electrical and Electronics	327.77	913.72	1.03	0.76
5	Petroleum Refinery	Petroleum-based	313.61	428.94	1.16	0.46
6	TV, Radio Receivers and Transmitters and Associated Goods	Electrical and Electronics	302.80	635.16	0.95	0.78
7	Office, Accounting and Computing Machinery	Electrical and Electronics	141.50	397.43	1.11	0.79
8	Professional	Business and Private Services	103.09	118.68	0.11	0.33
9	Basic Chemicals	Chemicals	102.32	158.05	0.42	0.48
10	Other Chemicals Product	Chemicals	70.74	133.16	0.94	0.72

Note:
Column (1) refers to size-adjusted value-added multipliers derived through a simulation of 1% increase in final demand.
Column (2) refers to the increment value in Ringgit for 1% increase in export demand.
BWL in column (3) and FWL in column (4) refer to backward and forward linkages.

Figure 31: Export demand growth: Sectors with the highest size-adjusted value-added multipliers, 2010



Note:
X-axis details the backward linkages index and Y-axis details the forward linkages index.
The monetary value refers to the value-added multiplier and values in parentheses () are the backward and forward linkages.
Sectors that have above average (equal to 1 and above) backward and forward linkages are considered to have the potential to pull and support the growth of other sectors.

An example of sectors associated with high size-adjusted value-added multiplier and linkages from domestic growth are:

i) Restaurants;
ii) Ownership of Dwellings; and
iii) Oils and Fats.

The Restaurants subsector is a domestic-oriented sector mainly comprised of food and beverage service activities. Through the simulation of 1% (RM291.5m) increase in domestic demand, the sector potentially generates a value-added of RM227.5m. Although the Ownership of Dwellings and Oils and Fats sectors do not exhibit above average forward linkages, linkage indicators suggest that the sectors have a strong degree of economic integration in boosting other sectors through their high backward linkages measure. In this case, the backward linkages may justify the importance of these sectors as the spill-over effect from the increased production activities which may benefit other economic sectors that act as the input suppliers.

An example of sectors associated with high size-adjusted value-added multiplier and linkages from export growth are:

i) Semi-conductor Devices, Tubes and Circuit Boards;
ii) Petroleum Refinery; and
iii) Office, Accounting and Computing Machinery.

For exports, sectors are analysed in a similar pattern as the key sectors for domestic demand. Using the size-adjusted multiplier measure, Semi-conductor Devices, Tubes and Circuit Boards brings the largest multiplier impact of RM327.8m along with backward and forward linkages of 1.03 and 0.76. Again, we can see that the forward linkages of this sector, as well as for Petroleum Refinery and Office, Accounting and Computing Machinery[31] sector are lower than 1. However, lower forward linkages do not imply that these sectors are not important because the linkages index only measure the integration of the sectors to other domestic sectors as input suppliers. In this instance, a low forward linkages index simply gives the indication that most of the output from these sectors are utilised by final consumers and export.

Through our analysis, Wholesale, Retail Trade and Motor Vehicle sector has the largest multiplier impact in the economy. However, this sector may not be considered as a key sector due to its low backward and forward linkages. It also cannot be a targeted sector because of two main reasons:

- It is a largely heterogeneous sector that comprises a huge number of individual economic activities. Thus, it is difficult for policymakers to provide specific targets and policies for the sector. Records show that in 2010, Wholesale Trade contributes 49% to the total output of the sector, followed by 35% by Retail Trade and 16% by Motor Vehicles.

[31] The major economic activities for Office, Accounting and Computing Machinery sector include the manufacturing of diodes, transistors, similar semiconductor devices, electronic integrated circuits, micro assemblies, and office machinery and equipment (except computers and peripheral equipment).

- This sector is not independent because of the nature of the sector to support development of other sectors. Specifically, 37% of the total output created by this sector are contributed by other sectors.

Structural changes

Analyses on the impact of size-adjusted value-added multiplier for overall demand growth, domestic demand and export in 2005 provide greater clarity on how the contribution of key sectors changed between 2005 and 2010.

In this sub-section, we compare the top 10 sectors with the highest size-adjusted value-added multipliers for the years 2005 and 2010. Comparison is made for two main reasons:

- To illustrate the level of economic diversification. A fairly diversified economy is an economy that has a number of different value-added streams and provides a country with the ability for sustainable growth because it does not rely on certain sectors. This diversification provides the country with the security and reliability that they need, so that if one economic sector is weak, the country knows that they have several other options for achieving growth.
- To verify the stability of the IO table analysis on Malaysia's economic structure. A fairly stable economic structure implies the stability of IO analysis for impact assessment.

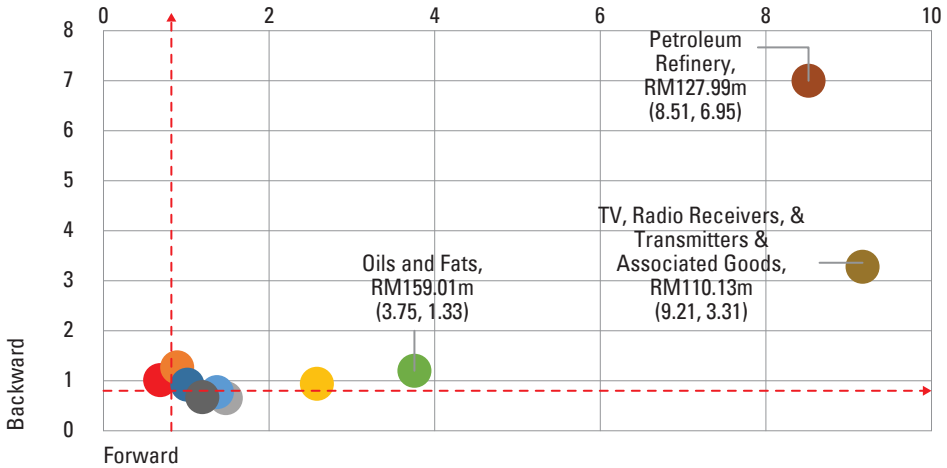
Table 10 gives detailed information on the structure in 2005 and 2010. Further details on the 2005 analyses are provided in Appendix 3.

Table 10: Overall demand growth: Sectors with the highest size-adjusted value-added multipliers, 2005 vs. 2010

Rank	Sector	Multiplier impact (RM m) (1)	Final demand (RM m) (2)	Linkages BWL (3)	Linkages FWL (4)
	A. 2005 Overall Demand Growth				
1	Crude Oil and Natural Gas	446.51	500.74	0.73	1.08
2	Wholesale and Retail Trade	371.57	582.72	0.86	1.33
3	Insurance	354.81	422.22	1.58	0.66
4	Semi-conductor Devices, Tubes and Circuit Boards	318.17	927.47	2.49	1.01
5	Office, Accounting and Computing Machinery	299.98	788.20	1.49	0.81
6	Oils and Fats	159.01	211.76	3.75	1.33
7	Business Services	132.81	163.33	1.09	1.04
8	Petroleum Refinery	127.99	215.97	8.51	6.95
9	Ownership of Dwellings	123.93	151.59	1.18	0.70
10	TV, Radio Receivers and Transmitters and Associated Goods	110.13	500.62	9.21	3.31
	B. 2010 Overall Demand Growth				
1	Wholesale and Retail Trade	920.72	1,176.95	0.95	1.01
2	Oils and Fats	584.40	720.79	9.04	1.73
3	Petroleum Refinery	452.65	619.10	2.88	1.61
4	Crude Oil and Natural Gas	383.46	418.98	0.52	1.22
5	Semi-conductor Devices, Tubes and Circuit Boards	342.41	954.52	1.60	0.85
6	TV, Radio Receivers and Transmitters and Associated Goods	328.24	688.53	1.26	0.88
7	Restaurants	227.46	291.47	1.67	0.87
8	Telecommunications	207.47	277.40	1.47	1.41
9	Ownership of Dwellings	182.85	191.03	1.15	0.85
10	Non-residential	165.78	246.79	1.94	0.65

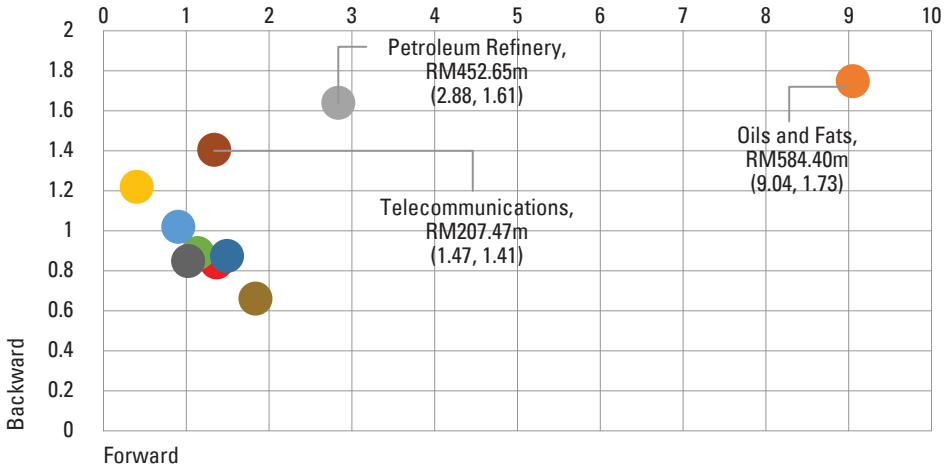
Note:
Column (1) refers to size-adjusted value-added multipliers derived through a simulation of 1% increase in final demand.
Column (2) refers to the increment value in Ringgit for 1% increase in final demand.
BWL in column (3) and FWL in column (4) refer to backward and forward linkages.

Figure 32: Overall demand growth: Sectors with the highest size-adjusted value-added multipliers, 2005



Note:
X-axis details the backward linkages index and Y-axis details the forward linkages index. The monetary value refers to the value-added multiplier and values in parentheses () are the backward and forward linkages. Sectors that have above average (equal to 1 and above) backward and forward linkages are considered to have the potential to pull and support the growth of other sectors.

Figure 33: Overall demand growth: Sectors with the highest size-adjusted value-added multipliers, 2010



Note:
X-axis details the backward linkages index and Y-axis details the forward linkages index. The monetary value refers to the value-added multiplier and values in parentheses () are the backward and forward linkages. Sectors that have above average (equal to 1 and above) backward and forward linkages are considered to have the potential to pull and support the growth of other sectors.

Among the top 10 sectors ranked in Table 10, seven sectors are listed in both 2005 and 2010. This could imply that the structural changes between this time period in the Malaysian economy was fairly limited.

Oils and Fats, Petroleum Refinery, and Telecommunications sectors are key sectors identified for the year 2010. In 2005, two E&E sectors (Semi-conductor Devices, Tubes and Circuit Boards and TV, Radio Receivers and Transmitters and Associated Goods), Oils and Fats, Business Services and Petroleum Refinery could be defined as the key sectors.

Among the sectors, Oils and Fats and Petroleum Refinery have marked their increase in importance in the economy. For both periods, these sectors exhibited high multiplier impact and linkages. In relation to the question of whether Malaysia is diversified, these results indicate a dependency on the same sectors to drive growth. As shown in the table above, in column (2), the figures do not only give the increment value in Ringgit for 1% increase in final demand, but they also indicate the multiplier size of the economic sectors. Multiplier size of these sectors in 2005 (panel A) are RM211.8m and RM216.0m and both increases to RM720.8m and RM619.1m respectively in 2010 (panel B). The multiplier sizes of both sectors grew by 27.8% and 23.5% per annum. The rapid increment relates to the increase in production activities to support growth in export by 150.3% for Oils and Fats and 127.9% for Petroleum Refinery as reported in the national IO table 2005 and 2010.

Box 5: Technical details of stability tests[32]

As mentioned earlier, an IO table is constructed using the data from the Economic Census that is conducted every five years. Due to the time lag between each of the IO table publications, it urges for a stability test on the IO coefficients. Other than the coefficients stability, the test also informs the rate of change in the economic structure. Ideally, the test is conducted on two sets of IO tables, preferably on two of the most recent publications. For the case of Malaysia, this includes the 2010 and 2005 IO tables.

Some other measures commonly used for stability testing include Mean Absolute Deviation, Differentiation Index, Pearson Correlation and Spearman Rank Correlation.

Mean Absolute Deviation (MAD)

$$\left(\frac{1}{n^2}\right)\sum_{i=1}^{n}\sum_{j=1}^{n}|\,a_{ij}^{*}-\bar{a}_{ij}\,|$$

MAD represents the average amount by which the 2010 IO coefficients differs from the 2005 IO coefficients.

Differentiation Index (DI)

$$\left(\frac{1}{n^2}\right)\sum_{i=1}^{n}\sum_{j=1}^{n}\frac{|\,a_{ij}^{*}-\bar{a}_{ij}\,|}{(a_{ij}^{*}+\bar{a}_{ij})}$$

DI is further extended from MAD to deal with zero-value coefficients.

[32] Saari, M. Yusof et. al. (2014)

Pearson Correlation

$$\frac{1}{n-1}\sum_{i=1}^{n}\frac{(a_{ij}^{*}-\bar{a}_{ij}^{*})}{s^{*}}\frac{(\bar{a}_{ij}-\bar{\bar{a}}_{ij})}{\bar{s}}$$

Pearson Correlation measures the strength of a linear association between input coefficients in 2010 and 2005 IO table.

Spearman Rank Correlation

$$1-\frac{6\sum_{i=1}^{n}d_i^2}{n^3-n}$$

Spearman Correlation assesses how well the relationship between two input coefficients can be described as a monotonic function.

Potential sectors for future growth

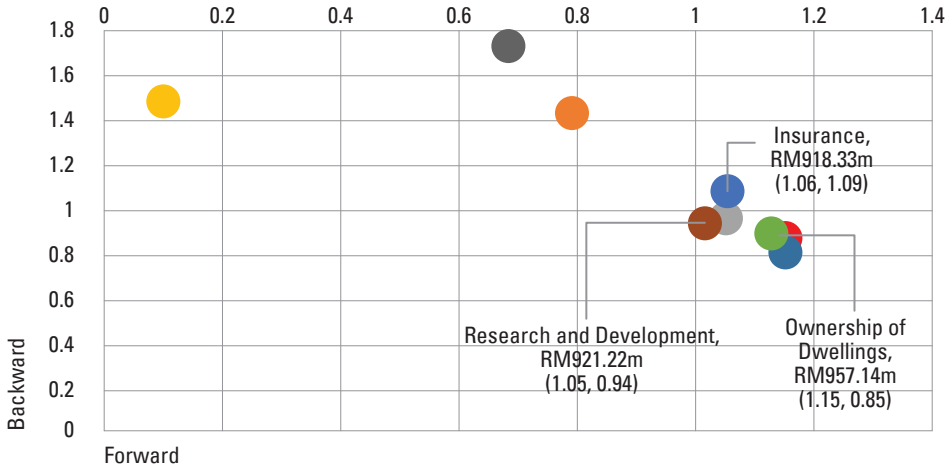
Earlier in this chapter, the concept of size-adjusted value-added multiplier was used to capture the potential value-added multiplier gains from a proportional increase in demand for a given sector. Nonetheless, conventional value-added multipliers, which measure multiplier gains in value-added from a specific amount of demand shock (e.g. final demand increases by RM1b), provide a rough guiding tool to identify which potential sectors can be further developed in the medium and long-term horizons. As before, to answer such question, this section presents the potential key sectors for future growth that can be considered. Table 11, Table 12 and Table 13 give the details for the top 10 sectors with the highest conventional value-added multiplier for overall demand, domestic demand, and exports.

Table 11: Overall demand growth: Sectors with the highest conventional value-added multipliers, 2010

Rank	Sector	Sectoral Grouping	Multiplier impact (RM m) (1)	Linkages	
				BWL (2)	FWL (3)
1	Ownership of Dwellings	Real Estate	957.14	1.15	0.85
2	Banks	Finance and Insurance	923.83	0.79	1.41
3	Research and Development	Business and Private Services	921.22	1.05	0.94
4	Paddy	Agriculture	920.27	0.11	1.50
5	Insurance	Finance and Insurance	918.33	1.06	1.09
6	Crude Oil and Natural Gas	Petroleum-based	915.21	0.52	1.22
7	Rubber	Agriculture	901.52	1.15	0.79
8	Education	Public Services	898.93	1.13	0.87
9	Other Private Services	Business and Private Services	892.40	1.02	0.92
10	Other Financial Institution	Finance and Insurance	878.91	0.70	1.71

Note:
Column (1) refers to the conventional value-added multiplier.
BWL in column (2) and FWL in column (3) refer to backward and forward linkages.

