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Innovation and Economic Growth in Malaysia

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Abstract: Since independence in 1957, Malaysia has transformed significantly from an economy based on primary commodities to one fuelled by manufacturing and services based on foreign investment.. Besides Malaysian economy has achieved steadily high growth for over five decades. However, after the Asian financial crisis of 1997, the growth of Malaysian economic slowed and the downturn remains until the 2008 global financial crisis made matters worse. Currently, Malaysian economy give some hints of recovery, but there is still concern that the recovery might be challenging. The reason is that Malaysia has lost its comparative and competitive advantages in several products to some new developing economies opening up and joining the trend of export-led growth. In addition, it cannot compete with developed countries with new technologies.

Key words: Innovation, economic growth, Malaysia.

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Contents

1. Introduction

In recent decades, there has been an overwhelming amount of development economics research devoted to explaining episodes of sustained high growth among developing nations. The four Asian Tigers: Hong Kong, Singapore, South Korea and Taiwan astounded the world in the mid to late twentieth century by retaining high growth rates. Interest in rapid economic growth continues today, as China develops at an unprecedented rate. Other large countries, like India and Brazil, are also entering into phases of rapid growth.

Nevertheless, few countries, such as the Asian Tigers, managed to progress from middle-income to become high-income advanced economies. Meanwhile a great deal of economies start to slow down after a sustained high growth period. After economies convert from low-income into middle-income, their supply and demand realities begin to shift rapidly. They are no longer as competitive in low value-added industries, like manufacturing. Labor intensive jobs begin to move to lower-wage countries, and economic growth tends to slow down. In the meantime, they are unsuccessful in moving up to the high-value added chain of production with developed countries.

Among these countries, economies in Southeast Asia are worthy examples to be mentioned. Before Asian financial crisis 1997-1998, three economies of Southeast Asia, including Malaysia, Thailand, and Indonesia, have been recognized as parts of second generation or second tier of newly industrialising economies or countries (Jomo, 2003). However, none of them have succeeded in upgrading into high-income countries, after reaching the middle-income level. In a competitive global economy, like many other middle-income countries, they are sandwiched between low-wage economies on one side and more innovative advanced economies on the other while failing to adapt new innovations.

In the meantime, innovations plays more important role in the economic growth today. In the worldwide division of labour the production factor “knowledge” becoming progressively more critical. Price proportions for the traditional factor cost of labour, capital and land are no more adequate to completely clarify the specialization patterns of industrial locations. The critical factor for competitiveness now has been recently the capacity to generate innovations (Altenburg, 2006).

The economy of Malaysia the third largest in Southeast Asia, after the much more populous Indonesia and Thailand (World Bank, 2015). Additionally, according to Global Competitiveness Report 2014-2015, Malaysia's economy was the highest ranked among the developing Asian economies, ranking the twentieth in the world, above Thailand or Indonesia (World Economic Forum, 2014).

Since independence in 1957, Malaysia has transformed significantly from an economy based on primary commodities to one fuelled by manufacturing and services based on foreign investment.. Besides Malaysian economy has achieved steadily high growth for over five decades. However, after the Asian financial crisis of 1997, the growth of Malaysian economic slowed and the downturn remains until the 2008 global financial crisis made matters worse. Currently, Malaysian economy give some hints of recovery, but there is still concern that the recovery might be challenging. The reason is that Malaysia has lost its comparative and competitive advantages in several products to some new developing economies opening up and joining the trend of export-led growth. In addition, it cannot compete with developed countries with high technology (Ariff, 2012).

