**Agglomeration in Practice:**

**The Malaysian Experience in Diversifying Manufacturing**[1]

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**Abstract**

This paper underlines the key strategies that led to the diversification of the manufacturing sector in Malaysia over the decades. Malaysia has successfully moved away from the heavy dependence on primary commodities via implementation of key national policy measures and adoption of 'multi-sector agglomeration' development strategy. This emphasised the 'agglomeration mode' in developing manufacturing, rather than pre-selecting a few niche industries. This had brought in three major waves of economic diversification - first, horizontal diversification with a shift from primary commodities to other sources of growth such as manufacturing and services sectors; second, vertical diversification in which the economy moved up the commodity-based value chain from upstream to downstream activities with higher value-added; and third, locational, by creating manufacturing activities over dispersed corridors rather than concentrated on a centralised location. This paper also highlights some of the benefits of diversification to the development and stability of the Malaysian economy as a whole, as well as the degree of diversification which varies across different subsectors.

**Keywords**

Manufacturing, diversification, agglomeration, horizontal, vertical, locational, resource-based industries, electronics and electrical (E&E)

[1] The authors are economists working in the Economics Department, Bank Negara Malaysia. They would like to acknowledge the useful feedbacks and comments by Fraziali Ismail, Dr. Mohamad Hasni Sha'ari and Dr. Ahmad Razi. All views expressed in this paper are solely of the authors and may not necessarily represent that of the Department or the Bank.

## Part 1: Introduction

Endowed with abundant natural resources, Malaysia was reliant on the primary sector prior to the 1960s to drive economic growth, with the primary sector contributing nearly half of the country's Gross Domestic Product (GDP). In addition, commodities used to account for nearly 80 percent of Malaysia's exports back in the 1960s. Since then, Malaysia has embarked on the road of horizontal and vertical diversification, as the economy placed more importance on the manufacturing and services, and less on the primary sector. The initial phase of development of the manufacturing sector was mostly toward import substitution, and thereafter was more export-oriented. By 2002, the primary sector accounted for only about 23 percent of exports, while the share of manufacturing in exports grew to approximately 75 percent (World Bank, 2013).

The interesting aspect about Malaysia is that it employed a 'multi-sector agglomeration' development strategy for its manufacturing sector. This entails developing manufacturing by building capabilities and strengths in as many diverse industries in manufacturing as possible, rather than pre-selecting a few niche industries. Not only is 'multi-sector agglomeration' a rarely used development strategy elsewhere, Malaysia has arguably demonstrated that this strategy can be successful, judging by the consistent growth in GDP and exports contributed by the manufacturing sector from 1980 until the present time. This paper attempts to highlight the main factors contributing to Malaysia's successful diversification in manufacturing, the benefits of such strategy and the direction of the sector going forward.

When it comes down to the success of the vertical and horizontal diversification, Malaysia has performed well in the resource-based industries, where it has a natural comparative advantage, having been endowed with natural capital. The Malaysia's resource-based industries are good examples of *normal agglomeration*, in that the economy diversified within the scope and constraint of its factor endowment of natural capital. This created various forward and backward linkages which enabled various manufacturing and services segments to be developed, particularly in the oil and gas, palm oil and rubber industries.

Another interesting industry in which Malaysia has experienced remarkable growth is the electronics and electrical (E&E) industry. In contrast to the resource-based industries, Malaysia does not have a natural comparative advantage in this sector. The E&E industry was developed with the intention of creating jobs, thereby upskilling the Malaysian workers. In addition, E&E was envisaged to be able to create an industrial base for the Malaysian economy, which would be more export-oriented and not solely aimed at import substitution. Since then, the Malaysian E&E industry has been further supported by the significant linkages it has had with well-established firms in other Asia Pacific nations in the commonly-known 'Global Value Chain' (GVC), producing components such as semiconductors and computing parts. As of 2013, E&E exports account for approximately 30 percent of Malaysia's total exports. (World Bank, 2013).

This paper aims to explore Malaysia's experience in adopting the agglomeration model to diversify its manufacturing sector, both in the resource-based and E&E industries. It also aims to study how both industries utilised the factor endowment of natural capital and skilled labour to support the diversification process within the comparative advantage boundaries of the country. The paper is structured as follows. Part 2 provides a literature review on the agglomeration and comparative advantage in theory, Part 3 explains in detail the diversification of Malaysia's manufacturing sector, and Part 4 concludes.

## Part 2: Literature Review

### 2.1 Introduction

The theory of comparative advantage had its roots from the 1800s when David Ricardo introduced the concept of free trade and the benefits of specialisation. Ricardo posited that countries should focus on producing goods where they are most efficient, and devote most resources to the development of these specialised industries. Nearly two centuries on, the Ricardian model of comparative advantage had formed the basis of international trade studies. This concept has been widely used to argue against protectionism and promote the benefits of free trade. Specialisation is key to free trade, such that countries are encouraged to produce along their comparative advantage boundaries to achieve optimal production efficiency. A point to note here is Ricardo had based his model on the manufacturing activities at the time when the West turned their attention to manufacturing to drive economic growth during the period of Industrial Revolution.

As the world economy evolved over time, the idea that specialisation increases efficiency has been constantly debated and sometimes refuted as being over-simplistic in the economic literature (Ricci, 1998). The emergence of the services sector in the twentieth century, coupled with the importance of the financial sector in driving the economy has caused the demarcation between specialisation and agglomeration harder to discern, especially in recent years. Nevertheless, researchers acknowledged the importance of these two sectors and had since improved on the Ricardian Model to include services (Marel, 2011) and the financial sectors (Ju and Wei, 2008).

In this literature review, the paper will focus on the manufacturing sector, back to the roots where the theory was founded. The section would explore the interesting debate of whether specialisation is still the focus of the manufacturing sector, or if agglomeration has taken over as the new normal.

### 2.2 Specialisation versus agglomeration: Expanding the Ricardian model

The Ricardian model has evolved over time. Nowadays, researchers seldom attribute the notion of comparative advantage to production of just few goods, but

have instead expanded the definition to include a wider basket of goods and services to reflect more realistic patterns of the countries' production (Dornbusch et al., 1977, 1980). Broadly, in the context of manufacturing, categories of goods can be classified as either being labour- or capital-intensive[2], or they can be more narrowly defined based on product categories, such as 'textiles and garments', 'electronics and electrical', 'heavy industries' or 'resource-based industries'[3].

### 2.3 Heckscher-Ohlin model of factor endowment: Theory and evidence

The Heckscher-Ohlin (H-O) theorem had built on the Ricardian model by utilising factor endowment to explain the production patterns based on the theory of comparative advantage. Basically, countries trade because of differences in factors of production, such that those endowed with labour would tend to produce and export labour-intensive products, and vice versa. (Heckscher, 1919 and Ohlin, 1933)

However, the H-O theorem experienced a similar drawback to the Ricardian model, as the simple version of the model is difficult to prove empirically. The first empirical test of the H-O theorem on the US economy conducted by Leontief (1953) revealed results contradictory to the theorem itself. As US products are higher in capital intensity relative to the rest of the world, US was supposed to import labour-intensive goods and export capital-intensive goods. However, Leontief found that the US imports were actually higher in capital intensity relative to its exports. Leontief's findings were thus dubbed the Leontief Paradox. Due to its limitations, the H-O model has been expanded to differentiate between skilled and unskilled labour, account for differences in technology (Trefler, 1993) and include land as a factor of production.

The Leontief Paradox have been tried and tested by many researchers, mostly aiming to improve on the traditional H-O theorem. One of the attempts was to measure factor abundance in the form of factor productivity (that is, effective factor endowment). Wu et al. (2006) analysed the factor intensity of the agricultural and food processing industries in Canada. Utilising the input-output model, the authors

[2] This is usually based on the proportions of inputs used in the production of a particular good (Wu et al., 2006).

[3] Category of manufacturing goods which are based on the outputs produced (Sachs and Shatz, 1994).

found that Canada tends to export food products with high capital and land intensity, and import products with higher labour intensity. This finding provides support for the H-O theorem. In a similar vein, Sachs et al. (1994) found similar results for the US economy. By differentiating labour according to their skill sets, the authors found that US manufacturing activities favour higher skilled labour, and is less efficient in producing lower skill-intensive goods. This led to the US economy exporting higher skill-intensive products, and importing lower skill-intensive goods. Hence, the H-O theorem of skill factor abundance does seem to hold for the US manufacturing activities.