Figure 34: Overall demand growth: Sectors with the highest conventional value-added multipliers, 2010



Note:
X-axis details the backward linkages index and Y-axis details the forward linkages index.
The monetary value refers to the value-added multiplier and values in parentheses () are the backward and forward linkages.
Sectors that have above average (equal to 1 and above) backward and forward linkages are considered to have the potential to pull and support the growth of other sectors.

Based on Table 11, several important sectors are identified. The top three sectors that exhibit favourable results are:

i) Ownership of Dwellings;
ii) Research and Development; and
iii) Insurance.

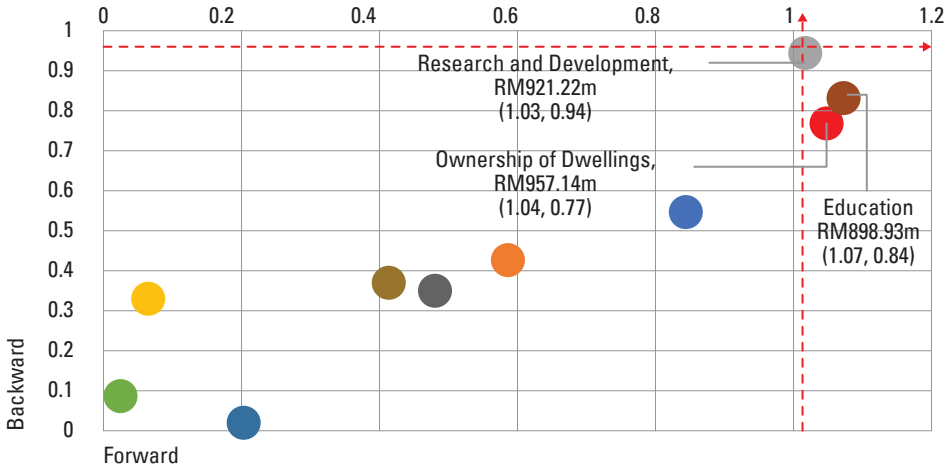
These sectors are identified using the conventional value-added multiplier impact and linkages measures. As can be seen, the Ownership of Dwellings sector has the highest potential multiplier impact. This sector is able to generate RM957.1m of value-added based on an increase in final demand totalling RM1b. For the linkages measure, its backward linkage is above the index threshold, which means that the sector is capable of boosting the growth of other sectors. The same scenario is also shown by the Research and Development sector. From the total of 10 sectors mentioned, the Insurance sector has the strongest linkages because it has high backward and forward linkages of 1.06 and 1.09.

Table 12: Domestic demand growth: Sectors with the highest conventional value-added multipliers, 2010

Rank	Sector	Sectoral Grouping	Multiplier impact (RM m) (1)	Linkages	
				BWL (2)	FWL (3)
1	Ownership of Dwellings	Real Estate	957.14	1.04	0.77
2	Banks	Finance and Insurance	923.83	0.59	0.43
3	Research and Development	Business and Private Services	921.22	1.03	0.94
4	Paddy	Agriculture	920.27	0.07	0.33
5	Insurance	Finance and Insurance	918.33	0.85	0.55
6	Crude Oil and Natural Gas	Petroleum-based	915.21	0.03	0.07
7	Rubber	Agriculture	901.52	0.20	0.02
8	Education	Public Services	898.93	1.07	0.84
9	Other Private Services	Business and Private Services	892.40	0.50	0.35
10	Other Financial Institution	Finance and Insurance	878.91	0.42	0.36

Note:
Column (1) refers to the conventional value-added multiplier.
BWL in column (2) and FWL in column (3) refer to backward and forward linkages.

Figure 35: Domestic demand growth: Sectors with the highest conventional value-added multipliers, 2010



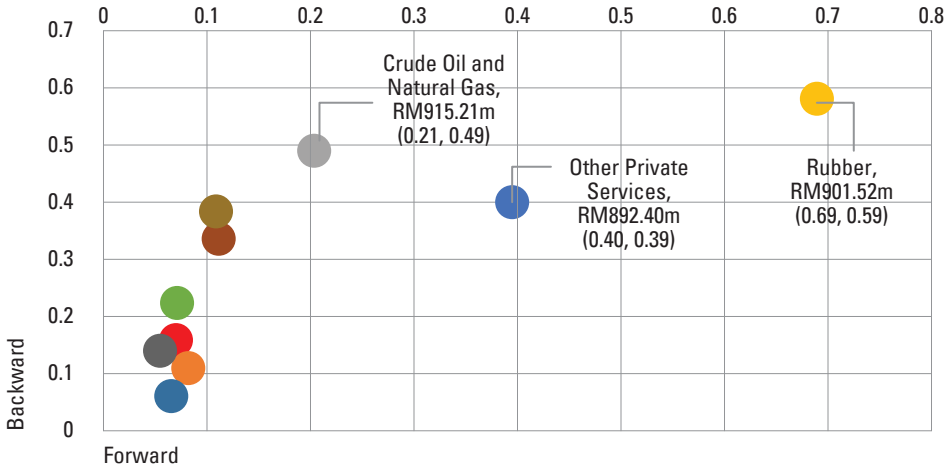
Note:
X-axis details the backward linkages index and Y-axis details the forward linkages index.
The monetary value refers to the value-added multiplier and values in parentheses () are the backward and forward linkages.
Sectors that have above average (equal to 1 and above) backward and forward linkages are considered to have the potential to pull and support the growth of other sectors.

Table 13: Export demand growth: Sectors with the highest conventional value-added multipliers, 2010

Rank	Sector	Sectoral Grouping	Multiplier impact (RM m) (1)	Linkages	
				BWL (2)	FWL (3)
1	Banks	Finance and Insurance	923.83	0.07	0.16
2	Insurance	Finance and Insurance	918.33	0.08	0.11
3	Crude Oil and Natural Gas	Petroleum-based	915.21	0.21	0.49
4	Rubber	Agriculture	901.52	0.69	0.59
5	Other Private Services	Business and Private Services	892.40	0.40	0.39
6	Other Financial Institution	Finance and Insurance	878.91	0.07	0.23
7	Cinema, Video and Television Activity	Transport and Communication	870.19	0.06	0.05
8	Professional	Business and Private Services	868.63	0.11	0.33
9	Stone Clay and Sand Quarrying	Mining and Quarrying	867.17	0.05	0.14
10	Metal Ore Mining	Mining and Quarrying	858.81	0.11	0.38

Note:
Column (1) refers to the conventional value-added multiplier.
BWL in column (2) and FWL in column (3) refer to backward and forward linkages.

Figure 36: Export demand growth: Sectors with the highest conventional value-added multipliers, 2010



Note:
X-axis details the backward linkages index and Y-axis details the forward linkages index.
The monetary value refers to the value-added multiplier and values in parentheses () are the backward and forward linkages.
Sectors that have above average (equal to 1 and above) backward and forward linkages are considered to have the potential to pull and support the growth of other sectors.

As shown in Table 12, top sectors exhibit only high multiplier impact but unaccompanied by high backward and forward linkages. This outcome is particularly normal if we utilise the conventional multiplier because the sectors that appear in the top 10 positions are mostly unconventional sectors with the Crude Oil and Natural Gas sector as an exception. Nevertheless, Ownership of Dwellings, Research and Development, and Education have shown that they are capable of producing high multiplier impact and bring considerably strong linkages.

For export growth, Crude Oil and Natural Gas, Rubber and Other Private Services are the three sectors that come with the highest multiplier impact and have comparably higher backward and forward linkages compared to other top sectors in Table 13. With RM1b worth of injections into the sectors, they are capable of generating RM915.2m, RM901.5m and RM892.4m of value-added respectively. However, the injection will not be able to generate high spill-over effects since the integration level of the sectors with other domestic sectors are low.

Conclusion

The principal aim of this chapter is to underscore the various interlinkages between sectors in the Malaysian economy to better understand the structure of the economy. Furthermore, the report finds that growth-inducing effects of sectors differ depending on the perspective considered.

Each sector plays a different role in its contribution to the GDP. As such, by adopting both backward and forward linkages as well as size-adjusted value-added multipliers analyses, this report provides three perspectives for sectors' potential growth-inducing effects onto: (i) the overall economy; (ii) the domestic demand component; and (iii) the export component. For example, a sector may be conducive to domestic demand growth, but it potentially has less effect on the growth in the export sector.

Furthermore, patterns emerge when comparing size-adjusted value-added multiplier snapshots over the years from 1978 – 2010. For example, Oils and Fats, Wholesale and Retail Trade, and Transport have consistently been included in the top 10 across the four decades. Secondly, the Oils and Fats subsector, although quite a dominant subsector, produces output mainly for its own consumption. This is contrasting to the patterns observed in the Wholesale and Retail Trade subsector —a large portion of its output is consumed by a variety of other sectors, which makes it a highly integrated sector in the economy.

Notedly, the economy has been growing ever since 2010 when the commodity prices have more or less halved over the same period. Therefore, although this chapter showcases findings of the interlinkages of the economy prior to 2010, the economy may have changed structurally since then.

Hence, this chapter provides a useful insight to understand how a sector is interlinked with other sectors and its potential spill-over effects onto the economy by utilising the linkages and size-adjusted value-added multiplier methods.

In addition, conventional multiplier analysis is provided in this chapter as a rough guiding tool to identify which potential sectors can be further developed in the medium and long-term horizons.

Appendix 2: Methodological approach for the size-adjusted multipliers and linkages

The methodology to account for the size-adjusted multiplier is a straight forward process. The size-adjusted multiplier can be calculated based on the Leontief inverse matrix. In the Leontief inverse matrix, the interdependencies among the production sectors can be shown based on the following material balance equation:

$$\mathbf{x} = \mathbf{A}\mathbf{x} + \mathbf{f} \tag{1}$$

Where x is the vector for gross output, $\mathbf{A}$ ($\mathbf{A} = \mathbf{Z}\hat{\mathbf{x}}^{-1}$), also known as the technical coefficient or IO coefficient, while $\mathbf{f}$ is the vector for final demand. In the standard Leontief model, equation (1) can be transformed and solved in a matrix notation as follows:

$$\mathbf{x} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{f} = \mathbf{L}\mathbf{f} \tag{2}$$

Where $\mathbf{I}$ is the identity matrix, and $(\mathbf{I} - \mathbf{A})^{-1}$ is known as the Leontief inverse matrix or the multiplier matrix. To obtain the sectoral multiplier, equation (2) can be rewritten as in equation (3) to include the impact from 1% increase in final demand level for each sector. It should be noted that the injection of 1% increment in final demand cannot be done simultaneously for all sectors, but it must be done for one sector at a time. Therefore, defining $\tilde{\mathbf{x}}$ is as follows:

$$\tilde{\mathbf{x}} = (\mathbf{I} - \mathbf{A})^{-1}\tilde{\mathbf{f}} = \mathbf{L}\tilde{\mathbf{f}} \tag{3}$$

Where $\tilde{\mathbf{f}}$ is the vector for final demand that is injected with 1% increase in the demand level, while $\tilde{\mathbf{x}}$ is the new output level resulted from the increase demand level. In the analysis, 1% increase in the demand level is extracted sector-by-sector. With the new output level, the multiplier impact can be calculated through the difference between $\tilde{\mathbf{x}}$ and $\mathbf{x}$.

For a more policy-oriented analysis, equation (3) can be further extended in a generalised form, taking into account specific variables, such as value-added, tax and employment. For illustration purposes, let us show how impact on value-added are calculated.

The value-added coefficient is defined as π, which measures the value-added use per unit of output. In matrix form, the value-added coefficient can be expressed as $\hat{\boldsymbol{\pi}} = \hat{\mathbf{v}}\hat{\mathbf{x}}^{-1}$, where value-added is formed in a diagonal matrix. Thus, the value-added multipliers, which are adjusted for relative sectoral sizes, can be expressed as follows:

$$\mathbf{v} = \hat{\boldsymbol{\pi}}\mathbf{L}(\mathbf{I} - \mathbf{A})^{-1}\tilde{\mathbf{f}} = \hat{\boldsymbol{\pi}}\mathbf{L}\tilde{\mathbf{f}} \quad (4)$$

Measuring backward and forward linkages

Backward and forward linkages measure the level of dependencies of intermediate input purchases and intermediate input sales for a given sector.

Backward linkages:
Measures inter-connection among input suppliers for an economic sector. If one sector increases its output, this means there will be increased demand from other industries (as a supplier) whose goods and factors of production are used as inputs to the production of that particular sector. In our methodology, a sector that has above average backward linkage index (equivalent to 1 or higher) indicates that the sector has strong inter-connection with its input suppliers.

Forward linkages:
Measures inter-connection among buyers for the output produced by an economic sector. That is, additional output of products is available to be used as inputs to other sectors for their own production and consumption. In our methodology, a sector that has above average forward linkage index (equivalent to 1 or higher) indicates that the sector has strong inter-connection with its output buyers.

Technically, backward and forward linkages can be calculated based on equations (5a) and (5b) below:

$$B_i = \left((1/n)\sum_i l_{ij} \Big/ (1/n^2)\sum_i \sum_j l_{ij} \right) \quad \text{for backward linkages} \quad (5a)$$

$$F_i = \left((1/n)\sum_j b_{ij} \Big/ (1/n^2)\sum_i \sum_j b_{ij} \right) \quad \text{for forward linkages} \quad (5b)$$

Where l_{ij} indicates a coefficient of the Leontief inverse matrix, b_{ij} represents a coefficient of the Ghosh inverse matrix and n is the number of sector in an IO table. The Ghosh inverse matrix can be derived as follows:

$$\mathbf{x}' = \mathbf{d}' (\mathbf{I} - \mathbf{B})^{-1} = \mathbf{d}'\mathbf{G} \quad (6)$$

Where $\mathbf{B}$ ($\mathbf{B} = \hat{\mathbf{x}}^{-1}\mathbf{Z}$) represents the Ghosh coefficient matrix and $\mathbf{d}'$ is the vector of primary inputs (i.e. value-added and imports). Each coefficient of the Ghosh matrix output shows the delivery z_{ij} of commodity sector i to sector j per unit of the seller's output.

It follows directly that the adjusted size of backward and forward linkages for value-added can be represented as;

$$\tilde{B}_i = \sum_i l_{ij} (f_i / x_i) \quad \text{for backward linkages} \quad (7a)$$

$$\tilde{F}_i = \sum_j b_{ij} (d_i / x_i) \quad \text{for forward linkages} \quad (7b)$$

In this study, we apply the hypothetical extraction method (HEM) that has been predominantly used in the current literature. The central idea of the HEM is that the hypothetical elimination of a complete sector in the economic system allows us to estimate the economy-wide contribution of the particular sector. Leaving the technical production process in a variant, it is thus assumed that the inputs required for the production are no longer delivered by the sector within the system, but has its origin outside the system.

For backward linkages, HEM nullifies the *i*-th column of the input coefficient matrix, denoted by $\mathbf{A}^{-i}$, and nullifies the *i*-th element of the final demand vector, denoted by $\mathbf{f}^{-i}$. As a consequence of this nullifying process, the vector of total output after extracting sector *i* is given by:

$$\mathbf{x}_l^{-i} = \mathbf{L}^{-i}\,\mathbf{f}^{-i} \quad \text{with} \quad \mathbf{L}^{-i} = (\mathbf{I} - \mathbf{A}^{-i})^{-1} \tag{8}$$

For forward linkages, HEM nullifies the *i*-th row of the output coefficient matrix, denoted by $\mathbf{B}^{-i}$, and nullifies the *i*-th element of the primary input vector, denoted by $\mathbf{d}^{-i}$. Thus, the total input after extracting of sector *i* is given by:

$$\mathbf{x}_b^{-i} = (\mathbf{d}^{-i})\,\mathbf{G}^{-i} \quad \text{with} \quad \mathbf{G}^{-i} = (\mathbf{I} - \mathbf{B}^{-i})^{-1} \tag{9}$$

Appendix 3: Additional analyses on conventional and size-adjusted multiplier impact

Size-adjusted multipliers, 2005

Table 14: Overall demand growth: Sectors with the highest size-adjusted value-added multipliers, 2005

Rank	Sector	Sectoral Group	Multiplier impact (RM m) (1)	Final demand (RM m) (2)	Linkages	
					BWL (3)	FWL (4)
1	Crude Oil and Natural Gas	Petroleum-based	446.51	500.74	0.73	1.08
2	Wholesale and Retail Trade	Wholesale and Retail Trade	371.57	582.72	0.86	1.33
3	Insurance	Finance and Insurance	354.81	422.22	1.58	0.66
4	Semi-Conductor Devices, Tubes and Circuit Boards	Electrical and Electronics	318.17	927.47	2.49	1.01
5	Office, Accounting and Computing Machinery	Electrical and Electronics	299.98	788.20	1.49	0.81
6	Oils and Fats	Oil Palm-based	159.01	211.76	3.75	1.33
7	Business Services	Business and Private Services	132.81	163.33	1.09	1.04
8	Petroleum Refinery	Petroleum-based	127.99	215.97	8.51	6.95
9	Ownership of Dwellings	Real Estate and Ownership of Dwellings	123.93	151.59	1.18	0.70
10	TV, Radio Receivers and Transmitters and Associated Goods	Electrical and Electronics	110.13	500.62	9.21	3.31

Note:
Column (1) refers to the size-adjusted value-added multipliers that are derived through the simulation of 1% increase in final demand. Column (2) refers to the increment value in Ringgit for 1% increase in final demand. BWL in column (3) and FWL in column (4) refer to backward and forward linkages.