Therefore, this thesis mainly attempts to use Malaysia as a case to illustrate the process of a middle income can catch up with high-income countries, especially in the era when the innovation take the center in the economic development. The research question is *why Malaysia has lagged behind in technological performance and how a middle income country such as Malaysia can catch up using high-tech innovations.*

This thesis is comprised of six sections. After the first section of introduction, methodology and data will be discussed in the second section. Following the second section, previous literature will be discussed in the essence of innovation, economic growth and catch-up process. The theoretical framework of departure of the thesis is outlined in the section four. Theories on innovation, economic growth and catch-up are elaborated in order to understand the catch-up in Malaysia. The fifth section presents the empirical analysis. That section has detailed analyses within its subsections for the process of catch-up of Malaysian economy. While the first subsection review Malaysian economic development, the second one handles the topic of innovation performance in Malaysia, and the third one relates to education and human capital in

Malaysia. Finally, the paper is concluded in the section six, by summarizing the key findings as regards the research questions.

It should be noted that the research, though, have some limitations. With regards to the complicated problems of middle income countries, the study certainly cannot cover all aspects of them. Therefore it only aim at analyzing the performance of upgrading technology and innovations in Malaysian economy. Secondly, other limits of this thesis can be related to the chosen indicators for the measurement of the innovation performance in Malaysia because innovation can be measured in various ways. Each indicator have its advantages and disadvantages which will be discussed later.

2. Methodology and data

The main methodology of the paper is qualitative. To have adequate learning about researched issues (both theoretical and empirical), the research method is based on in-depth literature search. Literature search is described in methodological literature as one of the research method technique that includes precise exploring of accessible materials significant for topic of interest. These materials may be spoken to by a wide range of academic publications, newspapers and magazines, (on-line) databases, or other important related materials (StatPac, 2014). Literature search method clearly have some benefits which are inexpensiveness and flexibility, though particular data may involve special access conditions (e.g. payment) and procedure of information gathering might be time-consuming. Literature search for this paper was centered around available publications about catch-up case studies, analyses of economic development and innovation.

However, due to a large number of researches related to the connection between innovation and economic growth or the process of catch-up, the general principles of handling documentary sources need implementing. The general principles of handling documentary sources are the same as those applied to other areas of social research. In all cases data must be managed scientifically, though every source need a different approach. Scott (1990) presents some useful guidelines for working with documentary sources. The four criteria are authenticity, credibility, representativeness and meaning. Authenticity refers to whether the evidence is genuine and from impeccable sources; credibility refers to the amount of distortion to the document or source, which will affect its sincerity and accuracy, representativeness refers to whether the documents consulted are representative of the totality of the relevant documents, and meaning refers to whether the evidence is clear and comprehensible, and how well the researcher might be able to understand the documents (pp. 1-2).

Data search for this research was done through various secondary sources,. The data used for the study derives from the main documentary material consisted of carefully reviewed scientific books, articles and journals. The data are collected and then utilised to compile tables and figures in order to demonstrate the main point of the paper.

Firstly, the general measure of economic performance will be used the first sub section of section five to introduce about the Malaysian economy. With regards to the measurement of innovations, there are several methods are used as innovation indicators, for example data analysis using such as research and development (R&D) data, data on patent applications, grants and citations, and bibliometric data. R&D indicator is the most common indicator, that of R&D intensity calculating ratio of R&D expenditure to measure of output. Acquired technology has been recently added to the indicator. It turns high or low –tech upside down because the so-called low –tech industries do not create direct advanced machinery, but they use the high tech technology in production. Another innovation indicator is patent data, which also have weaknesses. Many patents refer to inventions rather than innovations, especially commercial innovations. Moreover, more approaches have been created to provide new and better indicators for innovation including the object approach and the subject approach to innovation indicators. The Community Innovation Surveys (CIS) is one indicator using subject approach. It was a large-scale data using companies' self-assessment questionnaires and covering many European firms in order to measure innovation outputs. CIS showed that the larger the company is, the more innovative it is. However firms are innovative do not mean that they innovate. Meanwhile, there are many examples of the "object approach. For example, the SPRU database was formed by the Science Policy Research Unit at the University of Sussex (Smith, 2005). To be more specific, in this thesis, the data for R&D indicators, patent indicators and data taken from National Innovation Survey of Malaysian Science and Technology Information Centre (MASTIC) will be considered as the measurement for the innovations in Malaysia.