The fact that technological differences do account for variation in comparative advantage among economies remains the key factor in differentiating trading activities. Technological differences are probably the 'residual' component that credibly explains the tendency of the US manufacturing activities to favour higher skilled labour. In contrast, developing countries which are not technologically advanced have an inclination towards producing less skill-intensive goods (Sachs et al., 1994). As the importance of technological advancement in supply-side economics cannot be underestimated, researchers are now trying various approaches to measure knowledge capital, with the most common proxy being the research and development (R&D) expenditure or the number of patents issued in a country. (Carr et al., 2001). The knowledge capital model is widely used to study the locational decisions of multinational corporations (MNCs) at the micro level, which had an impact on the foreign direct investment (An and Maskus, 2006). The knowledge capital model is also used to determine a country's comparative advantage in international trade at the macro level by explaining on why developed countries have an inclination to produce capital-intensive goods, while developing countries have a higher likelihood to produce labour-intensive goods.

As an extension of the H-O theorem, Nishioka (2006) introduced knowledge capital, alongside physical capital, in an attempt to validate the H-O theorem in the presence of technological differences. By using a panel of 15 OECD countries, he found a strong correlation between knowledge intensity and differences in factor intensity in production. Nishioka's findings on the importance of knowledge capital shed new light into the international trade literature. Growing knowledge capital may be the

answer to the changing patterns of the comparative advantage, which is why developed countries have shifted from less skill-intensive goods to high skill-intensive goods over time.

The Malaysian economy implicitly validates the H-O theorem, judging from the utilisation of its natural capital abundance to move up the commodity-based value chain. Malaysia has been relatively successful in the oil and gas, rubber and palm oil industries by diversifying successfully toward downstream industries. However, the country could raise its comparative advantage by investing more in research and development (R&D) activities to build up its knowledge capital (World Bank, 2013). Malaysia's R&D spending is still lower than its developed counterparts, at only 1.06% of GDP in 2011. This is lower in comparison to the OECD average of 2.6% of GDP (World Bank, 2013)[4].

While keeping the relevance and applicability of extended H-O theorem in mind, the paper will explore the extent to which agglomeration supports or refutes the theory of comparative advantage, bounded by the factor endowment.

### 2.4 Can agglomeration and comparative advantage go together?

Although traditional comparative advantage models tend to focus on the importance of specialisation to enhance production efficiency, in practice, countries seldom focus on a few niche industries to drive their economies in an effort to fully utilise all available resources. Technological progress and innovation have enabled vertical and horizontal diversification, which indirectly leads to agglomeration. This however does not mean countries are now producing at a comparative disadvantage relative to the past. Rather, innovation has created knowledge spill-overs for the domestic economy, which led to the formation of forward and backward linkages and encouraged the emergence of new industries (Carlino and Kerr, 2014).

The emergence of new industries within the domestic supply chain may cause the domestic economy to move toward the 'agglomeration' route. This goes against the conventional wisdom of 'specialisation', the basic tenet in achieving production

[4] OECD countries are taken as a proxy for R&D spending of the developed countries.

efficiency. Notably, recent research has been more supportive of agglomeration, with the caveat that the industry agglomerates within its boundary of comparative advantage[5]. Epifani (2001) utilised the New Economic Geography (NEG) model, taking into account resource constraints to show that agglomeration can strengthen a country's comparative advantage, so long as the industry diversifies within the constraint of its factor endowment. Prior to Epifani's findings, Forslid and Wooton (1999) built on Krugman's extension of the H-O model to show that in an environment of sufficiently low trading costs, technological advancement encourages diversification of manufacturing activities.

Similarly, the fact that the Malaysia's manufacturing sector went through the agglomeration route does not necessarily mean that Malaysia is producing at a comparative disadvantage. So long as Malaysia practices normal agglomeration, as it is at present, the sector can remain globally competitive. This will be further explained in the next part of this paper.

Thus, based on the discussion above, specialisation is not a necessary condition in achieving comparative advantage. Normal agglomeration has shown, in theoretical models at least, to be able to increase efficiency, while at the same time, generating positive spill-over effects to the domestic economy, by creating job opportunities and serve as a buffer to external shocks. In the next section, the paper will analyse the various benefits of normal agglomeration through the lens of the Malaysian economy.

[5] This phenomenon is termed as *normal agglomeration,* where labour- or capital-intensive industries agglomerate in a labour- or capital-abundant country. The reverse is known as *perverse agglomeration*. Perverse agglomeration is known to occur in an environment of protectionism, which substantially raises trade costs (Epifani, 2001).

## Part 3: The Diversification of Manufacturing in Malaysia

### 3.1 Introduction

Primary commodities were the key growth driver of the Malaysian economy in the early days of independence, as the country was the world's largest producer of natural rubber and tin ore then. The heavy reliance on primary commodities in the early years posed a considerable challenge to the Malaysian economy, particularly in terms of vulnerability to volatile swings in global commodity prices. In 1980, primary commodities accounted for 35% of GDP and 77% of overall exports.

Beginning from the early 1980s, Malaysia started to embark on a massive economic diversification strategy with the objective of advancing into higher value-added activities, as well as reducing over-concentration in the production of upstream commodities, namely tin ore and natural rubber. With the inception of National Industrial Policies and Industrial Master Plans in the mid-1980s, the Government implemented a string of policy measures to aggressively promote the manufacturing sector, and subsequently the services sector in the 1990s.

### 3.2 From 'niche industries' to 'multi-sector agglomeration'

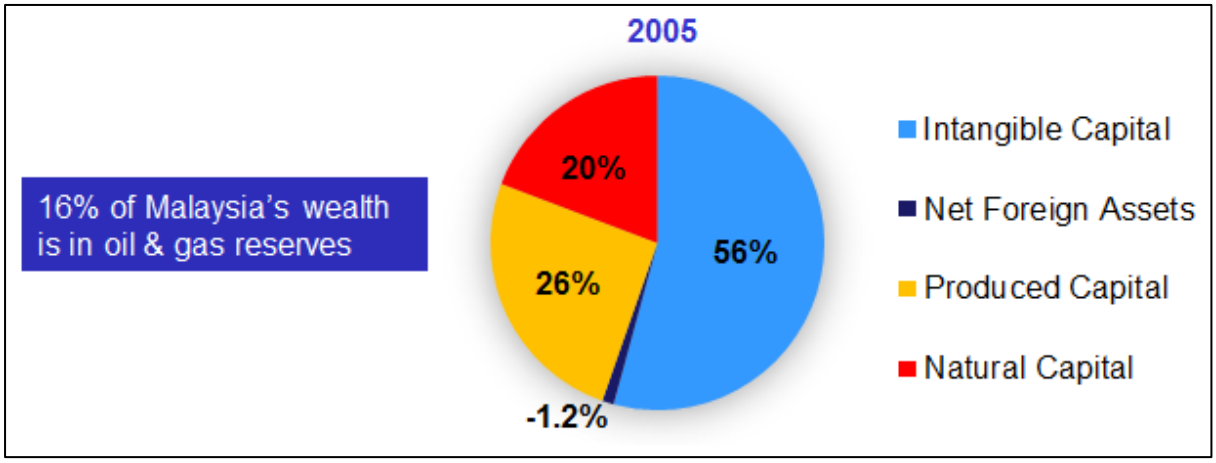
In the early stage, the economic development in Malaysia was targeted mainly on the production value chain of few primary commodities, such as rubber, tin ore, oil and gas, and palm oil. This strategy, which loosely followed the model of 'niche industries'[6], was supported by the fact that Malaysia has been blessed with natural resources, of which, 16% are in the form of oil and gas reserves (Chart 1)[7]. Although this initial development contributed to higher revenue as the upstream activities had become the main source of foreign exchange earnings (due partly to the relatively low and stable real effective exchange rate), it did not yield the desired results as the

[6] Examples of countries that adopted this model are Brunei, Russia, Saudi Arabia, Iraq and Iran that focused mainly on the development of oil and gas industries, as well as Brazil's dependence on iron ore, soybean and sugarcane to drive its industrial economy.