Table 15: Domestic demand growth: Sectors with the highest size-adjusted value-added multipliers, 2005

Rank	Sector	Sectoral Group	Multiplier impact (RM m) (1)	Domestic demand (RM m) (2)	Linkages	
					BWL (3)	FWL (4)
1	Wholesale and Retail Trade	Wholesale and Retail Trade	189.46	297.13	0.46	0.61
2	Ownership of Dwellings	Real Estate and Ownership of Dwellings	123.93	151.59	1.11	0.69
3	Restaurants	Hotel and Restaurants	104.69	128.82	1.46	0.73
4	Insurance	Finance and Insurance	95.30	113.41	0.65	0.18
5	Residential	Construction	83.99	146.04	1.52	0.53
6	Civil Engineering	Construction	77.17	119.90	0.94	1.05
7	Communication	Transport and Communication	76.80	88.22	0.85	0.89
8	Electricity and Gas	Electricity, Gas and Water	60.13	82.32	0.72	1.02
9	Motor Vehicles	Manufacturing	56.65	235.29	4.86	1.44
10	Non-residential	Construction	55.24	93.34	1.45	0.74

Note:
Column (1) refers to the size-adjusted value-added multipliers that are derived through the simulation of 1%-point increase in domestic demand.
Column (2) refers to the increment value in Ringgit for 1% increase in domestic demand.
BWL in column (3) and FWL in column (4) refer to backward and forward linkages.

Table 16: Export demand growth: Sectors with the highest size-adjusted value-added multipliers, 2005

Rank	Sector	Sectoral Group	Multiplier impact (RM m) (1)	Export (RM m) (2)	Linkages BWL (3)	Linkages FWL (4)
1	Crude Oil and Natural Gas	Petroleum-based	404.97	454.14	0.62	0.90
2	Semi-conductor Devices, Tubes and Circuit Boards	Electrical and Electronics	306.97	894.81	1.73	0.89
3	Office, Accounting and Computing Machinery	Electrical and Electronics	300.07	788.44	1.26	0.80
4	Insurance	Finance and Insurance	259.51	308.81	0.94	0.48
5	Wholesale and Retail Trade	Wholesale and Retail Trade	182.11	285.60	0.44	0.74
6	Oils and Fats	Oil Palm-based	155.14	206.60	1.40	1.02
7	Business Services	Business and Private Services	130.83	160.89	0.84	0.79
8	Petroleum Refinery	Petroleum-based	111.57	188.26	6.61	3.85
9	TV, Radio Receivers and Transmitters and Associated Goods	Electrical and Electronics	96.73	439.71	5.43	2.50
10	Other Chemicals Product	Manufacturing	93.68	160.29	1.12	0.78

Note:
Column (1) refers to the size-adjusted value-added multipliers that are derived through the simulation of 1% increase in export.
Column (2) refers to the increment value in Ringgit for 1% increase in export.
BWL in column (3) and FWL in column (4) refer to backward and forward linkages.

Conventional multipliers, 2005 and 2010

Table 17: Overall demand growth: Sectors with the highest conventional and size-adjusted value-added multipliers, 2005

Rank	Sector	Conventional Multiplier (RM m)	Size-adjusted Multiplier (RM m)	Linkages	
				BWL	FWL
		(1)	(2)	(3)	(4)
1	Other Mining and Quarrying	965.27	0.48	0.11	1.71
2	Recycling	921.92	2.11	0.18	1.39
3	Banks	917.86	2.76	0.59	1.73
4	Paddy	895.18	0.16	0.18	1.25
5	Crude Oil and Natural Gas	891.71	446.51	0.73	1.08
6	Financial Institution	883.09	14.18	1.13	1.52
7	Real Estate	872.43	42.31	0.68	1.49
8	Communication	870.55	86.58	1.05	1.33
9	Rubber	868.30	41.20	1.08	0.87
10	Accommodation	865.69	40.70	1.17	1.05

Note:
Column (2) refers to the size adjusted value-added multipliers that are derived through the simulation of 1% increase in final demand. BWL in column (3) and FWL in column (4) refer to backward and forward linkages.

Table 18: Overall demand growth: Sectors with the highest conventional and size-adjusted value-added multipliers, 2010

Rank	Sector	Conventional Multiplier (RM m)	Size-adjusted Multiplier (RM m)	Linkages	
				BWL	FWL
		(1)	(2)	(3)	(4)
1	Ownership of Dwellings	957.14	182.85	1.15	0.85
2	Banks	923.83	136.00	0.79	1.41
3	Research and Development	921.22	62.42	1.05	0.94
4	Paddy	920.27	0.06	0.11	1.50
5	Insurance	918.33	163.47	1.06	1.09
6	Crude Oil and Natural Gas	915.21	383.46	0.52	1.22
7	Rubber	901.52	68.94	1.15	0.79
8	Education	898.93	320.17	1.13	0.87
9	Other Private Services	892.40	47.74	1.02	0.92
10	Other Financial Institution	878.91	73.12	0.70	1.71

Note:
Column (2) refers to the size adjusted value-added multipliers that are derived through the simulation of 1% increase in final demand. BWL in column (3) and FWL in column (4) refer to backward and forward linkages.

Table 19: Overall demand growth: Sectors with the highest conventional value-added multipliers, 1983

	Sectoral Grouping	Multiplier impact (RM m) (1)	Linkages BWL (2)	Linkages FWL (3)
1	Building and Construction	29,858.24	0.94	0.58
2	Wholesale and Retail Trade	29,624.83	1.25	1.30
3	Processed Rubber	21,964.19	1.28	0.68
4	Oils and Fats	20,725.52	1.22	0.75
5	Mining and quarrying	19,813.29	1.27	1.35
6	Education	16,370.36	1.34	1.24
7	Real Estate and Ownership of Dwellings	16,006.81	1.38	1.56
8	Transport	13,326.38	1.02	1.07
9	Basic Metal Products	12,667.38	0.83	0.31
10	Fisheries	12,319.46	1.32	1.37
11	Forestry and Logging Products	9,800.23	1.29	1.49
12	Wooden Products	9,155.69	1.19	0.73
13	Agriculture Products	7,901.57	1.30	1.50
14	Electric Machinery	7,118.26	0.59	0.45
15	Health	6,636.23	1.19	0.97
16	Accommodation and Restaurant	5,820.76	1.04	0.85
17	Grain Mill Products	5,582.77	1.05	0.45
18	Financial Services	5,457.68	1.33	1.23
19	Meat and Dairy Products	3,466.48	0.77	0.31
20	Preserved Food	3,224.76	1.20	0.40

Note:
Column (1) refers to the conventional multipliers that are derived through the simulation of RM1b increase in final demand. BWL in column (2) and FWL in column (3) refer to backward and forward linkages.

Table 20: Overall demand growth: Sectors with the highest conventional value-added multipliers, 1991

	Sectoral Grouping	Multiplier impact (RM m) (1)	Linkages	
			BWL (2)	FWL (3)
1	Building and Construction	137,391.66	0.86	0.60
2	Wholesale and Retail Trade	116,828.15	1.25	1.35
3	Electric Machinery	103,460.91	0.49	0.40
4	Mining and Quarrying	89,750.17	1.31	1.55
5	Real Estate and Ownership of Dwellings	65,406.55	1.36	1.79
6	Oils and Fats	61,876.18	1.17	0.72
7	Transport	56,388.92	1.01	1.02
8	Education	54,183.79	1.29	1.28
9	Motor vehicles	40,326.01	0.77	0.72
10	Wooden Products	38,629.13	1.20	0.45
11	Accommodation and Restaurant	36,683.04	1.07	0.90
12	Forestry and Logging Products	36,589.03	1.31	1.53
13	Processed Rubber	26,497.65	1.30	0.36
14	Agriculture Products	24,891.97	1.25	1.44
15	Industrial Chemicals	22,858.28	0.77	0.69
16	Health	20,310.26	1.12	0.93
17	Non-electricity Machinery	19,704.23	0.52	0.31
18	Recreation and Culture	18,682.68	1.34	1.29
19	Rubber Products	17,414.07	0.97	0.67
20	Petroleum and Coal Products	17,301.19	1.11	0.67

Note:
Column (1) refers to the conventional multipliers that are derived through the simulation of RM1b increase in final demand. BWL in column (2) and FWL in column (3) refer to backward and forward linkages.

Table 21: Overall demand growth: Sectors with the highest conventional value-added multipliers, 2000

	Sectoral Grouping	Multiplier impact (RM m) (1)	Linkages	
			BWL (2)	FWL (3)
1	Electric Machinery	480,812.16	0.39	0.41
2	Mining and Quarrying	250,464.16	1.00	1.68
3	Building and Construction	247,144.94	0.68	0.62
4	Non-electricity Machinery	186,392.60	0.28	0.24
5	Other Private Services	154,857.02	15.38	1.06
6	Real Estate and Ownership of Dwellings	154,019.01	1.05	1.83
7	Transport	136,089.50	0.69	0.90
8	Education	122,669.67	1.05	1.33
9	Wholesale and Retail Trade	120,910.37	0.97	1.68
10	Oils and Fats	114,528.81	0.91	0.89
11	Petroleum and Coal Products	113,392.26	0.73	0.87
12	Accommodation and Restaurant	101,311.28	0.82	0.98
13	Wooden Products	82,724.01	0.88	0.69
14	Business Services	80,204.72	0.78	1.44
15	Communication	78,504.33	0.81	1.46
16	Industrial Chemicals	56,938.05	0.70	0.79
17	Health	55,140.23	0.87	0.87
18	Financial Services	49,404.37	1.01	2.18
19	Motor Vehicles	49,029.90	0.47	0.61
20	Other Manufactured Products	43,646.54	0.51	0.63

Note:
Column (1) refers to the conventional multipliers that are derived through the simulation of RM1b increase in final demand. BWL in column (2) and FWL in column (3) refer to backward and forward linkages.

Table 22: Overall demand growth: Sectors with the highest conventional value-added multipliers, 2010

	Sectoral Grouping	Multiplier impact (RM m) (1)	Linkages	
			BWL (2)	FWL (3)
1	Wholesale and Retail Trade	918,432.61	1.15	1.24
2	Other Manufactured Products	786,524.30	0.62	0.53
3	Oils and Fats	585,876.57	1.20	0.34
4	Building and Construction	456,964.81	0.95	0.72
5	Petroleum and Coal Products	450,926.56	1.07	0.82
6	Mining and Quarrying	390,935.56	1.34	1.87
7	Education	319,770.34	1.32	1.31
8	Communication	299,245.40	1.13	1.34
9	Accommodation and Restaurant	279,805.16	1.16	1.00
10	Transport	242,301.66	1.01	1.08
11	Financial Services	218,296.47	1.30	1.88
12	Business services	217,441.16	1.25	1.74
13	Real Estate and Ownership of Dwellings	174,424.56	1.34	1.75
14	Insurance	163,357.71	1.35	1.31
15	Non-electricity Machinery	157,486.35	0.53	0.40
16	Health	126,290.03	0.99	0.94
17	Industrial Chemicals	121,233.04	0.93	0.93
18	Electric Machinery	116,082.46	0.73	0.66
19	Recreation and Culture	95,101.06	1.02	0.67
20	Furniture and Fixture	93,876.51	0.91	0.80

Note:
Column (1) refers to the conventional multipliers that are derived through the simulation of RM1b increase in final demand. BWL in column (2) and FWL in column (3) refer to backward and forward linkages.

CHAPTER 03

DOMESTIC AND FOREIGN VALUE-ADDED IN FREE ZONES

CHAPTER 3

DOMESTIC AND FOREIGN VALUE-ADDED IN FREE ZONES

The E&E sector is deemed to be a key sector in the Malaysian economy as it contributes significantly to the country's manufacturing output, employment, investments and exports[33]. However, although the E&E sector is large in size (estimated to have contributed 44.6% of total manufactured goods exports in 2016[34]), this sector is often associated with low domestic value-added. On average, each unit of output produced requires 80% of raw materials (which are mostly imported) while only 20% of value-added are created[35]. Of the total value-added, only 32% are attributed to salaries and wages while the remaining 68% are profits[36].

Thus, this leads to an important question: to what extent are E&E products produced in Malaysia? The answer to this question will indicate the significance of the E&E sector to the Malaysian economy. Additionally, answering this important question requires analysis that distinguishes activities within and outside of free zones.

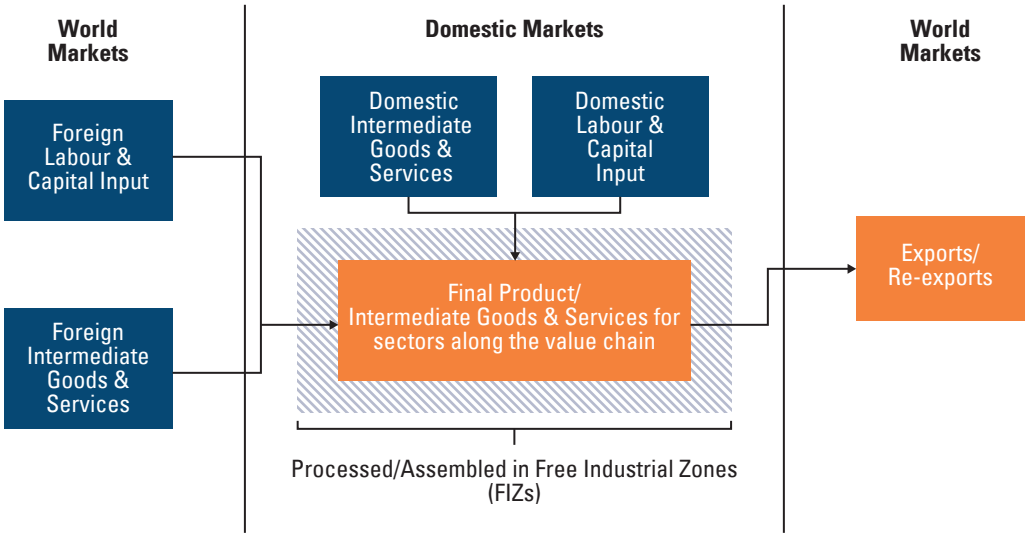
Free zones are special reserve areas provided by the government—where firms enjoy special tariff treatment, duty drawback schemes and other tax incentives on import and export activities[37]. Specifically, for a company to derive these benefits, they must fulfil the following requirements:

- A company must export at least 80% of its output, and this can be reduced to 60% with approval from the Ministry of International Trade and Industry (MITI) as well as the Customs department; and
- A company must achieve 40% of local content value in its products. If this is not reached, the company may still benefit if the imported raw materials have undergone "substantive transformation" in the production of end-products[38].

[33] PEMANDU (2015), Economic Planning Unit (2015)
[34] MIDA (2016)
[35] DOSM (2012)
[36] Ibid.
[37] WTO (2017)
[38] Ibid.

Thus, products exported from this area tend to have more foreign or import content in its production due to the relatively easier access to foreign inputs. Meanwhile, non-free zone activities include firms that are located outside of these zones, thereby are not entitled to the aforementioned benefits. Moreover, studies have found that the output of non-processing sectors have higher domestic value-added content and greater linkages to the domestic economy[39]. The success of the Export Processing Zones (EPZs) in pioneer countries such as Taiwan and South Korea provide a lesson that these zones need to be able to stimulate the growth of domestic sectors, especially through technological and knowledge spill-overs. For the case of South Korea, with the help of foreign multinational companies, E&E firms were able to create their own branding and become more competitive in the world market[40].