3. Previous research

This section will present the previous researches on innovation concept and the catch-up, especially in Asia.

3.1. Innovation concept

One of the earliest and most noticeable researchers into innovation was Joseph Schumpeter (1883-1950). Considered an "innovation theorist", Schumpeter's work revolved around the part of innovation on both social and economic change. Innovation was to him the main force for a process of essential qualitative change of economic development over the long run.

According to Schumpeter, innovation could be defined as "new combinations" of existing resources. These "combinations" could come in a variety of ways with him often citing examples in the form of new products, new methods of production, new sources of supply, finding and exploiting new markets, and discovering new ways to organize business. The action of creating and applying these new combinations was defined as the "entrepreneurial function". This function was to be implemented by what Schumpeter called "entrepreneurs". He emphasized the role of the entrepreneur. These entrepreneurs are the driving force behind the "new combinations", continually fighting an uphill battle against all levels of society. Entrepreneurs had to push through what he called the "resistance to new ways" in order for innovation to take effect and change society and the economy (Fagerberg, 2005). Innovations might be also categorized depending on how radical they are compared to present technology, although this perspective also built on Schumpeter's work. From this approach, "incremental" or "marginal" innovations are continuous improvements of innovations, in contrast to "radical" innovations (for example, the establishment of an absolutely new kind of machinery) or "technological revolutions" (comprising of a cluster of innovations that together may have a sweeping effect) (Fagerberg, 2005).

It is also important to distinguish between invention and innovation. According to Fagerberg (2005), "invention is the first occurrence of an idea for a new product or process, while innovation is the first attempt to carry it out into practice" (p.5). Invention and innovation are occasionally firmly connected, to the degree that it is difficult to recognize one from another. However, much of the time, a great time lag between the invention and innovation might exist, mirroring the procedure from developing the new idea, implementing them and finally commercializing them. The primary distinction between innovation and invention, which also marks if the innovation is a successful one, might be the strong economic implication and market-oriented properties. Distinctive types of innovation will also have differentiated effects on the economy and social development, for example: the product innovation, which implies the product with new function and better quality, may have a more apparent impact on the economic performance and the effect will show soon after new products entering market; then the process innovation may have unclear effect on economy which would be seen in a long term since it does not directly provide new products but concentrate on enhancing the efficiency during the production process (Fagerberg, 2005).

3.2. Catch-up in Asia

Fagerberg and Godinho (2005) state that "“Catch-up” relates to the ability of a single country to narrow the gap in productivity and income vis-à-vis a leader country" (p.515). An immeasurable number of early studies have explored the topic of the role of innovation in economic growth focused mainly on evidence of catch-up process from Europe and the United States. Since the fascinating development of East Asian economies, there were interests in understanding the connection of technological performance, innovation and catch-up in developing regions.

Amsden (2001) discusses various characteristic aspects of the rise of the rest. According to Amsden (2001), the late industrialization in the emerging economies need the factors to develop: the acquisition of knowledge-based assets; new control systems imposing discipline on economic behaviour and relating to the principle of reciprocity; globalization in connection to national ownership (with examination of manufacturing experience and the policy paradox of income distribution); and institution building (with particular reference to Thailand's reciprocal control mechanism). “The rest” refers to several countries in Asia and Latin America, including China, India, Indonesia, South Korea, Malaysia, Taiwan, and Thailand in Asia; Argentina, Brazil, Chile, and Mexico in Latin America; and Turkey in the Middle East (Amsden, 2001).