[7] This economic structure, although similar to most commodity-based middle-income countries such as Indonesia, Chile and Brazil, is in contrast with high-income countries which put higher emphasis on intangible wealth accumulation, thus reflecting more knowledge- and skill-driven economies. It is further supported by the World Bank (2005) study that shows the average composition of natural resources in the national wealth of non-commodity-based high-income countries stands only at 3%.

scopes for higher economic growth, value-added, job creation and capital accumulation, were rather limited.

**Chart 1: Malaysia's composition of national wealth as of 2005**




Source: World Bank (2013), Bank Negara Malaysia (BNM) estimates

Consequently, Malaysia's focus since the 1980s had shifted toward pursuing development for a wider range of industries, particularly related to the manufacturing sector. This was done to further broaden the domestic economic base. The First Industrial Master Plan launched in 1986 was particularly instrumental in driving the development of the manufacturing sector through the prism of the 'multi-sector agglomeration' strategy. This strategy leveraged primarily on the utilisation of abundant factor endowment in the form of natural resources toward the downstream manufacturing. It eventually accelerated the diversification of the domestic economy via creation of wider range of manufacturing activities, thereby reducing over-concentration on primary commodities.

### 3.3 The three major waves of diversification

The diversification that swept through the domestic economy over the past three decades can be analysed from three key perspectives - *horizontal*, *vertical* and *locational*. The rapid pace of horizontal diversification is evident from the increasingly robust growth observed in the manufacturing and services sectors, in tandem with a significant reduction in the reliance on primary commodities (Chart 2). Leveraging from the 'import substitution' policy introduced in the 1970s, the Malaysian economy also diversified vertically by moving up the production value chain from upstream to

higher value-added downstream activities, which can be witnessed from the rise of manufacturing-related resource-based industries, as well as electronics and electrical (E&E) industry (Chart 3). Of equal importance, the Malaysian Government had been rigorously pursuing the development of manufacturing industries across different locations or economic corridors in various states (such as Iskandar Malaysia in the state of Johor and Northern Corridor Economic Region in the states of Kedah and Penang), rather than concentrating the production activity in a centralised manufacturing hub. This enabled the effect of diversification to be spread across the country, stretching from the Peninsular to the states of Sabah and Sarawak.

**Chart 2: Horizontal diversification towards other sources of growth**

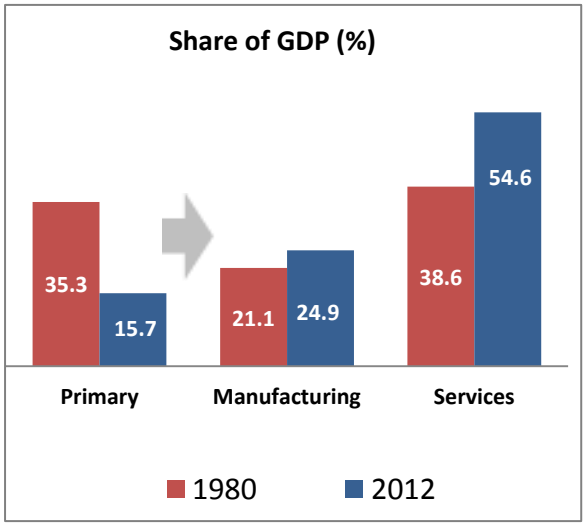
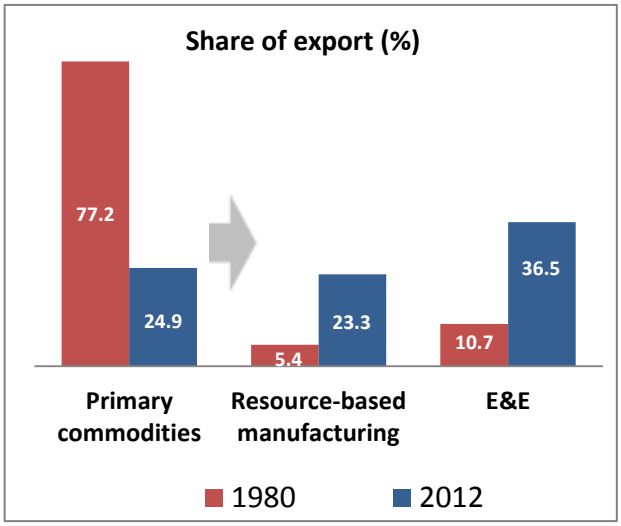



**Chart 3: Vertical diversification towards higher value-added activities**




Source: Department of Statistics, Malaysia (DOSM)

### 3.4 Horizontal diversification toward manufacturing and services sectors

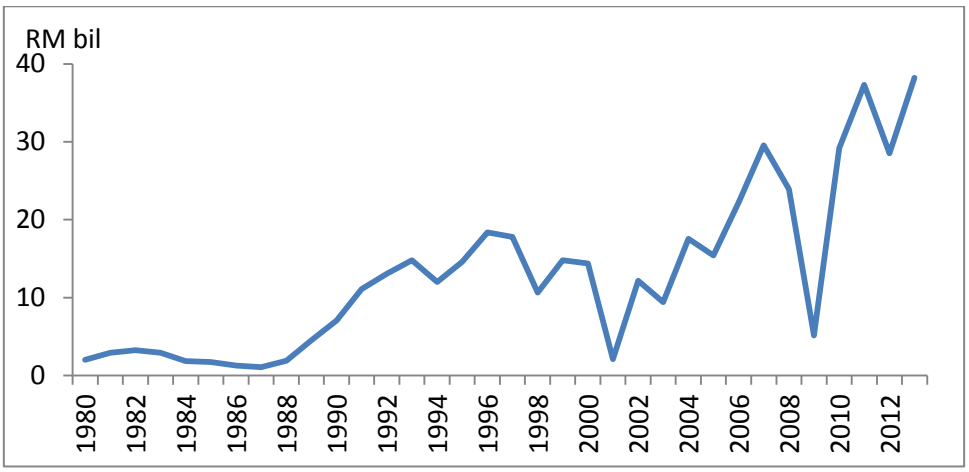
The early policies on diversification were initiated as a strategy to address the structural imbalances of over-reliance on primary commodities for exports and growth, as well as to mitigate the impact of commodity price swings on the economy. Deficits in both the current and fiscal accounts in the early 1980s were a result of the economic slowdown in tandem with global recession, coupled with a drastic collapse in the prices of tin ore and natural rubber in the mid-1980s (World Bank, 2013). This consequently served as a catalyst for the Government to diversify horizontally by

moving away from primary commodities towards advancing into other sources of growth in higher technology-intensive manufacturing and services sectors.

The strategy was pursued through the 'Malaysia Incorporated' policy, established in 1983, as well as the enactment of the Promotion of Investments Act in 1986, which re-emphasised the need for economic growth to be private sector-led through privatisation of major Government-owned agencies, as well as rapid promotion of industrialisation to further enhance and broaden the export earnings. In addition, various liberalisation measures and tax incentives had attracted significant foreign direct investment (FDI) and major multinational corporations (MNCs) to set up their manufacturing operations in Malaysia, thus enabled the creation of new export avenues, increase in skilled jobs and broadening of the economic base.

FDI to Malaysia started to pick up from mid-1980s with substantial investment from Japan, Taiwan, South Korea, United Kingdom and the United States, in addition to inflows from regional countries such as Hong Kong and Singapore (Brewer, 1991). Despite some notable blips in 2001 and 2009 (due to the technology bubble collapse and the Global Financial Crisis respectively), investment continued its upward trend to peak in 2013, almost an eighteen-fold increase from the 1980 level (Chart 4). Of significance, the bulk of investment was directed toward the manufacturing sector, consistently receiving the largest share of inflows over the decades from 1990s to 2010s, followed by services (Table 1).