Figure 37: Concept of processing trade activities in FIZs



Source: Authors' illustration

[39] See Dai, et al. (2016), Koopman, et al. (2008) and Manova, et al. (2016) for the case of China.
[40] Stein (2012)

This study expands the sectors in the IO table by separating them into free zone and non-free zone activities (as shown in Figure 37). Using this new dataset, we are able to measure the domestic value-added content in free zone and non-free zone activities. Due to data availability issues, this study focuses on Free Industrial Zones (FIZs)[41]. Licensed Manufacturing Warehouses (LMWs), for example, are not included. However, it is noteworthy that LMWs may also benefit similarly to those companies operating in FIZs.

Our findings show that free zone activities, specifically for FIZs, bring limited implications on the generation of Malaysian value-added content. Almost half of the exports produced by firms in FIZs are generated by the E&E sector, which has a significant amount of foreign content and lower domestic return. In fact, E&E firms that operate outside FIZs also show similar outcomes.

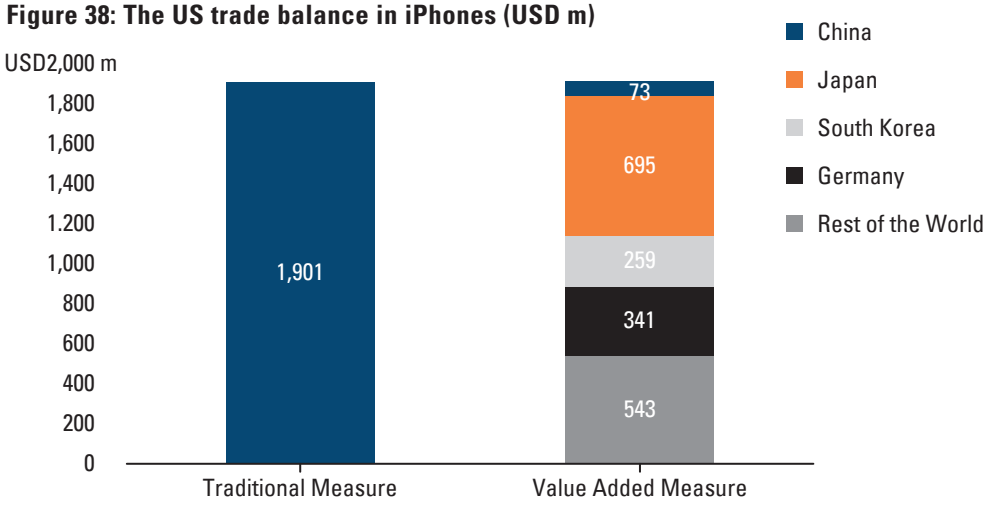
This chapter will explain in detail the importance of making a distinction between free zone and non-free zone activities, as well as present findings on how much Malaysia gains from both trade structures.

Trade in tasks

Rapid globalisation has transformed current international trade practices whereby most goods are no longer produced at a single location. Instead, production activities are fragmented and outsourced globally. Figure 38 illustrates the global production chain to produce an Apple iPhone. We see that the product designing, component manufacturing, assembly, processing, and packaging activities are completed in different countries.

[41] The map of FIZs in Malaysia is provided in Appendix 4.

Figure 38: The US trade balance in iPhones (USD m)



Source: KRI (2015)

Trade practices in specific activities have changed from 'trade in final goods' to 'trade in tasks' which have encouraged specialisation of different economies in a particular task that adds value along the production chain[42]. Various terms are used to describe 'trade in tasks' in the literature, such as trade in value-added, international outsourcing, vertical specialisation, trade fragmentation, and processing trade. All of these terms refer to the same concept in which the production process has been sliced up and distributed globally.

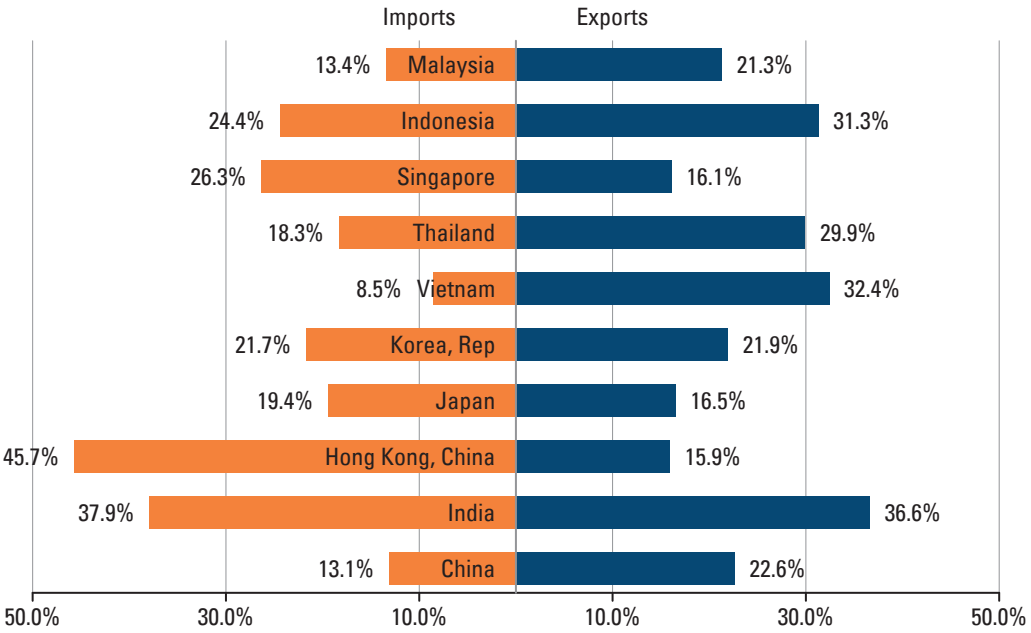
As a result of this transformation of trade patterns, trade in intermediate goods, parts and components have grown at a faster pace when compared to trade in final products[43]. In the past 16 years, world exports of intermediate goods have

[42] The report by WTO, et al. (2011) refers to the task specialisation of different economies through the case of the automobile industry. In this case, four ASEAN countries (Thailand, Philippines, Malaysia and Indonesia) are involved in which they act as the supplier/assembler to the Japanese automobile company. Each of the country is specialised in different tasks; i.e. Thailand (press parts, frame panels, electronic parts, interior parts and engine parts), Philippines (engine fuel system, emission dress parts, engine electronic parts, suspension parts and manual transmission), Malaysia (instrumental panel assembly, bumper and drive shaft) and Indonesia (cylinder head assembly, cylinder block, engine valve, steering handle and auto transmission).

[43] Ibid.

increased by 122.7% from 2000 to 2016 (USD1,376b to USD3,065b), with an average growth rate of 7.7% per annum[44]. In fact, intermediate goods make up a notable portion of Malaysia's trade, with 21.3% of total exports and 13.4% of imports (Figure 39).

Figure 39: Share of intermediate goods in the exports and imports of major Asian traders, 2016 (%)



Source: World Bank (n.d.-b)

The movement from 'trade in goods' towards 'trade in tasks' requires a new trade accounting approach since the traditional approach does not provide a full picture of Malaysia's trade relationships. The traditional approach only records the contribution of exports in terms of the gross value of products instead of the amount that the country actually adds to the goods while ignoring the domestic and foreign contents measurement[45][46]. It should be noted that the higher the foreign

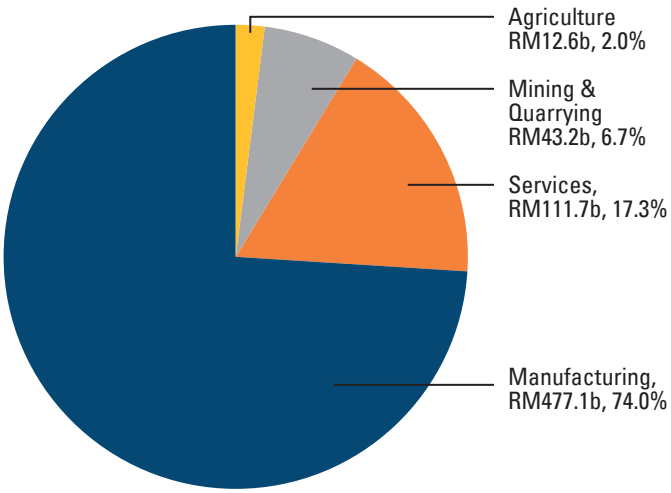
[44] World Bank (n.d.-b)
[45] Zhang, et al. (2012).
[46] For an explanation of TiVA, please refer to KRI (2015).

content embedded in exports, the lower the domestic value-added and in return the lower the contribution to GDP and vice versa. Thus, the current national accounting practice has the tendency to overestimate the return of exports. Therefore, assessing the domestic value-added content in exports would more accurately account for the country's real export return.

Domestic value-added and foreign content[47]

In 2010, the Manufacturing sector contributed the largest share of exports which constituted 74.0% of the total country's export, followed by Services (17.3%), Mining and Quarrying (6.7%), and Agriculture sectors (2.0%) (see Figure 40). Evidently, the Manufacturing sector constitutes a large proportion of Malaysia's export growth as well as GDP. As the current trade accounting system may be biased, it is crucial to re-evaluate the actual return from Malaysian exports by separating it into domestic value-added content and foreign content.

Figure 40: Structure of Malaysian exports, 2010



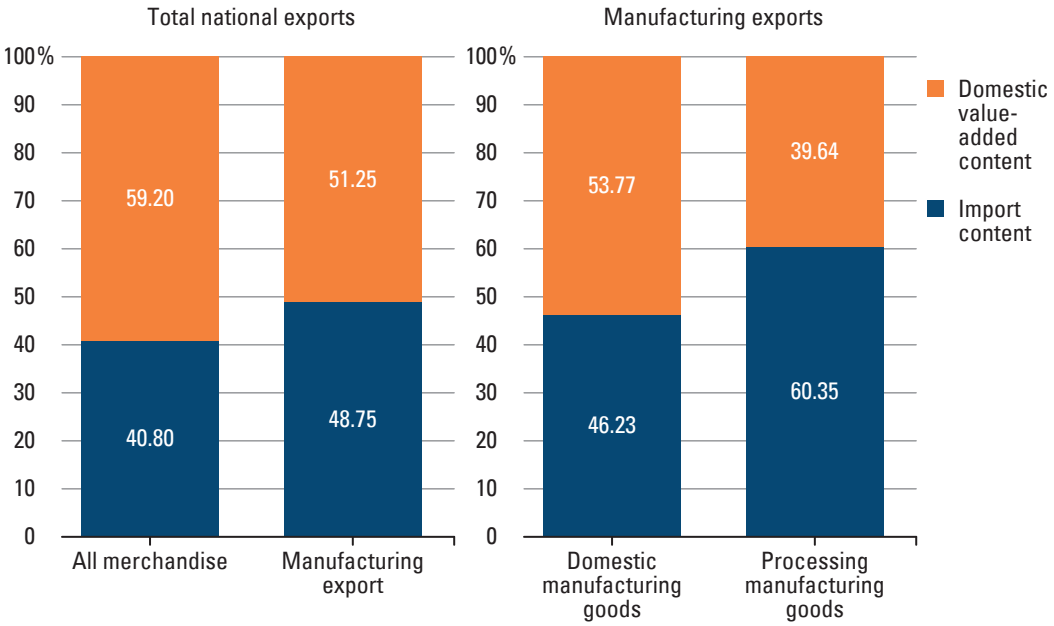
Source: DOSM (2014)

[47] Domestic value-added refers to the domestically generated value-added and foreign content refers to the value-added created in destinations outside of Malaysia.

The left-hand chart in Figure 41 shows the domestic value-added content and foreign content in exports. From total exports, the overall return of export earnings to domestic value-added were 59.2% whilst the remaining 40.8% were attributed to foreign content. This implies that out of the RM644.5b of total exports in 2010, only RM381.6b was actually earned by Malaysia as value-added.

Meanwhile, recall that the total value of the Manufacturing sector amounted to RM477.1b in 2010. However, after proper measurement of the domestic and foreign contents, the actual gains from manufacturing exports are only approximately half of the total exports which is equivalent to 51.3% (RM244.5b).

Figure 41: Domestic value-added and foreign content in exports, 2010 (%)



Source: DOSM (2014), Authors' calculations

Furthermore, when splitting the manufacturing exports further into FIZ and non-FIZ activities, the two different trade structures show interesting variations in the shares of foreign and domestic value-added contents as indicated in the right-hand chart in Figure 41. Manufacturing sectors that are categorised under the FIZ activities are given special incentives and facilities for imports and exports.

In 2010, activities within FIZs contributed approximately 18% (RM85b) to the total Malaysian manufacturing exports. This number could potentially grow as free duty import treatment encourages firms operating within FIZs to use more foreign intermediate goods[48]. As a result, foreign content for the FIZ Manufacturing sector is found to be higher at 60.4% as compared to 46.2% for the domestic Manufacturing sector. Hence, domestic value-added or export earnings generated from exports from FIZs is smaller, at only 39.6%. Therefore, the value-added or return of exports is smaller than the manufacturing firms operating under the non-FIZ regime. Furthermore, with the launch of the Digital Free Trade Zone (DFTZ) in 2017, Malaysia may expect more jobs in this sector as it aims to create 60,000 jobs and double SME export growth rate through improvement in the logistics of trade in goods[49].

By looking at the export composition based on the subsectors[50] as presented in Table 23, it is apparent that E&E is the key contributor for Malaysian exports which contributes 28.4% of the total exports in 2010—this is almost half of the exports produced by FIZ activities. This could imply that the government induces incentives through the FIZs to promote E&E activities. However, it is equally important to note that this sector has the largest import share at 25.4%. The other domestic export sectors within the manufacturing group are Foods with a 10.0% export share, Machineries at 9.0% and Petroleum Refinery at 6.7% (see column 1 Table 22).

[48] Davies, et al. (2016)
[49] MDEC (2017)
[50] The study has aggregated 69 Manufacturing sectors in the IO Table into 14 groups.

Table 23: Export and import shares of national, FIZ and non-FIZ sectors, 2010

	Sectors	National		Non- FIZ sectors		FIZ sectors	
		Export Share (%) (1)	Import Share (%) (2)	Export Share (%) (3)	Import Share (%) (4)	Export Share (%) (5)	Import Share (%) (6)
1	Foods	9.94	4.70	10.01	4.68	9.51	4.84
2	Tobacco Products	0.04	0.07	0.05	0.08	-	-
3	Textiles	0.98	0.84	0.90	0.80	1.50	1.14
4	Woods and Paper	3.15	2.01	2.34	1.53	8.43	5.94
5	Petroleum Refinery	6.66	5.45	7.67	6.11	0.00	0.00
6	Chemical	5.29	5.14	4.23	4.57	12.21	9.88
7	Tyres and Rubber	1.95	1.96	2.01	2.01	1.54	1.57
8	Plastic and Glass	1.79	2.30	1.83	2.39	1.56	1.62
9	Clays and Metals	3.82	7.46	3.56	7.67	5.50	5.76
10	Machineries	8.95	8.05	10.00	8.78	2.09	2.04
11	Electrical and Electronic	28.37	25.36	24.99	21.05	50.43	60.80
12	Motor Vehicles	2.06	4.79	1.95	4.97	2.77	3.29
13	Other Manufacturing	1.02	1.08	0.50	0.83	4.47	3.14
14	Rest of Sectors	25.98	30.79	29.95	34.54	-	-
Total		**100**	**100**	**100**	**100**	**100**	**100**

Notes:
National = total national figure; Non-FIZ sectors = sectors operating outside FIZ; and FIZ sectors = sectors operating within FIZ border.
Columns (1) and (2) refer to the share of exports and imports from the national IO table 2010.
Columns (3), (4), (5) and (6) are the share of exports and imports from total exports and imports for each category.
The rest of sectors refer to sectors other than Manufacturing which include Agriculture, Mining and Quarrying, and Services sectors.

While Table 23 gives us a picture of the export and import structure of the different sectors, Table 24 segregates the effects further into the domestic value-added and foreign content of the exports of each sector considered.

In Table 24, the subsectors with the highest with the highest domestic value-added in the non-FIZ sector are those that are also quite substantial as demonstrated in Column (6). Conversely, under the same trade structure, a significant amount of foreign content is found in Motor Vehicles (60.4%), Machineries (57.9%) and E&E (57.1%).