Odagiro and Goto (1996) analyse the important role of technological progress in the economic development and uses the framework of evolutionary approach proposed by Nelson and Winter (1982). In their book, the dynamic processes of technology acquisition and building of technological capabilities in Japan from the second half of the nineteenth century in a wide range of industries (textiles, iron and steel, electrical equipment, automobiles, shipbuilding and aircraft, and pharmaceuticals) was analysed. They emphasize the role of both private sector (the firms) and the public sector (the government) in Japan’s development, together with the inflow of information, capital, and other resources from overseas. Firstly, the initiative of the private sector is essential because its attempt to amass adequate technological capabilities, to take risks in making investment, especially to enter new industries, and to make the right managerial decisions. Meanwhile, the government supported this accumulation, by forming industrial infrastructure and supporting investment, as well establishing the education system. The government also protected infant industries, involved in the import of technology, controlled inward investment, invested in government research laboratories, and encouraged demand for developing industries (Odagiro & Goto, 1996).

One case which got much consideration was the ascent of Korea from being one of the poorest nations in the world to a first world innovative center in only three decades. Linsu Kim, who made the legitimate study on the subject, utilized the idea "technological capability" (Kim, 1980) as an analytical gear to decipher the Korean evidence. He characterized it as " the ability to make effective use of technological knowledge in efforts to assimilate, use, adapt and change existing technologies. It also enables one to create new technologies and to develop new products and processes…” (Kim, 1997, p.4). Consequently, the idea comprised not just organized R&D, which seemingly is a little action in numerous creating nations, additionally different capabilities required for exploiting the technology commercially.

Meanwhile, Shin (1996) summarized Gerschenkron’s framework and applied it to examine study of twentieth-century Asian as nineteenth-century European economic advance. . He analyses cases in the iron and steel industry. The first example is the nascent German regional industry (1800-1850). Second, examination of the British-German-Japanese competition (1850-1930) is presented. Next illustration is the United State-Japan-Korea battle for supremacy (1950-1990). A fourth case takes up the U.S.-Japan-(South) Korea semiconductor shootout, 1950-1993. He, then, asserts that only Gerschenkron scheme can give a thorough representation of national economic development by looking at economic potential and changing sociopolitical arrangement (Shin, 1996).

The literature seems to confirm that the central role of human capacity, capability and competence formation for innovation should not be underemphasized. Knowledge is increasingly recognised as a critical determinant of economic growth, in spite of disagreements within the theoretical approaches. Moreover, coherent and effective administration and suitable governance regimes are necessary to ensure good results from the technological upgrade.

Above points also are mentioned as the problems of the process of Malaysian catch-up in "Malaysia's development challenge" book. Hill (2012) addresses both macroeconomic and sectoral challenges. The macroeconomic difficulties are Malaysia's part in three economic crises, public sector resource management, monetary policy and financial sector development, and issues associated with environmental policy and sustainable development. Sectoral challenges discussed are "microeconomic reform" (a combination of regulatory and governance reform and industry policy), service sector liberalisation, education, poverty eradication, demographic and labor force dynamics (Hill, 2012). Hill (2012) addressed three threats for Malaysian economy in order to "graduate from the middle" which is also the main discussion of the book . The first challenge is changing global environment but also because of government missteps, so Malaysia's macroeconomic policy challenges are intensifying. The second challenge relate to upgrading and innovation because Malaysian economy have difficulties in promoting technologically and capturing more value-added which are both essential for economic catch-up to take place. Finally, the New Economic Policy, while reducing income gaps among ethnic groups, has weakened the quality of education, and hence the human capital base vital to the transformation to high-income economy (Hill, 2012).

4. Theoretical background

This theory section will elaborate relevant theories. Firstly, theories on innovation and its links to economic growth. Economists have for a long time been interested in the role of innovation in economic development or growth. There are the two main approach to the subject: neoclassical and evolutionary approach. While the neoclassical tradition attaches to a perspective in which cause and effect are obviously separable, and growth is a steady state phenomenon, the evolutionary approach is one of historical circumstances, complex causal mechanisms, and, turbulent growth patterns that appear to be far from a consistent state (Verspagen, 2005, p.493). However, economic development is changing process rather than a long-run steady goal. In additional, various developing countries all over the world are at different stages of development make the explanation of economic growth and innovation in developing countries more difficult. Therefore, evolutionary view seems to provide a better tools to analyse the issues of developing countries rather than neoclassical approach.