**Chart 4: Total net foreign direct investment inflows in Malaysia (1980-2013)**




Source: Department of Statistics, Malaysia (DOSM), World Bank, Bank Negara Malaysia (BNM) estimates

**Table 1: Net FDI inflows by sector in Malaysia**

| Sector (%) | 1990-1999 | 2000-2009 | 2010-2013 |
|---|---|---|---|
| Manufacturing | 63 | 41 | 45 |
| Services | 15 | 37 | 29 |
| Oil and gas | 17 | 17 | 24 |
| Others* | 5 | 5 | 2 |
| **Total net FDI inflows** | **100** | **100** | **100** |

* Others mainly consist of the agriculture and construction sectors

Source: Department of Statistics, Malaysia (DOSM), Bank Negara Malaysia (BNM) estimates

### 3.5 Vertical diversification in the resource-based and electronics and electrical industries

The diversification within the commodity sector can be traced from the 'import substitution' policy, introduced in the early 1970s to address the structural over-concentration of upstream commodities in the economy. To promote import substitution, the Government began to develop the resource-based industries, which was closely related to the upstream production of natural rubber and tin ore. Under vertical diversification, the production of resource-based industries eventually evolved from raw or basic upstream commodity products into more advanced and complex downstream outputs such as the manufactures of petrochemicals, oleochemicals, refined petroleum and palm oil, rubber gloves, tyres and prophylactic products.

Resource-based industries have been the largest growth driver of manufacturing sector over the decade from 2002-2012, as the development of downstream activities contributed to higher value-added in the industries. Rising commodity prices during this period had also led to higher prices of most products in the resource-based industries, providing further impetus to the growth of the industries. During this period, value-added of the resource-based industries increased by 6.2% on compounded annualised growth rate (CAGR) basis, outpacing the 1.5% growth in the E&E industry, thus becoming the largest manufacturing subsector from 2005 onwards (Chart 5). Resource-based industries contributed substantially to the Malaysia's exports, growing by 10.3% on CAGR basis during the same period, resulting in the exports of resource-based products to account for 51% of total manufactured exports in 2012 as compared with 30% in 2002 (Chart 6).

Diversification into resource-based industries ensured that the share of manufactured exports to total exports remained high at between 70-75%, even as exports of primary commodities also increased in value during the period amid the rise in commodity prices.

**Chart 5: Manufacturing GDP growth and share of key components**

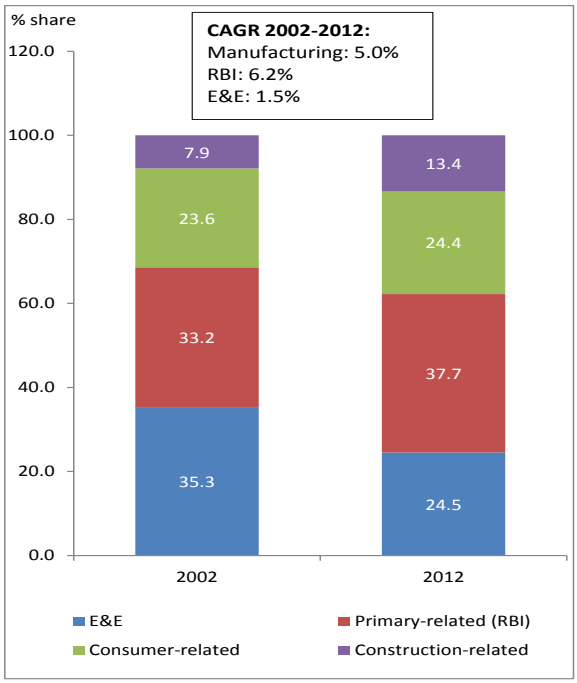
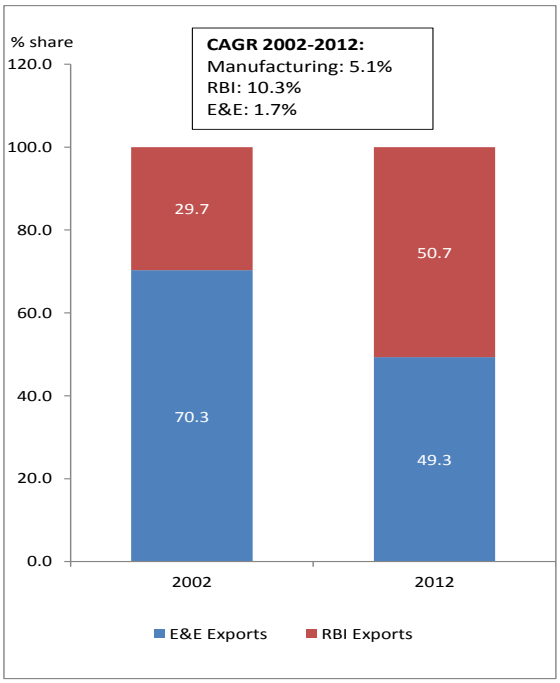



**Chart 6: Manufactured exports and share of key components**

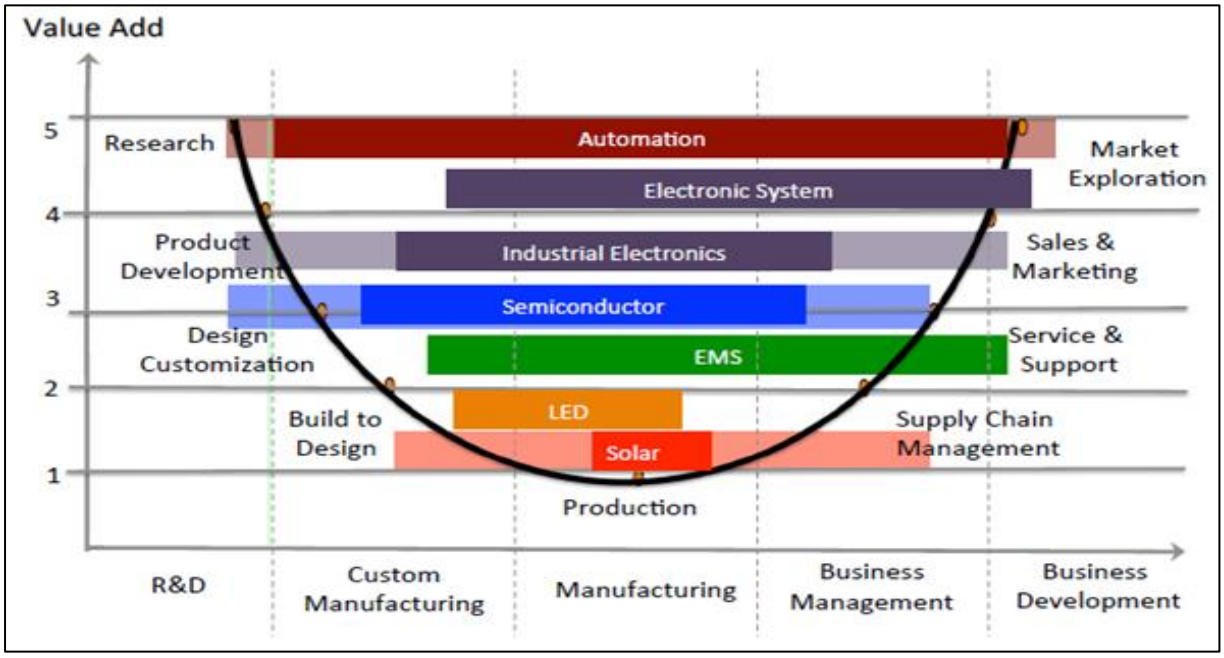



Source: Department of Statistics, Malaysia (DOSM)

While the resource-based industries remained the major growth driver in recent years, the advancement into high technology-oriented manufacturing sector continued to be driven by the E&E industry. The diversification of the E&E industry can be analysed from the shift in concentration from low value-added to high value-added production levels, particularly in both front- and back-end operations (Chart 7). In its early days, the E&E industry was largely labour-intensive and focused mainly on low value-added activities such as production and packaging, but had lately gained the move higher up the value chain once most manufacturing operations became automated. The industry continued to emphasise on the development of front-end operations with the establishment of wafer fabrication plants in the 1990s, as well the focus on research, design and development (D&D) activities. Moving into 2000s, the manufacturers began to diversify the production of semiconductors, a major segment within the E&E industry, beyond its conventional use in personal computers and laptops into new growth areas such as tablets,