Moreover, under the FIZ sectors, the results show that high export shares for sectors such as E&E do not necessarily imply high contents of domestic value-added. In columns (3) and (4), findings indicate that Motor Vehicle (73.8%), Tyres and Rubbers (69.4%) and E&E (69.0%) have the highest foreign content. In the Motor Vehicle sector, for example, for every Ringgit of processing exports, RM0.74 is attributed to foreign content and RM0.26 is the domestic value-added.

However, there are also several FIZ sectors that are associated with higher domestic value-added contents such as Petroleum Refinery (67.4%), Other Manufacturing[51](61.7%) and Foods sectors (60.7%). It is important to note that the Other Manufacturing sector contains high domestic value-added at 61.7% under this regime because it includes Repair and Maintenance as one of the subsectors. The Repair and Maintenance sector has higher domestic value-added shares at 51.4% due to its nature as the maintenance service provider for the manufacturing of machineries and equipment. Thus, the Repair and Maintenance sector mostly consumes domestic inputs and utilises less foreign inputs (imports).

Equally important is that the degree of export returns also depends on the size of export shares. Column (6) shows that the following two sectors have lower export values: Petroleum Refinery (almost approaching RM0b) and Foods (RM8.1b). The export share for Petroleum Refineries in FIZs is smaller due to the limited number of FIZ firms that are involved in this sector, which contributed only RM20,000 in 2010.

[51] This sector refers to the manufacture of jewellery, musical instruments, sports goods and medical supplies. See the Glossary for more details.

From columns (5) and (6), it can be seen that the domestic value-added content in exports are much higher for the non-FIZ sectors than the FIZ sectors. For example, the share of non-FIZ contribution into the Foods sector for exports stands at approximately 87.3%, of which 73.2% is domestic value-added. Similarly, all of the exports value in the Petroleum Refinery sector comes from the non-FIZ regime, of which 72.8% is domestic value-added. Although the E&E sector has the highest export share in both non-FIZ and FIZ regimes in comparison to other sectors, it has been noted earlier that only 43% and 31% are domestic value-added respectively. In general, it can be seen that the non-FIZ trade structure provides greater domestic returns for exports than under the FIZ trade structure.

Table 24: Domestic value-added and foreign contents in manufacturing exports, 2010

	Sectors	Non- FIZ sectors		FIZ sectors		Export	
		Domestic Value-added (%)	Foreign Content (%)	Domestic Value-added (%)	Foreign Content (%)	Non-FIZ (RM b)	FIZ (RM b)
		(1)	(2)	(3)	(4)	(5)	(6)
1	Foods	73.18	26.82	60.71	39.29	55.97	8.12
2	Tobacco Products	80.07	19.93	-	-	0.28	-
3	Textiles	63.49	36.51	52.17	47.83	5.03	1.28
4	Woods and Paper	71.16	28.84	53.21	46.79	13.08	7.20
5	Petroleum Refinery	72.79	27.21	67.44	32.56	42.89	0.00
6	Chemical	60.40	39.60	45.08	54.92	23.67	10.43
7	Tyres and Rubber	48.72	51.28	30.57	69.43	11.24	1.32
8	Plastic and Glass	49.66	50.34	43.27	56.73	10.24	1.33
9	Clays and Metals	50.08	49.92	35.38	64.62	19.90	4.70
10	Machineries	42.13	57.87	41.31	58.69	55.90	1.79
11	Electrical and Electronic	42.89	57.11	31.03	68.97	139.74	43.08
12	Motor Vehicles	39.58	60.42	26.17	73.83	10.92	2.36
13	Other Manufacturing	66.34	33.66	61.68	38.32	2.78	3.82
14	Rest of Sectors	81.88	18.12	-	-	167.45	-

Notes:
Summation of domestic value-added share and foreign content should equal to 100%.
For instance, column 1 + column 2 = 100%.
Summation of columns (5) and (6) will equal to total exports.

Impact on value-added

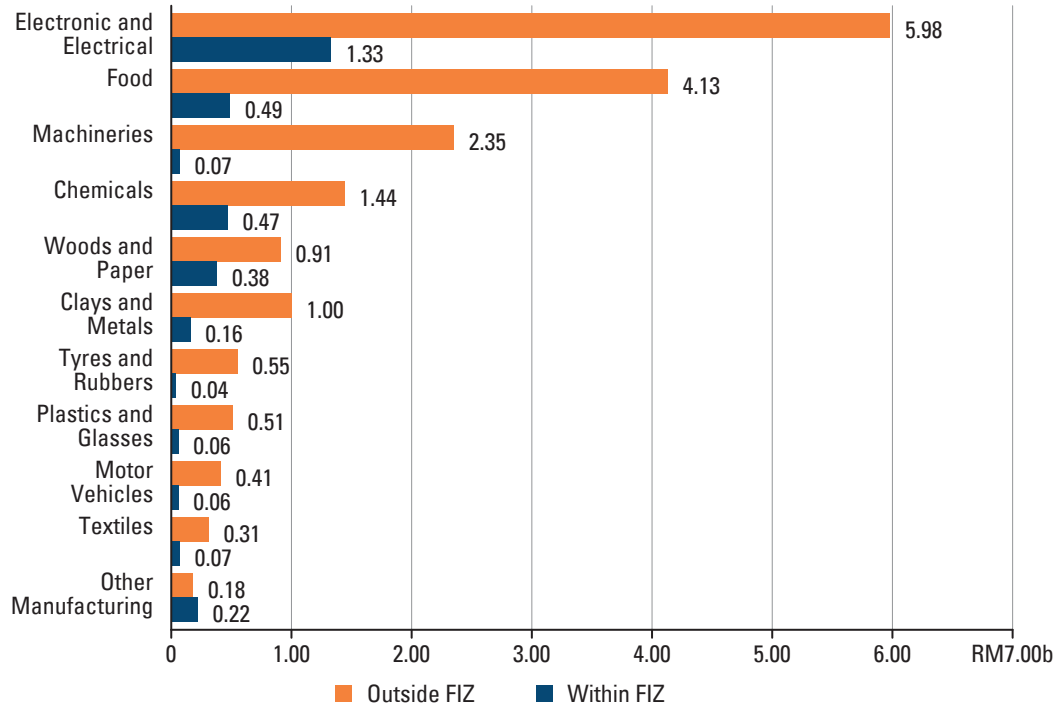
The relative contribution of the FIZ sectors can also be assessed by examining the value-added impact. Figure 42 presents the impact on value-added that is contributed by FIZ and non-FIZ sectors for every 1% increase in final demand. For the non-FIZ sectors, the highest impact is sourced from Foods[52] (RM4.1b), E&E (RM6.0b) and Machineries (RM2.4b). Conversely, for FIZ sectors, the highest impact is attained by E&E (RM1.3b), Foods (RM0.49b) and Chemicals (RM0.47b). Results also point that non-FIZ sectors generate a higher proportion of the total value-added as compared to the FIZ sectors, which is generally associated with higher domestic value-added across the Manufacturing sector.

It is also important to note that FIZ activities are closely linked to multinational firms. In 2010, almost 89.1% (RM11.8b from a total of RM13.3b) of the E&E investments were owned by foreign multinational firms[53]. Therefore, due to the strong presence of foreign ownership in the sector, the Gross National Income (GNI) generated from this sector would be lower as the profit earned by the foreign entities would be omitted. Nevertheless, the role of FIZ activities is still important as it signifies the strong relationship between Malaysia and its trading partners. Thus, any policies regarding this matter need to be executed cautiously to ensure sustainable growth.

[52] Foods sector consists of subsectors such as Meat and Meat Production, Preservation of Seafood, Preservation of Fruits and Vegetables, Dairy Production, Oils and Fats, Grain Mills, Bakery Products, Confectionery, Other Food Processing, Animal Feeds, Wine and Spirit and Soft Drink.

[53] MIDA (2011)

Figure 42: Contribution of activities within and outside FIZs on value-added, 2010



Source: DOSM (2014)
Note: The results presented are based on the simulation of 1% increase of final demand for sectors operating within and outside of FIZs.

Conclusion

The primary aim of this chapter was to evaluate the role of the Malaysian E&E sector compared to other Manufacturing sectors and its potential to boost and uplift economic growth. This chapter first segregates the Manufacturing sector into non-FIZ and FIZ sectors before providing analysis on the subsector level. FIZs, established to boost exports, have good logistics, infrastructure and expedited customs clearance. This policy setting is skewed to firms that are part of GVCs or multinational companies rather than SMEs that produce outside FIZs. However, the role of FIZs is still important as higher foreign content impacts the integration level between Malaysia and its trading partners.

In sum, it has been illustrated that the FIZ activities are generally associated with lower domestic value-added and contain a higher share of imports. This is potentially due to less utilisation of domestic inputs, which may be in line with the policy objectives of free zones. For the E&E sector, we find that its contribution to the Malaysian economy is related to the volume of exports rather than to domestic value-added—each Ringgit of export of E&E is relatively low with RM0.43 for the E&E non-FIZ sector and RM0.31 for the E&E FIZ sector. Our results are in line with the findings in the literature, whereby sectors in free zones are found to have a lower contribution to the domestic economy[54]. For the case of China, the contribution of sectors in free zones is also found to be minimal[55]. Additionally, sectors in free zones tend to have moderate performance especially in wages and skill intensity. Thus, the results provide an apparent reason for why the export performance of non-FIZ and FIZ sectors has to be analysed separately.

Nevertheless, it is important to bear in mind that the value of a sector could go beyond its domestic value-added content such as its productivity growth, employment share and role in the global technology frontier. Although the value-added component to the domestic economy from FIZs can still be improved, policies to address this issue should be in line with the general policy objectives of free zones.

This study is unable to validate whether the low value-added content in E&E products is a sign of structural weakness. The low domestic value-added content is common for E&E products that are heavily involved in GVC networks. Therefore, the most important aspects to be justified are the magnitude and strength of Malaysian E&E production linkages in GVC networks. To do so, we would need to integrate the Malaysian IO table with the system of global IO tables, which goes beyond the scope of our study.

[54] For example, see for example, Dai, et al. (2016)
[55] Ibid., Manova, et al. (2016), Koopman, et al. (2008)

Appendix 4: Map of FIZs in Malaysia

Figure 43: Free Industrial Zones in Malaysia

Source: Authors' illustration

CHAPTER 04

THE ROLE OF SMALL AND MEDIUM ENTERPRISES

CHAPTER 4

THE ROLE OF SMALL AND MEDIUM ENTERPRISES

Small and medium enterprises (SMEs)[56] may offer a viable solution to uncover new sectors that can be promoted to stimulate domestic growth. Based on the Department of Statistics' *Profile of Small and Medium Enterprises*, SMEs accounted for 98.5% of the total number of establishments in 2015[57]. Thus, SMEs play an important role in driving the growth of the economy.

SMEs are particularly viewed as below average performers due to their low productivity levels compared to large-sized firms or sectors. This can be seen by looking at the SME Annual Report 2016/17 that shows SMEs' productivity to be 3.3 times lower than the large firms in 2016, given that SMEs are largely reliant on labour input[58]. To accelerate the growth of SMEs, the SME Masterplan 2012 – 2020 highlighted six factors, which include: (i) innovation and technology adoption, (ii) human capital development, (iii) access to financing, (iv) market access, (v) legal and regulatory environment, and (vi) infrastructure[59]. Thus, any shocks impacting these indicators will potentially hamper SMEs from attaining their full potential.

There is a loose connection between SMEs and large-sized sectors in production chains. Although SMEs and large-sized sectors are found to be highly dependent on large-sized sectors, the large-sized sectors are less integrated with SMEs.

[56] Please refer to Box 6 for the detailed definition of SMEs used in this chapter.
[57] DOSM (2017)
[58] SME Corporation Malaysia (2017)
[59] SME Corporation Malaysia (2011)

The analysis of SMEs is divided as follows; the first section assesses the contribution of SMEs; the next section observes the production linkages; the third section presents the demand linkages; while the following section shows the potential of SME sectors by looking at multiplier and linkage measures. The final section gives the concluding remarks. Analysis in these sub-sections break down the sectors in the IO table by disaggregating the sectors into SMEs and large-sized firms. Using this new dataset, we provide some new insights on the key sectors for small, medium and large-sized firms.

Box 6: Definition of SMEs

Under the 2005 definition, SMEs can be categorised into two group of sectors; (i) the Manufacturing sector; and (ii) the rest of sectors. For the rest of sectors, the definition covers the Agriculture, Mining and Quarrying, Construction and Services sectors. To cluster a sector under the small, medium and large classifications, two parameters are considered; (i) number of employees; or (ii) annual sales turnover. However, priority will be given to the number of employees in case the parameters fall in different sectoral clusters. The full description of the definition is provided in Table 25.

Table 25: The definition of SMEs for the Manufacturing sector and the rest of sectors

Firm sizes	Definition
A. Manufacturing sector	
Small	Between 5 and 50 full-time employees/between RM250,000 and less than RM10m annual sales turnover
Medium	Between 50 and 150 full-time employees/between RM10m and RM25m annual sales turnover
Large	More than 150 full-time employees/more than RM25m annual sales turnover
B. Rest of the sectors (Agriculture, Mining and Quarrying, Construction and Services)	
Small	Between 5 and 20 full-time employees/between RM200,000 and less than RM1m annual sales turnover
Medium	Between 20 and 50 full-time employees/between RM1m and RM5m annual sales turnover
Large	More than 50 full-time employees/more than RM5m annual sales turnover

Note: The definition of SMEs used in this chapter refers to the definition that was endorsed by the National SME Development Council (NSDC) in 2005. The new definition that was endorsed in 2013 is not being used because one of the primary data sources utilised in the study, the *Profile of Small and Medium Enterprise* report was published based on the 2005 definition.

Contribution of SMEs

A review of SMEs reveals that they have contributed RM492.6b (23.7%) to the total national output as compared to large-sized sectors with a contribution of RM1,304.6b (62.9%) in 2010. Disaggregating the contribution of SMEs into small and medium sizes, the former has contributed RM280.5b (13.5%) and the latter RM212.1b (10.2%). Before we discuss the contribution level in detail, it is worth noting that the total amount of output, value-added and imports shown in Table 26 is equal to the total national amount. The amount shown also includes the contribution of the rest of the sectors in row D for the sectors that cannot be classified into SMEs due to data limitation. Table 26 provides the detailed information.

Table 26: The contribution of small, medium and large-sized sectors on output, value-added and import, 2010

Sectors	Output		Value-added		Import	
	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)
A. Small	**280.5**	**13.5**	**142.1**	**17.8**	**37.6**	**9.3**
Agriculture, Forestry and Logging, and Fishing	2.6	0.1	1.3	0.2	0.3	0.1
Mining and Quarrying	0.3	0.0	0.1	0.0	0.0	0.0
Manufacturing	63.4	3.1	15.7	2.0	15.7	3.9
Construction	7.2	0.3	2.8	0.3	1.4	0.3
Services	206.9	10.0	122.2	15.4	20.2	5.0
B. Medium	**212.1**	**10.2**	**63.9**	**8.0**	**39.6**	**9.8**
Agriculture, Forestry and Logging, and Fishing	2.6	0.1	1.4	0.2	0.2	0.1
Mining and Quarrying	0.8	0.0	0.3	0.0	0.1	0.0
Manufacturing	130.6	6.3	22.4	2.8	29.7	7.4
Construction	12.9	0.6	4.8	0.6	2.4	0.6
Services	65.3	3.1	35.1	4.4	7.1	1.8

Sectors	Output		Value-added		Import	
	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)
C. Large	**1,304.6**	**62.9**	**401.1**	**50.4**	**301.4**	**74.8**
Agriculture, Forestry and Logging, and Fishing	118.7	5.7	72.0	9.0	10.7	2.7
Mining and Quarrying	8.0	0.4	6.2	0.8	0.7	0.2
Manufacturing	707.1	34.1	143.3	18.0	233.5	57.9
Construction	70.7	3.4	19.9	2.5	12.0	3.0
Services	400.1	19.3	159.6	20.0	44.4	11.0
D. Rest of sectors	**276.9**	**13.4**	**189.0**	**23.7**	**24.5**	**6.1**
Crude Oil and Natural Gas	98.0	4.7	81.9	10.3	5.5	1.4
Others	178.9	8.6	107.1	13.5	19.0	4.7
E. Total Economy	**2,074.2**	**100.0**	**796.1**	**100.0**	**403.1**	**100.0**

Note: Rest of sectors refer to Crude Oil and Natural Gas, and public sectors that are unable to be categorised as small, medium and large-sized sectors respectively, due to data unavailability.