4.1.Innovation and economic growth

Economists have for a long time been interested in the role of innovation in economic development or growth. The connection between economic growth and innovation has been studied for quite a while. Technological change in economic theory can be found in the works of Karl Marx and Schumpeter. While technological change is the results of productive forces in Marx's theory, Schumpeter consider entrepreneurs are the center of the technological development (Fagerberg, 2005). Firstly, economic growth is often calculated using growth accounting which utilizes factor inputs and total factor productivity (TFP) to attribute growth to its proximate sources (Crafts, 1999).

There is another approach to explain the role of innovation for the economic growth – the evolutionary theory, which appeared during the 1980s and 1990s (Verspagen, 2005).

The evolutionary methodology to the examination of technological change in economic growth is based in part on "the axiom that individual humans are unable to cope in a fully maximizing way with the complexities of technology" (Verspagen, 2005, p.496). The complexities of technology is presented in the micro-foundations of innovation and technological change which includes two important aspects: uncertainty and differences in the significance of innovations. "Uncertainty" refers to situations in which probabilities are neither known, nor can they be deduced, calculated, or estimated in an objective way. The second issue to be discussed in this section is the technological or economic significance of innovations. This is the reason for a distinction in the literature between incremental and radical innovations. Moreover, there is an important interaction and interdependence between radical and incremental innovations (Verspagen, 2005).

Evolutionary economics uses two forces to explain the aggregate economic growth: selection and the generation of novelty (Verspagen, 2005). While the process of selection reduces the variety present, novelty is constantly added to the system. In modern economies, selection mechanisms in modern economies are the market and other economic institutions and innovation is an crucial novelty generating process (Verspagen, 2005).

The evolutionary approach to economic growth disposes of cumulative causation over time, variety and selection, and draws heavily on economic history. Theories and historical analyses of this type propose a view of the interactions among technology, the economy, and the institutional context. They recommend that an uneven temporal pattern could be brought into by technological innovation economic growth. One extreme example of this temporal pattern of innovation is the idea of a “long wave” in economic growth, in which periodicity is limited in a short range of 50–60 years, such as being claimed in the research of Kleinknecht (1987); Freeman and Louçã (2001). An alternate perspective asserts that growth patterns are intrinsical unmanageable, with little consistency regarding strict cycles. Regardless, the evolutionary view contends that the economy is quite far from anything that could be portrayed as a stable state due to the uneven temporal rates of technological change (Verspagen, 2005).

Moreover, although evolutionary theory includes many different approaches to theorize about economic growth and innovation, for example, non-formal evolutionary approach and formal evolutionary approach (Verspagen, 2005), there are some common points can draw from them (Verspagen, 2001). The evolutionary perspective can give a better insights into the process of technological change in developing countries (Rasigan Maharajh & Erika Kraemer-Mbula, 2010)

Firstly, evolutionary approach considers economic growth as a process of change, not of convergence to a steady-state growth path (Verspagen, 2001). Economic performance is seen in terms of the rate and nature of progress. The evolutionary growth theory regards economic growth as the outcome of the co-evolution of technologies, firm and industry structures, and supporting and governing institutions (Nelson, 2008). Therefore, it is difficult to predict the process of economic growth. Evolutionary theories conceive innovation as an interactive, complex (non-linear) and path dependent process, that, as such, is open-ended and never reaches a state of equilibrium (Edquist, 1997). As such, innovation and learning are not restricted to R&D effort but learning by using, by doing and by interacting (Lundvall, 1988) are highlighted. Economic progress should have been be comprehended as a learning procedure (Lall, 2000).