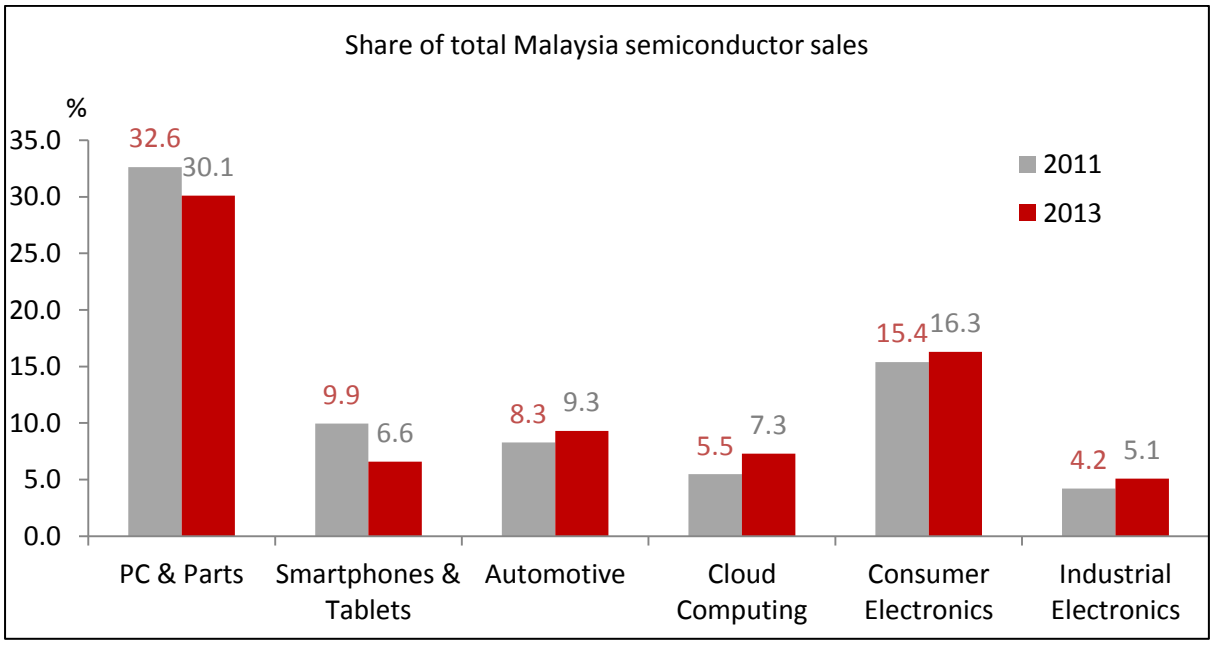
mobile, automotive applications and cloud storage (Chart 8). Presently, the industry continued to focus on further elevating the value chain by encouraging more D&D activities, in addition to diversifying the applications of semiconductors through the 'More-than-Moore' strategy toward telecommunications, automotive and advanced electrical appliances in the advent of the 'Internet-of-Things' revolution.

**Chart 7: The value chain of E&E production in Malaysia**




Source: Malaysian American Electronics Industry (MAEI)

**Chart 8: Diversification in the manufacture of semiconductors in Malaysia**

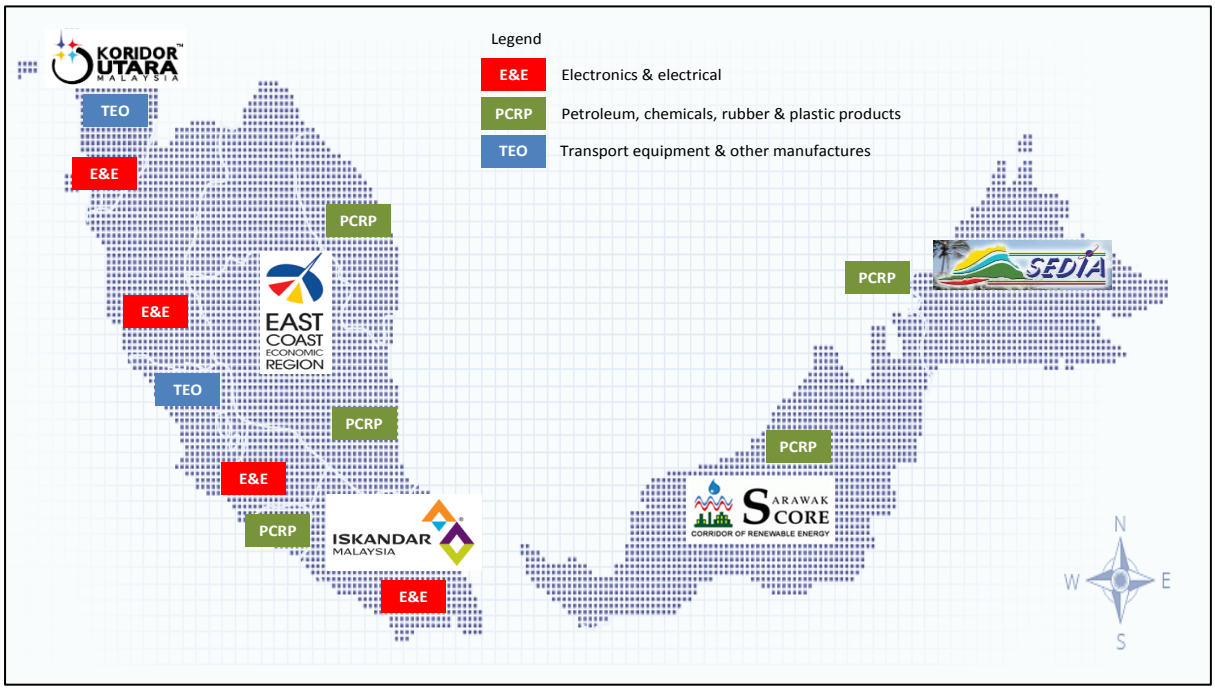



Source: Gartner Dataquest (2013); IDC, IHS, PWC Analysis, TheInfoPro, IC Insights and BNM estimates

### 3.6 Locational diversification versus centralisation

Another critical factor of diversification was the Government strategy in dispersing manufacturing industries across the country, rather than concentrating in few centralised locations (Chart 9). Malaysia, since the start of industrialisation era, had been practicing the policy of establishing strategic industrial areas for key industries in various states instead of centralising a major manufacturing hub for a particular industry in a certain state. This is in contrast with the industrial concentration strategies adopted in advanced and regional industrialised countries such as Korea Republic, Japan, People's Republic of China and Thailand. The Malaysian strategy proved to be a success, with one relevant example of Kulim Technology Park in the northern state of Kedah, the country's first high-technology industrial park established in 1996 with the objective of integrating capital-intensive and high-technology industries primarily in the field of electronics, biotechnology and advanced materials. Another example is the Gebeng Industrialised Estate in the easternmost region of Pahang state that serves as a hub for chemical and petrochemical industries. Continuing from this strategy, Malaysia has launched and developed five economic corridors across the country since the onset of the Ninth Malaysian Plan (2006-2010) (Table 2).

**Chart 9: The locational diversification of Malaysia's manufacturing activities**




Source: Department of Statistics, Malaysia (DOSM), Malaysian Institute of Economic Research (MIER)

**Table 2: Economic corridors in Malaysia**

| Economic corridor | State(s) | Year established |
|---|---|---|
| Iskandar Malaysia | Johor | 2005 |
| Northern Corridor Economic Region (NCER) | Kedah, Penang, Perlis, Perak (Northern) | 2007 |
| East Coast Economic Region (ECER) | Kelantan, Pahang, Terengganu, Johor (Mersing) | 2007 |
| Sarawak Corridor of Renewable Energy (SCORE) | Sarawak | 2008 |
| Sabah Development Corridor (SDC) | Sabah | 2008 |

Source: Economic Planning Unit, Malaysia (EPU)

While the key objective in adopting this 'economic corridor' approach is to ensure development is spread evenly across the country, one observation is that none of the key industries are centralised in one particular corridor. For example, the electronics and electrical (E&E) industry may has the largest manufacturing plants in the northern island state of Penang, but it also has significant presence in the states of Selangor, Negeri Sembilan, Kedah, Johor, Perak and Malacca. Similarly, the petroleum and chemical industries are dispersed from the states of Pahang and Terengganu in the west to Johor in the south and Sarawak in the east[8].