In terms of value-added contribution, SMEs generated RM206.0b (25.8%) and large-sized sectors generated RM401.1b (50.4%). Among SMEs, the small-sized sectors generated more value-added with a contribution of RM142.1b (17.8%) compared to only RM63.9b (8.0%) by medium-sized sectors. Another important observation is that there is a positive association between sectoral sizes and import content as shown in the import column in Table 26. The smaller the size of the sector, the lower the import content observed. Specifically, small-sized sectors only require RM37.6b (9.3%) of imports, medium-sized sectors require RM39.6b (9.8%) and large-sized sectors require RM301.4b (74.8%).

The analysis of the contribution of SMEs identifies three important points. Firstly, the share of output and value-added in the economy is dominantly contributed by large-sized sectors while SMEs only contribute about one-third of the share. Secondly, the larger the size of the sector, the larger the output produced. Thirdly, small-sized sectors have a higher degree of value-added intensity. That is, each Ringgit of output produced by this sector contains RM0.51 of value-added, whilst it is RM0.30 for medium-sized, and RM0.31 for the large-sized firms.

Production linkages

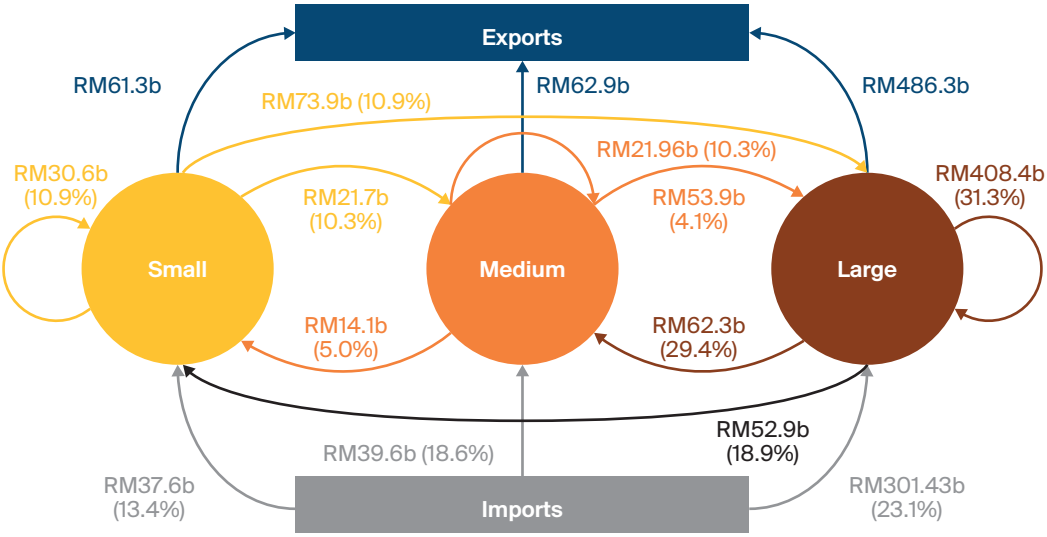
To investigate the underlying factors attributed to the low level of productivity of SMEs, one of the measures is to analyse the relationship between SMEs and large-sized sectors. This can be done by observing the linkages or flow of inputs and outputs between every size of the production sector.

Figure 44 presents the production linkages for small, medium and large-sized sectors as well as their interaction with the import and export markets. For a better understanding of the concept of production linkages, Table 27 further details the information presented in Figure 44.

Based on Figure 44 and Table 27, two main observations can be highlighted. Firstly, there is a loose connection between SMEs and large-sized sectors in the production chains. SMEs and large-sized sectors are found to be highly linked to large-sized sectors, but large-sized sectors are less integrated with SMEs. Specifically, small and medium-sized sectors demand 18.9% (RM53.9b) and 29.4% (RM62.3b), respectively, of the total intermediate inputs that are produced by large-sized sectors. However, the large-sized sectors are more connected to its peers with a demand level of 31.3% (RM408.4b). Thus, if the government promotes investment in either SMEs or large-sized sectors, the large-sized sectors would produce larger growth linkages effects as compared to SMEs.

Secondly, the production of small-sized sectors is associated with higher value-added intensity. Of the total output produced by small-sized sectors, 50.6% (RM142.1b) is value-added, compared to 30.1% (RM63.9b) and 30.7% (RM401.1b) by medium and large-sized sectors respectively. An explanation behind the lower value-added creation and the lack of interdependency between large-sized sectors and SMEs could be due to the role of imports. Imports are leakages to the domestic economy and a large consumption of imports implies less value-added.

Figure 44: Production linkages between small, medium and large-sized sectors and the interaction with the import market, 2010



Source: DOSM (2014), Authors' illustration

Table 27: Production linkages between small, medium and large-sized sectors, 2010

Production Linkages	Small		Medium		Large		Rest of Sectors	
	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)
Small	30.6	10.9	21.7	10.2	73.9	5.7	10.0	3.6
Medium	14.1	5.0	21.9	10.3	53.9	4.1	7.4	2.7
Large	52.9	18.9	62.3	29.4	408.4	31.3	42.8	15.5
Rest of Sectors	0.9	0.3	1.4	0.7	57.4	4.4	2.6	1.0
Import	37.6	13.4	39.6	18.6	301.4	23.1	24.5	8.9
Indirect Taxes	2.4	0.8	1.3	0.6	8.5	0.6	0.6	0.2
Value-added	142.1	50.6	63.9	30.1	401.1	30.7	189.0	68.2
Total Input	280.5	100.0	212.1	100.0	1,304.6	100.0	276.9	100.0

Note: Rest of Sectors refer to Crude Oil and Natural Gas, and public sectors that are unable to be categorised as small, medium and large-sized sectors respectively, due to data unavailability.

Figure 44 and Table 27 present the outcome from the analysis at the aggregate level without separating the production linkages at the sectoral level. Table 28 – Table 32 give details at the sectoral level. In sum, as a percentage share of the sector's output, the value-added for both small and medium-sized firms is highest in the Services sector with 59.1% and 53.8% shares respectively. Conversely, the Agriculture sector contributes the smallest share of value-added to SMEs (19.0% and 13.2% respectively). On the other hand, the Mining and Quarrying sector generates the highest value-added shares for large-sized firms (77.5%), and smallest for the Manufacturing sector (20.3%).

Table 28: Amount of input requirements, taxes paid and value-added generated by the Agriculture sector, 2010

Production Linkages	Small Agriculture		Small Others		Medium Agriculture	
	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)
Small Agriculture	0.5	2.9	0.8	0.3	2.4	4.3
Small Others	3.0	15.4	26.3	10.1	4.4	7.8
Medium Agriculture	1.1	5.7	1.4	0.5	8.7	15.5
Medium Others	1.2	6.0	10.4	4.0	1.4	2.6
Large Agriculture	4.4	23.0	3.9	1.5	21.6	38.3
Large Others	3.2	16.9	41.4	15.8	3.8	6.7
Rest of Sectors	0.1	0.5	0.8	0.3	0.8	1.4
Import	2.0	10.4	35.6	13.6	5.7	10.1
Indirect Taxes	0.0	0.3	2.3	0.9	0.1	0.2
Value-added	3.7	19.0	138.4	53.0	7.4	13.2
Total Input	**19.2**	**100.0**	**261.4**	**100.0**	**56.3**	**100.0**

Note: Rest of Sectors refer to Crude Oil and Natural Gas, and public sectors that are unable to be categorised as small, medium and large-sized sectors respectively, due to data unavailability.

Medium Others		Large Agriculture		Large Others		Rest of Sectors	
RM b	Share (%)	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)
0.4	0.3	3.2	1.5	0.8	0.1	0.2	0.1
14.5	9.3	7.7	3.7	62.2	5.7	9.7	3.5
1.5	1.0	8.1	3.9	2.4	0.2	0.5	0.2
10.2	6.5	3.8	1.8	39.6	3.6	6.9	2.5
3.3	2.1	64.6	31.1	12.0	1.1	1.3	0.5
33.7	21.6	21.3	10.2	310.6	28.3	41.5	15.0
0.6	0.4	0.6	0.3	56.7	5.2	2.6	1.0
33.9	21.7	20.7	9.9	280.7	25.6	24.5	8.9
1.2	0.8	0.6	0.3	7.9	0.7	0.6	0.2
56.5	36.3	77.4	37.2	323.8	29.5	189.0	68.2
155.8	**100.0**	**207.9**	**100.0**	**1,096.6**	**100.0**	**276.9**	**100.0**

Table 29: Amount of input requirements, taxes paid and value-added generated by the Mining and Quarrying sector, 2010

Production Linkages	Small Mining and Quarrying		Small Others		Medium Mining and Quarrying	
	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)
Small Mining and Quarrying	0.0	0.0	0.0	0.0	0.0	0.0
Small Others	0.1	16.7	30.5	10.9	0.1	15.6
Medium Mining and Quarrying	0.0	0.1	0.1	0.0	0.0	0.2
Medium Others	0.0	8.7	14.0	5.0	0.1	8.4
Large Mining and Quarrying	0.0	0.8	0.6	0.2	0.0	2.1
Large Others	0.1	32.8	52.2	18.6	0.2	28.9
Rest of Sectors	-	-	0.9	0.3	-	-
Import	0.0	8.8	37.6	13.4	0.1	8.8
Indirect Taxes	0.0	0.5	2.4	0.8	0.0	0.5
Value-added	0.1	31.7	142.0	50.7	0.3	35.5
Total Input	**0.3**	**100.0**	**280.2**	**100.0**	**0.8**	**100.0**

Note: Rest of Sectors refer to Crude Oil and Natural Gas, and public sectors that are unable to be categorised as small, medium and large-sized sectors respectively, due to data unavailability.

Medium Others		Large Mining and Quarrying		Large Others		Rest of Sectors	
RM b	Share (%)	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)
0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0
21.6	10.2	0.2	2.1	73.5	5.7	10.0	3.6
0.2	0.1	0.0	0.0	0.4	0.0	0.0	0.0
21.6	10.2	0.1	1.2	53.4	4.1	7.4	2.7
1.7	0.8	0.0	0.2	4.5	0.3	0.3	0.1
60.4	28.6	0.8	9.5	403.2	31.1	42.5	15.3
1.4	0.7	-	-	57.4	4.4	2.6	1.0
39.5	18.7	0.7	8.8	300.7	23.2	24.5	8.9
1.3	0.6	0.0	0.5	8.4	0.6	0.6	0.2
63.7	30.1	6.2	77.5	394.9	30.5	189.0	68.2
211.4	**100.0**	**8.0**	**100.0**	**1,296.5**	**100.0**	**276.9**	**100.0**

Table 30: Amount of input requirements, taxes paid and value-added generated by the Manufacturing sector, 2010

Production Linkages	Small Manufacturing		Small Others		Medium Manufacturing	
	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)
Small Manufacturing	1.8	2.8	1.8	0.8	5.4	4.1
Small Others	6.9	10.9	20.1	9.3	8.6	6.6
Medium Manufacturing	2.6	4.1	2.5	1.2	14.6	11.2
Medium Others	2.7	4.2	6.3	2.9	2.5	1.9
Large Manufacturing	14.6	23.0	34.3	15.8	39.1	29.9
Large Others	2.9	4.6	1.1	0.5	6.5	5.0
Rest of Sectors	0.2	0.3	0.7	0.3	1.3	1.0
Import	15.7	24.8	21.9	10.1	29.7	22.7
Indirect Taxes	0.4	0.6	2.0	0.9	0.6	0.4
Value-added	15.7	24.7	126.4	58.2	22.4	17.1
Total Input	**63.4**	**100.0**	**217.1**	**100.0**	**130.6**	**100.0**

Note: Rest of Sectors refer to Crude Oil and Natural Gas, and public sectors that are unable to be categorised as small, medium and large-sized sectors respectively, due to data unavailability.

Medium Others		Large Manufacturing		Large Others		Rest of Sectors	
RM b	Share (%)	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)
1.4	1.7	10.5	1.5	5.6	0.9	1.9	0.7
6.4	7.8	23.8	3.4	34.1	5.7	8.0	2.9
2.6	3.2	22.7	3.2	9.1	1.5	3.4	1.2
2.1	2.6	10.2	1.4	11.9	2.0	4.0	1.5
16.1	19.8	138.7	19.6	189.9	31.8	42.3	15.3
0.6	0.8	65.1	9.2	14.7	2.5	0.5	0.2
0.1	0.1	55.2	7.8	2.2	0.4	2.6	1.0
9.8	12.1	233.5	33.0	67.8	11.4	24.5	8.9
0.7	0.9	4.0	0.6	4.4	0.7	0.6	0.2
41.6	51.0	143.3	20.3	257.8	43.1	189.0	68.2
81.5	**100.0**	**707.1**	**100.0**	**597.5**	**100.0**	**276.9**	**100.0**

Table 31: Amount of input requirements, taxes paid and value-added generated by the Construction sector, 2010

Production Linkages	Small Construction		Small Others		Medium Construction	
	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)
Small Construction	0.0	0.4	0.1	0.0	0.0	0.4
Small Others	0.7	10.3	29.8	10.9	1.1	8.5
Medium Construction	0.0	0.4	0.1	0.0	0.1	0.7
Medium Others	0.4	6.2	13.5	4.9	0.8	6.0
Large Construction	0.1	1.9	0.3	0.1	0.5	4.0
Large Others	1.6	22.6	50.9	18.6	3.1	24.3
Rest of Sectors	0.0	0.0	0.9	0.3	0.0	0.0
Import	1.4	19.5	36.2	13.2	2.4	18.7
Indirect Taxes	0.0	0.4	2.3	0.9	0.1	0.4
Value-added	2.8	38.4	139.3	51.0	4.8	36.9
Total Input	**7.2**	**100.0**	**273.3**	**100.0**	**12.9**	**100.0**

Note: Rest of Sectors refer to Crude Oil and Natural Gas, and public sectors that are unable to be categorised as small, medium and large-sized sectors respectively, due to data unavailability.

Medium Others		Large Construction		Large Others		Rest of Sectors	
RM b	Share (%)	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)
0.2	0.1	0.3	0.5	0.8	0.1	0.6	0.2
20.4	10.2	5.1	7.1	67.8	5.5	9.3	3.4
0.2	0.1	0.9	1.2	1.3	0.1	0.8	0.3
20.8	10.4	4.4	6.2	47.3	3.8	6.6	2.4
0.5	0.3	5.1	7.2	3.6	0.3	4.4	1.6
58.2	29.2	22.8	32.2	376.9	30.5	38.4	13.9
1.4	0.7	0.0	0.0	57.4	4.6	2.6	1.0
37.1	18.6	12.0	17.0	289.3	23.5	24.5	8.9
1.3	0.6	0.3	0.4	8.2	0.7	0.6	0.2
59.2	29.7	19.9	28.1	381.2	30.9	189.0	68.2
199.2	**100.0**	**70.7**	**100.0**	**1,233.8**	**100.0**	**276.9**	**100.0**

Table 32: Amount of input requirements, taxes paid and value-added generated by the Services sector, 2010

Production Linkages	Small Services		Small Others		Medium Services	
	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)
Small Services	19.1	9.2	7.8	10.6	5.3	8.2
Small Others	1.7	0.8	2.0	2.8	0.9	1.4
Medium Services	5.9	2.8	2.9	3.9	1.7	2.6
Medium Others	2.3	1.1	3.1	4.1	2.0	3.0
Large Services	25.5	12.3	8.7	11.8	6.7	10.3
Large Others	7.5	3.6	11.3	15.3	5.6	8.6
Rest of Sectors	0.7	0.3	0.2	0.2	0.1	0.2
Import	20.2	9.8	17.4	23.7	7.1	10.9
Indirect Taxes	1.9	0.9	0.4	0.6	0.7	1.0
Value-added	122.2	59.1	19.9	27.0	35.1	53.8
Total Input	**206.9**	**100.0**	**73.6**	**100.0**	**65.3**	**100.0**

Note: Rest of Sectors refer to Crude Oil and Natural Gas, and public sectors that are unable to be categorised as small, medium and large-sized sectors respectively, due to data unavailability.