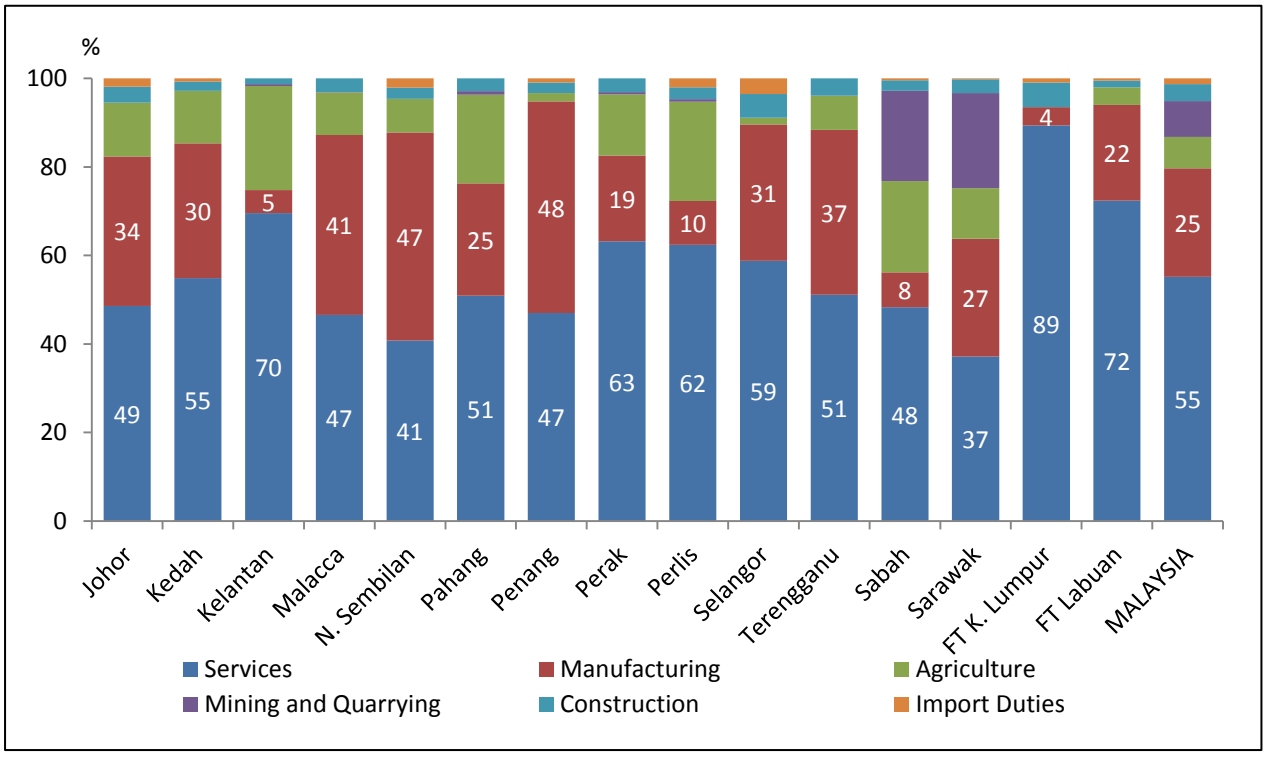
There are notable benefits that can be observed in terms of distribution of income and economic activities across the states. The diversification enabled the economic activities, particularly the manufacturing sector, to be spread more evenly than it would have under the industrial concentration strategy. This is evident from the current presence of manufacturing activities in most of the states (Chart 10). Establishment of manufacturing activities in various states also helped to raise the income levels especially for states that were once heavily dependent on primary activities such as agriculture and mining. Statistics show that states with higher intensity of manufacturing activities generally achieved higher income per capita, such as Penang, Selangor, Malacca, Kedah, Negeri Sembilan, Sarawak, Pahang

[8] These observations were based on a study by Kumagai (2013) that analyses the degree of industrial agglomeration in different locations in Malaysia using the Location Quotient (LQ) approach.

and Johor (Table 3). Similar statistics also show that most states registered higher nominal income per capita growth on CAGR basis as compared to the overall average growth of the country.

Moreover, locational diversification reduces the risks associated with concentration of a particular industry in a single hub. Centralisation has clear benefits in terms of economic of scale as well as easier access to critical resources and factors of production which leads to lower production costs. However, centralised industries are also generally more susceptible to cyclical upturns and downturns in the economy, as well as locational factors such as natural disasters or political uncertainty. For example, the centralised car manufacturing hub in the Ayutthaya region in Thailand was affected by the destructive floods in 2011[9], paralysing the whole car supply chain in Thailand. The industry was again beset by political unrest in 2013[10] which threatened the relocation of major foreign carmakers into its neighbouring countries.

**Chart 10: Percent share of economic activity (GDP) by state in Malaysia, 2013**




Source: Department of Statistics, Malaysia (DOSM)

[9] Source: The Wall Street Journal, 'Floods force auto makers in Thailand to halt production', 12 October 2011.

[10] Source: Reuters, 'Toyota may rethink Thai investment plans if crisis lingers', 20 January 2014.

**Table 3: Nominal GDP per capita by state in Malaysia, 2005-2013**

| State (RM) | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012[e] | 2013[p] | CAGR '05-'13 |
|---|---|---|---|---|---|---|---|---|---|---|
| FT Kuala Lumpur | 42,414 | 45,519 | 49,687 | 56,135 | 57,040 | 62,075 | 68,125 | 74,579 | 79,752 | 8.2 |
| FT Labuan | 26,552 | 31,281 | 33,687 | 31,107 | 31,200 | 32,387 | 37,113 | 40,668 | 43,848 | 6.5 |
| Sarawak | 25,291 | 27,782 | 30,790 | 37,125 | 31,286 | 34,136 | 39,566 | 40,396 | 41,115 | 6.3 |
| Penang | 26,833 | 29,624 | 31,381 | 33,694 | 30,098 | 33,601 | 35,069 | 36,787 | 38,356 | 4.6 |
| Selangor | 23,494 | 24,571 | 26,359 | 29,273 | 28,468 | 31,457 | 33,687 | 35,916 | 37,851 | 6.1 |
| Malacca | 20,410 | 22,065 | 23,415 | 25,885 | 25,397 | 28,328 | 31,161 | 33,623 | 34,109 | 6.6 |
| Negeri Sembilan | 20,768 | 22,796 | 24,605 | 26,950 | 25,595 | 28,586 | 31,222 | 32,545 | 33,033 | 6.0 |
| Pahang | 16,534 | 18,108 | 20,160 | 22,351 | 20,548 | 23,008 | 26,057 | 26,274 | 26,759 | 6.2 |
| Johore | 16,298 | 16,996 | 18,753 | 20,162 | 18,878 | 21,329 | 23,562 | 24,569 | 25,302 | 5.7 |
| Terengganu | 15,863 | 17,692 | 19,476 | 20,984 | 19,102 | 20,581 | 22,145 | 22,717 | 23,285 | 4.9 |
| Perak | 12,320 | 13,233 | 14,832 | 16,552 | 15,809 | 17,341 | 19,350 | 20,510 | 21,150 | 7.0 |
| Sabah | 11,134 | 12,138 | 14,104 | 17,523 | 15,515 | 17,118 | 18,932 | 18,713 | 18,603 | 6.6 |
| Perlis | 12,761 | 13,555 | 14,500 | 15,705 | 15,186 | 16,175 | 17,032 | 17,990 | 18,519 | 4.8 |
| Kedah | 9,811 | 10,821 | 12,160 | 13,023 | 12,481 | 13,744 | 15,393 | 15,777 | 16,316 | 6.6 |
| Kelantan | 6,075 | 6,752 | 7,662 | 8,570 | 8,421 | 9,322 | 10,363 | 10,568 | 10,677 | 7.3 |
| **Malaysia** | **20,870** | **22,478** | **24,589** | **27,929** | **25,385** | **27,890** | **30,464** | **31,920** | **32,984** | **5.9** |

[e] Estimate [p] Preliminary

Source: Department of Statistics, Malaysia (DOSM)

### 3.7 The benefits of diversification in manufacturing

The positive impact of diversification in the manufacturing sector is four-fold. First, it facilitated the deepening of forward and backward linkages in the economy, ensuring close inter-dependence and inter-connectedness between upstream and downstream production[11]. As the momentum of downstream production activities intensified, higher value-added outputs are generated and retained within the domestic economy. A recent study by Puasa (2013) shows that the Iskandar Malaysia economic corridor in Johor had succeeded in creating significant forward and backward linkages for the food industry, followed by the E&E industry and the manufactures of chemicals and chemical products[12].

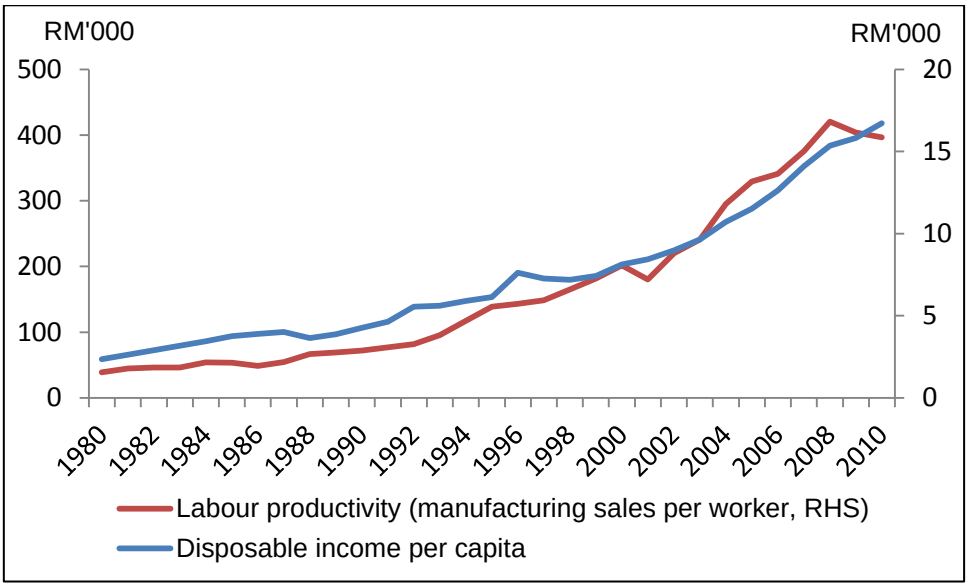
[11] This is in line with the 'path dependency' theory where it is almost impossible for a country to shift entirely from a traditional sector into the high-technology manufacturing and services sectors without a gradual transformation period (Felipe et al., 2013).

[12] The results were generated using the analysis of calibrated Malaysian Input-Output Tables constructed specifically for Iskandar Malaysia by the Malaysian Institute of Economic Research.

Second, the robust growth of the manufacturing sector has led to an increase in productivity as a result of diversion of the under-employed or surplus labour force in the upstream agriculture sector to the downstream manufacturing sector. As at end-2012, according to the Department of Statistics Malaysia, the manufacturing sector employed 2.22 million people, accounting for 17.5% of the total employment in country. In 1982, the sector employed just 0.82 million people, or a 15% share. During the same period, the agriculture sector saw its employment share decline from 31% in 1982 to 12.5% in 2012, or about 1.6 million workers. The average value of manufacturing sales per worker, a proxy for labour productivity, saw a sharp increase from RM54,036 in the period between 1980 and 1990 to RM309,596 in the 2000-2010 period (Chart 11). As a result, this contributed to higher income and consumption among rural and urban workers. Disposable income per capita of the country increased almost three-fold from an average of RM3,448 in the 1980-1990 period to RM12,004 in the 2000-2010 period (Chart 12).

Third, manufacturing sector comprises mostly tradable subsectors that have benefited from the comparative advantage against other regional competitors as well as the extensive access to global markets. This has resulted in the significant participation in the global manufacturing value chain, with clear evidence that Malaysia's export values of core final goods to affluent markets are on par not only with its regional peers (for example, Thailand), but also with highly industrialised East Asian economies such as Japan, Korea and Taiwan (ADB, 2014). These enabled the industries to leverage on the geographical and agglomeration dynamics in the Asia-Pacific region to produce products at lower costs, both in resource-based and E&E industries.

**Chart 11: Labour productivity and disposable income per capita in Malaysia**




Source: Department of Statistics, Malaysia (DOSM), Haver Analytics, Oxford Economics and Bank Negara Malaysia (BNM) estimates

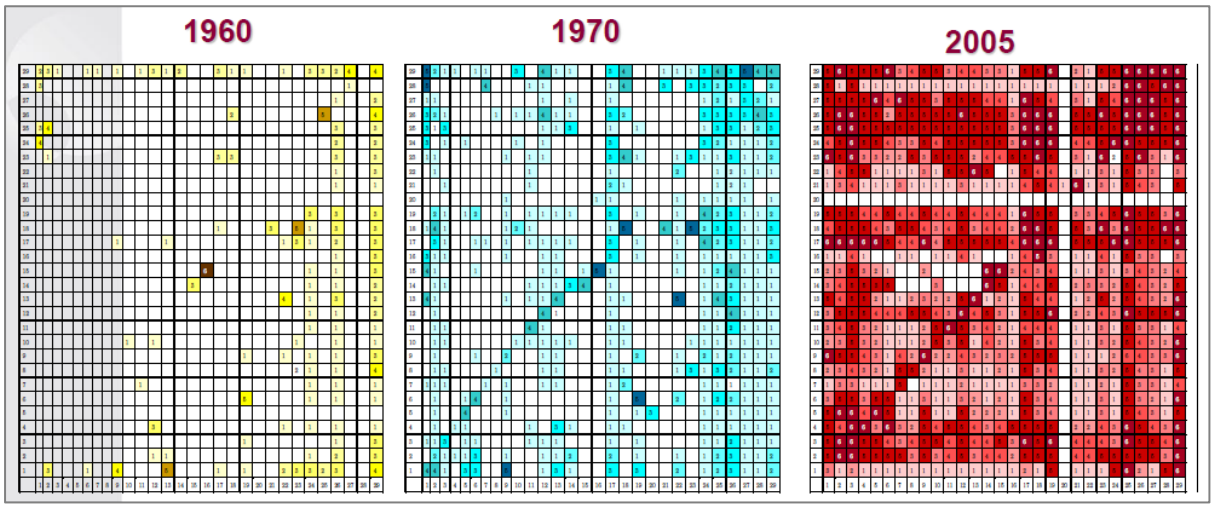
Finally, as explained earlier, diversification has been crucial in moderating the influence of commodity price volatility on the economy. As dependence on natural resources exposes the country to higher risks of commodity price fluctuations and terms-of-trade shocks, diversification generally channels balanced investment into productive non-commodity sectors in addition to the commodity sector itself, ensuring sound, stable and preserved economic growth (World Bank, 2013).

The favourable results of diversification can be seen from the increasing degree of intensity of economic activities across various inter-connected industries over the years, as observed in the evolution of the Malaysian Input-Output Tables[13] from 1960 to 2005 (Chart 12). In the respective tables, the shaded areas represent the

[13] The Input-Output Tables provide a comprehensive aggregation of all production in the economy, tracking from sources of inputs to intermediate and final uses of products. The Input-Output Tables of the Malaysian economy are published by the Department of Statistics, Malaysia on a five-year basis, with the latest data available at base year 2005. Muto (JICA, 2013) utilised the Input-Output Tables approach to measure the impact of 'multi-sector agglomeration' to the Malaysian economy over the decades. Other international agencies such as Asian Development Bank (2014) also applied the Input-Output Tables in analysing the inter-connection between global value chains and international trade, and subsequently its contribution to the domestic value-added. One particular example cited in the analysis was the estimation of value of electronic products from Malaysia that served as inputs into the automobile industries in Japan.

intensity of economic activities generated among the inter-connected industries. This implies a darker shade generally indicates higher value-added generated from the inter-linkage between two particular industries. In 1960, the intensity level of economic activities was very low and mainly concentrated in very few major industries. The intensity level eventually increased through time, as observed in the higher number of shaded areas in the 1970 table. By 2005, the intensity level had risen significantly and became more diverse across most industries in the economy, hence underlining the extent of diversification of manufacturing in Malaysia.