Medium Others		Large Services		Large Others		Rest of Sectors	
RM b	Share (%)	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)
9.3	6.3	26.8	6.7	28.1	3.1	7.4	2.7
6.2	4.2	2.8	0.7	16.2	1.8	2.6	0.9
2.4	1.6	8.0	2.0	9.9	1.1	3.2	1.1
15.9	10.8	4.3	1.1	31.7	3.5	4.2	1.5
6.9	4.7	105.1	26.3	57.4	6.3	24.4	8.8
43.1	29.4	43.7	10.9	202.2	22.4	18.4	6.6
1.3	0.9	2.2	0.5	55.2	6.1	2.6	1.0
32.4	22.1	44.4	11.1	257.0	28.4	24.5	8.9
0.7	0.4	3.2	0.8	5.3	0.6	0.6	0.2
28.8	19.6	159.6	39.9	241.5	26.7	189.0	68.2
146.9	**100.0**	**400.1**	**100.0**	**904.5**	**100.0**	**276.9**	**100.0**

Demand linkages

As a continuation to the outcomes presented on production linkages, this section will discuss demand linkages for the output produced by SMEs and large-sized sectors. Specifically, this sub-section will present the flow of output for intermediate use and the flow of output to final demand components that include private consumption, government consumption, investment and exports. Table 33 provides details for demand linkages.

Based on Table 33, three main observations can be highlighted. Firstly, most of the output produced by small, medium and large-sized sectors flow back into the economy as intermediate inputs. Based on the comparison between sectoral sizes, 48.6% (RM136.2b) of the output produced by small-sized sectors is consumed as intermediate inputs in the economy compared to only 45.8% (RM97.2b) and 43.4% (RM566.5b) for medium and large-sized sectors respectively. This observation reveals that SMEs are relatively more domestically integrated with other economic sectors.

Secondly, other than channelling the produced output back into the economy, the output from small-sized sectors is found to be highly demanded for private consumption. This observation differs slightly for medium and large-sized sectors as their outputs are primarily produced for the export market rather than used as intermediate inputs domestically. This also indicates that the small-sized sectors are domestically oriented, while medium and large-sized sectors are export-oriented. Based on this observation, it is evident that different policies are needed to drive the growth of these sectors since their outputs serve different markets. Finally, government consumption only appears under the Rest of Sectors classification due to the existence of public sectors. The sectors include Public Administration, Education, Health, Defence and Public Order, and Other Public Administration. It is important to note that according to the System of National Accounts 2008, government expenditure shown in Table 33 only refers to the payment of salary and wages to civil servants.

Table 33: Demand linkages for small, medium and large-sized sectors, 2010

Demand Linkages	Small		Medium		Large		Rest of Sectors	
	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)
Intermediate Demand	136.2	48.6	97.2	45.8	566.5	43.4	62.3	22.5
Private Consumption	71.5	25.5	31.9	15.1	191.1	14.7	62.0	22.4
Government Expenditure	-	-	-	-	-	-	101.4	36.6
Investment	11.6	4.1	13.7	6.5	78.6	6.0	5.5	2.0
Export	61.3	21.8	69.2	32.6	468.3	35.9	45.7	16.5
Total Output	280.5	100.0	212.1	100.0	1,304.6	100.0	276.9	100.0

Note: Rest of Sectors refer to Crude Oil and Natural Gas, and public sectors that are unable to be categorised as small, medium and large-sized sectors respectively, due to data unavailability.

Potential drivers for small and medium-sized sectors

For policymaking purposes, it is important to analyse the role of different sectors to small and medium-sized sectors. For example, whether the same sectors are important to the small and medium-sized clusters. To analyse sectors in each cluster, we evaluate the sectoral multiplier impact by imposing a 1% increase in the final demand for each sector[60], which has been similarly conducted in Chapter 2. This method is identified as the size-adjusted value-added multiplier. By extending the analysis to include backward and forward linkages, the magnitude of the spill-over effects of the multiplier can be measured. Table 34 to 36 present results for key drivers using the size-adjusted value-added multipliers while Appendix 6 present the results from the conventional value-added multiplier.

[60] Please refer to Appendix 2 for the methodology to account for the sectoral multiplier impact.

Small-sized sectors

Table 34 lists the top 10 small-sized sectors with the highest size-adjusted value-added multipliers. The Wholesale and Retail Trade sector has the largest impact on a 1% increase in final demand. Every percentage point increase in final demand indicates that this sector generates RM455.9m of value-added. The outstanding performance of this sector can be explained by its heterogeneous nature. Ranked in second position is the Restaurant sector, generating a value-added multiplier of RM178.8m. An observation of the four sectors with the largest simulation impact reveals that this result is consistent with the government initiative under the Economic Transformation Programme (ETP) to focus on the Wholesale and Retail, Tourism, Financial Services, and Palm Oil and Rubber sectors[61]. Although these sectors may bring substantial impact on the economy, the linkages to the rest of the domestic economy is not above average (shown by the low backward or forward integration)[62]. In this case, for small-sized sectors, Oils and Fats, Wood Products, Paper and Paper Products and Furniture, Chemicals and Fertilisers and Food Products have stronger linkages to the rest of the economy.

[61] PEMANDU (2011)

[62] In short, backward linkages measure the inter-connection among input suppliers for an economic sector, while forward linkages measure the inter-connection among buyers for the output produced by an economic sector. A more descriptive explanation is presented in Chapter 2 of the report.

Table 34: Top 10 small-sized sectors with the highest size-adjusted value-added multiplier, 2010

Rank	Sector	Multiplier impact (RM m) (1)	Final demand (RM m) (2)	Linkages BWL (3)	Linkages FWL (4)
1	Wholesale and Retail Trade and Motor Vehicle	455.93	562.54	0.85	1.08
2	Restaurants	178.78	226.87	1.44	0.88
3	Finance and Insurance	118.79	128.11	0.68	1.48
4	Oils and Fats	52.99	66.39	5.06	1.17
5	Wood Products, Paper and Paper Products and Furniture	34.94	52.13	1.63	1.45
6	Professional	30.80	35.57	0.81	1.49
7	Residential and Non-residential	17.04	24.01	1.70	0.72
8	Land Transport	13.98	19.31	0.95	1.53
9	Chemicals and Fertilisers	13.58	22.74	2.06	1.60
10	Food Products	12.85	23.37	3.57	1.46

Notes: Column (1) refers to the size-adjusted value-added multipliers that are derived through the simulation of 1% increase in final demand.
Column (2) refers to the increment value in Ringgit for 1% increase in final demand.
BWL in column (3) and FWL in column (4) refer to backward and forward linkages.

Medium-sized sectors

The size-adjusted value-added multipliers for medium-sized sectors are presented in Table 35. The Oils and Fats and the Wholesale and Retail Trade and Motor Vehicle sectors have a higher impact from a 1% increase in final demand. Although the Wholesale and Retail Trade and Motor Vehicle sectors may bring large multiplier impact, this sector is not strongly interlinked to the rest of the other sectors due to its low backward integration. Low backward integration implies that the sector is unable to produce large economic spill-over effects to other sectors. Other sectors that have a large multiplier impact and have strong interlinkages to other sectors are Chemicals and Fertilisers; Food Products; Wood Products, Paper and Paper Products and Furniture; and Rubber Products. In total, there are six sectors with large multiplier impact and strong backward and forward linkages.

Table 35: Top 10 medium-sized sectors with the highest size-adjusted value-added multiplier, 2010

Rank	Sector	Multiplier impact (RM m) (1)	Final demand (RM m) (2)	Linkages BWL (3)	Linkages FWL (4)
1	Oils and Fats	175.94	221.86	5.33	1.10
2	Wholesale and Retail Trade and Motor Vehicle	147.40	188.45	0.91	1.06
3	Chemicals and Fertilisers	44.05	76.69	1.76	1.50
4	Food Products	39.38	78.11	3.78	1.51
5	Residential and Non-residential	34.44	50.46	1.72	0.69
6	Wood Products, Paper and Paper Products and Furniture	27.38	43.99	2.12	1.68
7	Rubber Products	21.81	49.63	3.65	1.82
8	Finance and Insurance	21.35	23.32	0.72	1.54
9	Restaurants	15.66	20.06	1.58	0.92
10	Other Fabricated Metal Products	15.10	32.14	1.50	1.72

Note: Column (1) refers to the size-adjusted value-added multipliers that are derived through the simulation of 1% increase in final demand.
Column (2) refers to the increment value in Ringgit for 1% increase in final demand.
BWL in column (3) and FWL in column (4) refer to backward and forward linkages.

Large-sized sectors

Table 36 presents the size-adjusted value-added multiplier for large-sized sectors. The Manufacturing subsectors (Semi-conductor Devices, Tubes and Circuit Boards, and TV, Radio Receivers and Transmitters and Associated Goods) and the Wholesale and Retail Trade and Motor Vehicle sectors are in the top 10 ranking. Based on the analysis, the Petroleum Refinery sector has the largest multiplier impact amongst large-sized sectors. In addition, the Oils and Fats sector shows exceptional performance in the Malaysian economy, with high backward and forward linkages. Other well-performing sectors based on their respective multiplier impact and linkages indices are Wholesale and Retail Trade and Motor Vehicle; Finance and Insurance; Telecommunications; and Chemicals and Fertilisers.

Table 36: Top 10 large-sized sectors with the highest size-adjusted value-added multiplier, 2010

Rank	Sector	Multiplier impact (RM m) (1)	Final demand (RM m) (2)	Linkages BWL (3)	Linkages FWL (4)
1	Petroleum Refinery	444.56	613.81	2.86	1.55
2	Oils and Fats	350.30	432.54	43.58	7.33
3	Semi-conductor Devices, Tubes and Circuit Boards	333.84	938.39	1.61	0.82
4	TV, Radio Receivers and Transmitters and Associated Goods	312.80	655.73	1.27	0.85
5	Wholesale and Retail Trade and Motor Vehicle	311.25	425.96	1.28	1.02
6	Finance and Insurance	239.74	273.97	1.28	1.51
7	Metal Products and Machineries	226.35	541.21	1.44	0.98
8	Residential and Non-residential	214.37	325.57	1.84	0.65
9	Telecommunications	206.49	275.23	1.15	1.34
10	Chemicals and Fertilisers	146.62	261.26	2.22	1.62

Note: Column (1) refers to the size-adjusted value-added multipliers that are derived through the simulation of 1% increase in final demand.
Column (2) refers to the increment value in Ringgit for 1% increase in final demand.
BWL in column (3) and FWL in column (4) refer to backward and forward linkages.

Conclusion

This chapter analyses the linkages between SMEs and large enterprises. Results indicate that small and medium-sized sectors are more dependent on the large-sized sector in acquiring intermediate inputs for their production of output. However, the large-sized sector is less dependent on small and medium-sized sectors since most of its inputs are obtained within the large-sized cluster and imports. The weaker industrial networks between small, medium and large-sized sectors may explain why growth in final demand does not bring substantial effects to the domestic economy. Creating greater and more sustainable business cooperation between large firms and SMEs may help to boost the growth of SMEs and the overall economy.

It was also found that the output from small-sized sectors is highly demanded for private consumption use. This observation differs slightly for medium and large-sized sectors as their outputs are primarily produced for the export market rather than used as intermediate inputs domestically. This also indicates that the small-sized sectors are domestically oriented, while medium and large-sized sectors are export-oriented. Based on this observation, it is evident that different policies are needed to drive the growth of these sectors since their outputs serve different markets.

Given the structure of small, medium and large-sized enterprises, the interlinkages between them differ respectively. Therefore, depending on the scale, policies could be formulated to account for these different characteristics. For example, a policy that targets a large-sized enterprise may not automatically trickle down to SMEs.

CHAPTER 4
THE ROLE OF SMALL AND MEDIUM ENTERPRISES

Appendix 5: Additional tables on demand linkages in major economic sectors

Table 37: Demand linkages for the Agriculture sector, 2010

Demand Linkages	Small Agriculture		Small Others		Medium Agriculture	
	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)
Intermediate Demand	1.6	62.2	134.6	48.4	1.8	69.5
Private Consumption	0.6	24.1	70.8	25.5	0.4	16.5
Government Consumption	-	-	-	-	-	-
Investment	0.1	4.4	11.5	4.1	0.1	3.9
Export	0.2	9.4	61.0	22.0	0.3	10.1
Total Output	**2.6**	**100.0**	**277.9**	**100.0**	**2.6**	**100.0**

Note: Rest of Sectors refer to Crude Oil and Natural Gas, and public sectors that are unable to be categorised as small, medium and large-sized sectors respectively, due to data unavailability.

Medium Others		Large Agriculture		Large Others		Rest of Sectors	
RM b	Share (%)	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)
95.5	45.6	84.4	71.1	482.1	40.7	62.3	22.5
31.5	15.0	18.6	15.7	172.5	14.5	62.0	22.4
-	-	-	-	-	-	101.4	36.6
13.6	6.5	3.6	3.1	75.0	6.3	5.5	2.0
69.0	32.9	12.1	10.2	456.3	38.5	45.7	16.5
209.6	**100.0**	**118.7**	**100.0**	**1,185.9**	**100.0**	**276.9**	**100.0**

Table 38: Demand linkages for the Mining and Quarrying sector, 2010

Demand Linkages	Small Mining and Quarrying		Small Others		Medium Mining and Quarrying	
	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)
Intermediate Demand	0.3	88.7	135.9	48.5	0.7	88.7
Private Consumption	-	-	71.5	25.5	-	-
Government Consumption	-	-	-	-	-	-
Investment	0.0	0.5	11.6	4.1	0.0	0.5
Export	0.0	10.8	61.2	21.9	0.1	10.8
Total Output	**0.3**	**100.0**	**280.2**	**100.0**	**0.8**	**100.0**

Note: Rest of Sectors refer to Crude Oil and Natural Gas, and public sectors that are unable to be categorised as small, medium and large-sized sectors respectively, due to data unavailability.

Medium Others		Large Mining and Quarrying		Large Others		Rest of Sectors	
RM b	Share (%)	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)
96.6	45.7	7.1	88.7	559.3	43.1	62.3	22.5
31.9	15.1	-	-	191.1	14.7	62.0	22.4
-	-	-	-	-	-	101.4	36.6
13.7	6.5	0.0	0.5	78.6	6.1	5.5	2.0
69.2	32.7	0.9	10.8	467.5	36.1	45.7	16.5
211.4	**100.0**	**8.0**	**100.0**	**1,296.5**	**100.0**	**276.9**	**100.0**

Table 39: Demand linkages for the Manufacturing sector, 2010

Demand Linkages	Small Manufacturing		Small Others		Medium Manufacturing	
	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)
Intermediate Demand	28.4	44.8	107.8	49.7	57.5	44.0
Private Consumption	6.0	9.4	65.5	30.2	13.5	10.3
Government Consumption	-	-	-	-	-	-
Investment	2.0	3.2	9.6	4.4	4.4	3.3
Export	27.0	42.6	34.3	15.8	55.3	42.3
Total Output	**63.4**	**100.0**	**217.1**	**100.0**	**130.6**	**100.0**

Note: Rest of Sectors refer to Crude Oil and Natural Gas, and public sectors that are unable to be categorised as small, medium and large-sized sectors respectively, due to data unavailability.

Medium Others		Large Manufacturing		Large Others		Rest of Sectors	
RM b	Share (%)	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)
39.8	48.8	225.7	31.9	340.7	57.0	62.3	22.5
18.4	22.6	64.8	9.2	126.3	21.1	62.0	22.4
-	-	-	-	-	-	101.4	36.6
9.3	11.5	21.7	3.1	57.0	9.5	5.5	2.0
14.0	17.1	394.8	55.8	73.5	12.3	45.7	16.5
81.5	**100.0**	**707.1**	**100.0**	**597.5**	**100.0**	**276.9**	**100.0**

Table 40: Demand linkages for the Construction sector, 2010

Demand Linkages	Small Construction		Small Others		Medium Construction	
	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)
Intermediate Demand	2.1	28.7	134.1	49.1	3.4	26.5
Private Consumption	1.1	15.0	70.4	25.8	1.6	12.6
Government Consumption	-	-	-	-	-	-
Investment	3.8	52.0	7.8	2.9	7.2	56.0
Export	0.3	4.3	61.0	22.3	0.6	4.9
Total Output	**7.2**	**100.0**	**273.3**	**100.0**	**12.9**	**100.0**

Note: Rest of Sectors refer to Crude Oil and Natural Gas, and public sectors that are unable to be categorised as small, medium and large-sized sectors respectively, due to data unavailability.

Medium Others		Large Construction		Large Others		Rest of Sectors	
RM b	Share (%)	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)
93.8	47.1	14.5	20.6	551.9	44.7	62.3	22.5
30.3	15.2	4.1	5.8	187.0	15.2	62.0	22.4
-	-	-	-	-	-	101.4	36.6
6.5	3.2	47.7	67.4	31.0	2.5	5.5	2.0
68.6	34.4	4.4	6.2	464.0	37.6	45.7	16.5
199.2	**100.0**	**70.7**	**100.0**	**1,233.8**	**100.0**	**276.9**	**100.0**

Table 41: Demand linkages for the Services sector, 2010

Demand Linkages	Small Services		Small Others		Medium Services	
	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)
Intermediate Demand	103.8	50.2	32.4	44.1	33.9	51.9
Private Consumption	63.8	30.8	7.7	10.5	16.4	25.1
Government Consumption	-	-	-	-	-	-
Investment	5.7	2.7	5.9	8.0	2.0	3.1
Export	33.7	16.3	27.6	37.5	13.0	19.9
Total Output	**206.9**	**100.0**	**73.6**	**100.0**	**65.3**	**100.0**

Note: Rest of Sectors refer to Crude Oil and Natural Gas, and public sectors that are unable to be categorised as small, medium and large-sized sectors respectively, due to data unavailability.

Medium Others		Large Services		Large Others		Rest of Sectors	
RM b	Share (%)	RM b	Share (%)	RM b	Share (%)	RM b	Share (%)
63.4	43.1	234.7	58.7	331.8	36.7	62.3	22.5
15.6	10.6	103.6	25.9	87.5	9.7	62.0	22.4
-	-	-	-	-	-	101.4	36.6
11.7	8.0	5.6	1.4	73.1	8.1	5.5	2.0
56.2	38.3	56.2	14.0	412.1	45.6	45.7	16.5
146.9	**100.0**	**400.1**	**100.0**	**904.5**	**100.0**	**276.9**	**100.0**

Appendix 6: Additional tables on conventional value-added multipliers for each sector

Table 42: Top 10 small-sized sectors with the highest conventional value-added multiplier, 2010

Rank	Sector	Multiplier impact (RM m) (1)	Linkages BWL (2)	Linkages FWL (3)
1	Finance and Insurance	927.24	0.68	1.48
2	Real Estate	900.64	0.45	1.83
3	Cinema, Video and Television Activity	884.56	1.22	1.29
4	Professional	866.01	0.81	1.49
5	Accommodation	858.42	1.23	0.97
6	Crops	850.68	0.64	0.95
7	ICT and Computer Services	837.66	0.92	1.70
8	Wholesale and Retail Trade and Motor Vehicle	810.48	0.85	1.08
9	Telecommunications	804.32	1.10	1.42
10	Publishing Activity	802.01	1.36	0.92

Note: Column (1) refers to the conventional value-added multiplier.
BWL in column (2) and FWL in column (3) refer to backward and forward linkages.

Table 43: Top 10 medium-sized sectors with the highest conventional value-added multiplier, 2010

Rank	Sector	Multiplier impact (RM m) (1)	Linkages BWL (2)	Linkages FWL (3)
1	Finance and Insurance	915.75	0.72	1.54
2	Real Estate	889.94	0.45	1.88
3	Cinema, Video and Television Activity	874.25	1.18	1.28
4	Accommodation	844.47	1.29	1.23
5	Professional	833.69	0.88	1.55
6	Crops	826.05	0.51	0.99
7	ICT and Computer Services	824.75	0.87	1.69
8	Oils and Fats	793.00	5.33	1.10
9	Publishing Activity	791.55	1.32	0.93
10	Telecommunications	786.51	1.05	1.42

Note: Column (1) refers to the conventional value-added multiplier.
BWL in column (2) and FWL in column (3) refer to backward and forward linkages.

Table 44: Top 10 large-sized sectors with the highest conventional value-added multiplier, 2010

Rank	Sector	Multiplier impact (RM m) (1)	Linkages BWL (2)	Linkages FWL (3)
1	Cinema, Video and Television Activity	884.32	0.97	1.26
2	Crops	875.76	0.37	1.06
3	Finance and Insurance	875.05	1.28	1.51
4	Professional	871.82	0.63	1.48
5	Mining and Quarrying	866.68	0.23	1.51
6	Real Estate	856.61	1.12	2.21
7	Business Services	831.01	0.64	1.71
8	Publishing Activity	821.08	1.14	0.96
9	Accommodation	811.06	1.55	1.28
10	Oils and Fats	809.86	43.58	7.33

Note: Column (1) refers to the conventional value-added multiplier.
BWL in column (2) and FWL in column (3) refer to backward and forward linkages.

GLOSSARY

Sectoral glossary based on the Malaysia Standard Industrial Classification 2008:

Sector	Description of Sector
Banks	• Central banking • Other monetary intermediation
Basic Chemicals	• Manufacture of basic chemicals
Business Services	• Advertising • Activities of employment placement agencies • Temporary employment agency activities • Other human resources provision • Travel agency activities • Tour operator activities • Other reservation service and related activities • Private security activities • Security systems service activities • Investigation activities • Combined facilities support activities • General cleaning of buildings • Other building and industrial cleaning activities • Landscape care and maintenance service activities • Combined office administrative service activities • Photocopying, document preparation and other specialised office support activities • Activities of call centres • Organisation of conventions and trade shows • Activities of collection agencies and credit bureaus • Packaging activities • Other business support service activities
Chemicals and Fertilisers	• Manufacture of basic chemicals • Manufacture of fertilisers and nitrogen compounds

Sector	Description of Sector
Cinema, Video and Television Activity	• Motion picture, video and television programme production activities • Motion picture, video and television programme post-production activities • Motion picture, video and television programme distribution activities • Motion picture projection activities • Sound recording and music publishing activities • Radio broadcasting • Television programming and broadcasting activities
Civil Engineering	• Construction of roads and railways • Construction of utility projects • Construction of other civil engineering projects, except buildings • Demolition • Sites preparation
Clays and metals	• Manufacture of refractory products • Manufacture of clay building materials • Manufacture of other porcelain and ceramic products • Manufacture of cement, lime and plaster • Manufacture of articles of concrete, cement and plaster • Cutting, shaping and finishing of stone • Manufacture of other non-metallic mineral products • Manufacture of basic iron and steel • Manufacture of basic precious and other nonferrous metals • Casting of iron and steel • Casting of non-ferrous metals • Manufacture of structural metal products

Sector	Description of Sector
Clays and metals	• Manufacture of tanks, reservoirs and containers of metal • Manufacture of steam generators, except central heating hot water boilers • Forging, pressing, stamping and roll-forming of metal; powder metallurgy • Treatment and coating of metals; machining • Manufacture of cutlery, hand tools and general hardware • Manufacture of other fabricated metal products
Crude Oil and Natural Gas	• Extraction of crude petroleum • Extraction of natural gas • Support activities for petroleum and natural gas extraction
Education	• Pre-primary and primary education • General secondary education • Technical and vocational secondary education • Higher education • Sports and recreation education • Cultural education • Other education • Educational support services
Electrical and Electronic	• Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus • Manufacture of batteries and accumulators • Manufacture of fibre optic cables • Manufacture of other electronic and electric wires and cables • Manufacture of wiring devices

Sector	Description of Sector
Electrical and Electronic	• Manufacture of electric lighting equipment • Manufacture of other electrical equipment • Manufacture of electronic components and boards • Manufacture of communication equipment • Manufacture of consumer electronics • Manufacture of irradiation, electro medical and electrotherapeutic equipment • Manufacture of measuring, testing, navigating and control equipment • Manufacture of optical instruments and photographic equipment • Manufacture of magnetic and optical media • Manufacture of watches and clocks
Financial Institution	• Activities of holding companies • Trusts, funds and similar financial entities • Financial leasing • Other credit granting • Other financial service activities, except insurance/takaful and pension funding activities
Foods	• Processing and preserving of meat • Processing and preserving of fish, crustaceans and Molluscs • Processing and preserving of fruits and vegetables • Manufacture of dairy products • Manufacture of vegetable and animal oils and fats • Manufacture of grain mill products • Manufacture of starches and starch products • Manufacture of bakery products • Manufacture of sugar • Manufacture of cocoa, chocolate and sugar confectionery

Sector	Description of Sector
Foods	• Manufacture of macaroni, noodles, couscous and similar farinaceous products • Manufacture of prepared meals and dishes • Manufacture of other food products • Manufacture of prepared animal feeds • Manufacture of wines • Manufacture of malt liquors and malt • Manufacture of soft drinks; production of mineral waters and other bottled waters
Insurance	• Insurance/Takaful • General insurance • Reinsurance/Retakaful • Pension and provident funding
Land Transport	• Passenger rail transport, interurban • Freight rail transport • Urban and suburban passenger land transport • Other passenger land transport • Freight transport by road • Transport via pipeline
Machineries	• Manufacture of engines and turbines, except aircraft, vehicle and cycle engines • Manufacture of fluid power equipment • Manufacture of other pumps, compressors, taps and valves • Manufacture of bearings, gears, gearing and driving elements • Manufacture of ovens, furnaces and furnace burners • Manufacture of lifting and handling equipment • Manufacture of other general-purpose machinery • Manufacture of weapons and ammunition

Sector	Description of Sector
Machineries	• Manufacture of power-driven hand tools • Manufacture of agricultural and forestry machinery • Manufacture of metal-forming machinery and machine tools • Manufacture of machinery for metallurgy • Manufacture of machinery for mining, quarrying and construction • Manufacture of machinery for food, beverage and tobacco processing • Manufacture of machinery for textile, apparel and leather production • Manufacture of other special-purpose machinery • Manufacture of domestic appliances • Manufacture of computers and peripheral equipment • Manufacture of office machinery and equipment • Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus • Manufacture of batteries and accumulators
Metal Ore Mining	• Mining of iron ores • Mining of uranium and thorium ores • Mining of other non-ferrous metal ores
Office, Accounting and Computing Machinery	• Manufacture of computers and peripheral equipment • Manufacture of office machinery and equipment
Oils and Fats	• Manufacture of vegetable and animal oils and fats
Other Chemicals Product	• Manufacture of plastics and synthetic rubber in primary forms • Manufacture of pesticides and other agrochemical products

Sector	Description of Sector
Other Chemicals Product	• Manufacture of other chemical products • Manufacture of man-made fibres
Other Fabricated Metal Products	• Forging, pressing, stamping and roll-forming of metal; powder metallurgy • Treatment and coating of metals; machining • Manufacture of cutlery, hand tools and general hardware • Manufacture of other fabricated metal products
Other Financial Institution	• Administration of financial markets • Security and commodity contracts brokerage • Other activities auxiliary to financial service activities • Risk and damage evaluation • Activities of insurance/takaful agents and brokers • Other activities auxiliary to insurance, takaful and pension funding • Fund management activities
Other Manufacturing	• Manufacture of jewellery and related articles • Manufacture of imitation jewellery and related articles • Manufacture of musical instruments • Manufacture of sports goods • Manufacture of games and toys • Manufacture of medical and dental instruments and supplies
Other Private Services	• Social work activities without accommodation for the elderly and disabled carried out by government offices or by private organisations • Other social work activities without accommodation • Repair of computers and peripheral equipment • Repair and maintenance of communication equipment

Sector	Description of Sector
Other Private Services	• Repair of consumer electronics • Repair of household appliances and home and garden equipment • Repair of footwear and leather goods • Repair of furniture and home furnishings • Repair of personal and household goods • Washing and (dry-) cleaning of textile and fur products Hairdressing and other beauty treatment • Funeral and related activities of human or animal corpses and related activities • Other service activities • Activities of households as employers of domestic personnel • Undifferentiated goods-producing activities of private households for own use • Undifferentiated service-producing activities of private households for own use
Ownership of Dwellings	• Services provided by owner-occupiers and individuals/firms who let out their residential properties
Paddy	• Growing of paddy
Petroleum Refinery	• Manufacture of coke oven products • Manufacture of refined petroleum and bio-diesel products
Plastic and glass	• Manufacture of plastic products • Manufacture of glass and glass products
Professional	• Legal activities • Accounting, bookkeeping and auditing activities; tax consultancy

Sector	Description of Sector
Professional	• Activities of head offices • Management consultancy activities • Architectural and engineering activities and related technical consultancy • Technical testing and analysis • Market research and public opinion polling • Specialised design activities • Photographic activities • Other professional, scientific and technical activities
Research and Development (Business and Private Services)	• Research and experimental development on natural science and engineering • Research and experimental development on social sciences and humanities
Residential and Non-Residential	• Construction of buildings
Restaurants	• Restaurants and mobile food service activities • Event catering • Other food service activities • Beverage serving activities
Rubber	• Growing of rubber trees (estate) • Growing of rubber trees (smallholdings)
Rubber Products	• Manufacture of other rubber products
Semi-Conductor Devices, Tubes and Circuit Boards	• Manufacture of electronic components and boards
Stone Clay and Sand Quarrying	• Quarrying of stone, sand and clay

Sector	Description of Sector
Telecommunications	• Wired telecommunications activities • Wireless telecommunications activities • Satellite telecommunications activities • Other telecommunications activities
Textiles	• Finishing of textiles • Manufacture of knitted and crocheted fabrics • Manufacture of made-up textile articles, except apparel • Manufacture of carpets and rugs • Manufacture of cordage, rope, twine and netting • Manufacture of other textiles
Tobacco Products	• Manufacture of tobacco products
TV, Radio Receivers and Transmitters and Associated Goods	• Manufacture of communication equipment • Manufacture of consumer electronics
Tyres and rubbers	• Manufacture of rubber tyres and tubes; re-treading and rebuilding of rubber tyres • Manufacture of other rubber products
Wholesale and Retail Trade and Motor Vehicle	• Wholesale and retail sale of new and used vehicles • Maintenance and repair of motor vehicles • Sale of motor vehicle parts and accessories • Sale, maintenance and repair of motorcycles and related parts and accessories • Wholesale on a fee or contract basis • Wholesale of agricultural raw materials and livestock • Wholesale of meat, fish, fruits and vegetables • Wholesale of food, beverages and tobacco • Wholesale of textiles, clothing and footwear • Wholesale of pharmaceutical goods and toiletries

Sector	Description of Sector
Wholesale and Retail Trade and Motor Vehicle	• Wholesale of sports goods, games, leather, travelling goods and musical instruments • Wholesale of handicraft, watches, clocks and jewellery • Wholesale of other household goods • Wholesale of computers, computer peripheral equipment and software • Wholesale of electronic and telecommunications equipment and parts • Wholesale of agricultural machinery, equipment and supplies • Wholesale of other machinery and equipment • Wholesale of solid, liquid and gaseous fuels and related products • Wholesale of metals and metal ores • Wholesale of construction materials, hardware, plumbing and heating equipment and supplies • Wholesale of waste and scrap and other products • Retail sale in non-specialised stores with food, beverages or tobacco predominating • Other retail sale in non-specialised stores • Retail sale of food in specialised stores • Retail sale of beverages in specialised stores • Retail sale of tobacco products in specialised stores • Retail sale of automotive fuel in specialised stores • Retail sale of computers, peripheral units, software and telecommunications equipment in specialised stores • Retail sale of audio and video equipment in specialised stores • Retail sale of textiles in specialised stores

Sector	Description of Sector
Wholesale and Retail Trade and Motor Vehicle	• Retail sale of hardware, paints and glass in specialised stores • Retail sale of carpets, rugs, wall and floor coverings in specialised stores • Retail sale of electrical household appliances, furniture, lighting equipment and other household articles in specialised stores • Retail sale of books, newspapers and stationary specialised stores • Retail sale of music and video recordings in specialised stores • Retail sale of sporting equipment in specialised stores • Retail sale of games and toys in specialised stores • Retail sale of clothing, footwear and leather articles in specialised stores • Retail sale of pharmaceutical and medical goods, cosmetic and toilet articles in specialised stores • Other retail sale of new goods in specialised stores • Retail sale of second-hand goods • Retail sale via stalls and markets of food, beverages and tobacco products • Retail sale via stalls and markets of textiles, clothing and footwear • Retail sale via stalls and markets of other goods • Retail sale via mail order houses or via Internet • Other retail sale not in stores, stalls or markets
Wood Products, Paper and Paper Products and Furniture	• Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials • Manufacture of pulp, paper and paperboard

Sector	Description of Sector
Wood Products, Paper and Paper Products and Furniture	• Manufacture of corrugated paper and paperboard and of containers of paper and paperboard • Manufacture of other articles of paper and paperboard • Manufacture of furniture

Source: Department of Statistics Malaysia, 2008

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