**Chart 12: Input-Output Tables of Malaysia at base years 1960, 1970 and 2005**




Sources: Japan International Cooperation Agency (JICA, 2013) and Department of Statistics, Malaysia (DOSM)

The impact of diversification is also evident from the perspective of export. An interesting trend can be observed during the period of 2000-2013, which saw a rise in the share of non-E&E (resource-based) as well as commodities to total gross exports (Table 4). This phenomenon was contributed by several key factors. First was the rising global demand for raw materials at that time particularly from the fast-growing Asian economies, which benefited the four major commodities of Malaysia, namely palm oil, liquefied natural gas (LNG), crude oil and natural rubber. Second is the greater focus on the higher value-added downstream manufacturing activities in line with continued efforts to further move the resource-based industries up the value chain.

**Table 4: Percent share of gross exports in Malaysia**

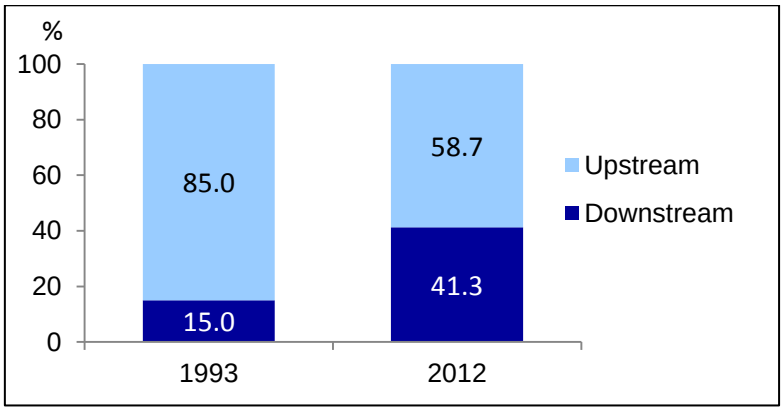
| Product (%) | 1970 | 1980 | 1990 | 2000 | 2010 | 2013 |
|---|---|---|---|---|---|---|
| **Non-resource-based** | **3.5** | **17.1** | **47.8** | **72.0** | **56.4** | **51.2** |
| Electronics and electrical (E&E) | 1.0 | 10.7 | 33.3 | 61.7 | 42.4 | 36.7 |
| Transport equipment | 0.6 | 0.8 | 2.4 | 0.8 | 1.5 | 1.3 |
| Textiles, clothing & footwear | 0.6 | 2.9 | 4.9 | 2.8 | 1.5 | 1.4 |
| **Resource-based** | **8.4** | **5.4** | **11.0** | **13.1** | **19.8** | **25.2** |
| Rubber products | 0.3 | 0.3 | 1.7 | 1.3 | 2.4 | 2.5 |
| Petroleum products | 3.1 | 0.7 | 1.6 | 2.2 | 4.6 | 9.3 |
| Chemicals & chemical products | 0.7 | 0.7 | 1.8 | 4.0 | 6.5 | 7.2 |
| **Total manufacturing** | **11.9** | **22.4** | **58.8** | **85.2** | **76.2** | **76.4** |
| Commodities and others | 88.1 | 77.6 | 41.2 | 14.8 | 23.8 | 23.6 |
| **Total gross exports** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| Total gross exports (RM billion) | 5.2 | 28.2 | 79.6 | 373.3 | 638.8 | 719.8 |
| Total gross exports (USD billion) | 1.7 | 12.9 | 29.5 | 98.2 | 198.6 | 228.3 |

Source: Department of Statistics, Malaysia (DOSM) and Bank Negara Malaysia (BNM)

### 3.8 Degree of diversification within industries

While the manufacturing sector as a whole benefited from the impact of diversification, the extent however varies across industries. In the oil and gas industry, the strong institutional support provided by PETRONAS, Malaysia's state-owned oil and gas company, in championing investment in downstream activities was a major enabling factor of diversification. Profit margins and fiscal factors were also crucial in encouraging PETRONAS to diversify. The consistently low prices of crude oil and natural gas in the 1980s and 1990s, coupled with higher petroleum income tax rate of 38% imposed on upstream oil and gas production, had contributed to higher post-tax profits from various downstream manufacturing activities (World Bank, 2013). The type of oil products manufactured in Malaysia have evolved from basic upstream outputs such as petrol, diesel and basic petrochemicals into lubricants, aromatics, specialty jet fuel and advanced petrochemicals. At present, almost half of the PETRONAS's revenue is derived from downstream activities (Chart 13).

**Chart 13: Percent share of PETRONAS's revenue based on activity**




Source: PETRONAS, 2013

The diversification in the rubber industry is also noteworthy. Driven initially by small and medium enterprises (SMEs), these companies, such as Top Glove, Supermax, Kossan, Hartalega and Karex[14] have eventually evolved into public-listed entities valued at billions of ringgit, while becoming world leaders in the production of rubber gloves and prophylactic products (World Bank, 2013). Lower input costs from declining prices of natural rubber and the availability of low cost foreign labour spurred the development of the industry in the 1980s and 1990s.

Meanwhile, there remains an ample scope for greater downstream diversification in the palm oil industry. Many of Malaysia's competitors in the industry in neighbouring countries have started venturing into various downstream activities, particularly in the production of oleochemicals and palm-based biodiesel. Apart from the resource based industries, Malaysia has also tried to promote agglomeration in the heavy industries segment, namely steel and automotive. However, owing to the fact that Malaysia does not have a comparative advantage in this segment, they had to be promoted through extensive usage of import substitution policies which is still present to this day to remain competitive, particularly against other countries in the Asian region (Alavi, 1996). A need for policy review is indeed timely in providing a conducive environment for continued diversification and agglomeration in both the palm oil and heavy industries sector.

[14] Top Glove, Supermax, Kossan and Hartalega are the four largest rubber glove manufacturers in the world, while Karex Industries, a Malaysian company which started as an SME in 1988, is currently the world's largest producer of prophylactic products with a 15 percent share in global market.

## Part 4: Conclusion

Change is the new constant. As the world economy constantly evolves, so must Malaysia to keep up with new developments. The diversification of Malaysia's manufacturing sector is unique in that it was achieved throughout the decades through agglomeration, and not necessarily by the virtue of comparative advantage. Recent literature has suggested that both agglomeration and comparative advantage can co-exist in developing an economy, and Malaysia is a practical example of this, as evident from its attempt to build up both the resource-based and E&E industries.

To keep up with the challenges of ever-increasing globalisation, the Malaysian economy has to continue to invest in knowledge capital so as to be able to move up the value chain. A crucial aspect in the near term is for Malaysia to attract high-skilled labour into the country, and introduce automation as means of reducing the dependence on imported low-skilled labour. That way, Malaysia will be better positioned to shift the pattern of its comparative advantage in the manufacturing sector, to one that is based on high-skilled labour.

Malaysia can not afford to be contented with the results of diversification, as key challenges remain. These are particularly seen in human capital, depletion of natural resources and intense competition from global and regional markets. As Malaysia could no longer enjoy the advantage of surplus in cheap labour, industry players in the manufacturing sector will have to initiate greater automation in their production processes as well as deepen their differentiation into higher value-added activities. Some industries have already embarked on this, particularly those that have moved into higher value-added products such as nitrile-based gloves for the heatlhcare industry and advanced prophylactic products. Other manufacturers, particularly in the palm oil industry, may need to intensify investment into manufactures of specialised, higher value-added oleochemicals and petrochemicals from the current basic products.

The increased diversification of manufacturing-related industries as a result of higher involvement of commodity sector in the downstream activities has formed the fundamental catalyst in generating greater economic growth, value-added, job

creation and capital accumulation in recent years. Moving forward, continued diversification in the economy is critical in further improving the economic fundamentals toward advancing Malaysia's goal of becoming a high-income nation by 2020.

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