On the other hand, Nelson (2008) admit that learning or mastering advanced technologies today in less developed countries is in some ways easier and in some ways more troublesome than it was when Korea and Taiwan were successfully taking abroad modern technologies. It is easier in light of the fact that nowadays training can give a significant base for learning by doing and using. The reason is that codified knowledge hidden most vital technologies can be obtained through training, sometimes advanced training, in the relevant sciences and engineering disciplines. From this perspective, technological catch-up is simpler today than it was 50 years ago (Nelson, 2008). From another point of view, however, it is more difficult. Firstly, there is a more prominent necessity for large-scale public and private investments to make a technologically refined unit of local engineers and applied scientists. While in the early phases of catch-up a significant part of the required technical sophistication can be acquired by sending students oversea to study. When development progresses, it is necessary to raise the absolute number of engineers and scientists. Hence a large proportion of the education is going to have to be undertaken locally. Consequently, without a comprehensive education system catch-up might not be able to happen. This represents a noteworthy test both for financing and for institution building. In addition, in today's world, countries pursuing to catch up technologically will be working under more restrictive regulatory regime characterized by international treaties than earlier, for example the TRIPs (Trade-Related Aspects of Intellectual Property Rights) Agreement or treaties enforced through the WTO. These treaties do leave room for support of training, and some types of research and development but to exploit of this benefit poses a major institutional threat (Nelson, 2008).

4.2.Innovation and catch-up

Although there is potential for late-comers to catch up with the frontier countries, there are differences in countries' capabilities to exploit this potential. Abramovitz (1986) suggested that the ability to catch-up of a technologically less developed country stay within in so-called 'social capabilities'.

In his paper (1986), Abramovitz presents the catch-up hypothesis which is stated that the potential of rapid growth of the less-developed economies lies in their productivity level. The productivity level is controlled entirely by the level of technology embodied in capital stock. In the case of a leading country, this technology included in its stock was at the very frontier of technology at the time of investment. The technological age of the stock is considered as the same as its chronological age. Meanwhile in a following country with the lower productivity level, the technological age of the stock is high relative to its chronological age. The stock is out-of-date even for its age (Abramovitz, 1986).

When a leader discards old stock and replaces it, the accompanying productivity increase is governed and limited by the advance of knowledge between the time when the old capital was installed and the time it is replaced. Those who are behind, however, have the potential to make a larger leap. New capital can embody the frontier of knowledge, but the capital it replaces was technologically superannuated. So-the larger the technological and, therefore, the productivity gap between leader and follower, the stronger the follower's potential for growth in productivity; and, other things being equal, the faster one expects the follower's growth rate to be. Followers tend to catch up faster if they are initially more backward. Viewed in the same simple way, the catch-up process would be self-limiting because as a follower catches up, the possibility of making large leaps by replacing superannuated with best-practice technology becomes smaller and smaller. A follower's potential for growth weakens as its productivity level converges towards that of the leader (Abramovitz, 1986).

However, being backward does not itself guarantee that a nation will catch up. Qualifications are necessary for the hypothesis. Firstly, the country have to have “social capability”. Abramovitz (1986) states that “a country's potential for rapid growth is strong not when it is backward without qualification, but rather when it is technologically backward but socially advanced” (p. 388). However, He suggested that a country’s potentiality for productivity advance through the catch-up process is defined by the combination of technological gap and social capability, however this is only potential for productivity advance by way of catch-up in the long run. The rate of realization of potential depends on still another series of factors that are mainly independent of those governing the potentiality itself, and hence, different between countries.

Although Abramovitz (1986) found that it was difficult to quantify social capabilities, it is not true that he did not have apparent thoughts about what the concept was meant to cover. He developed a long list of aspects that he considered to be particularly relevant as social capabilities, including education, experience in the organization and management of large scale enterprises, and financial institutions and markets capable of mobilizing capital on a large scale.

He also mentions that “three technological features of modern production – scale and specialization , capital-tensity an expanded auxiliary activity – demand three developments in the nature skills, knowledge, experience, established institutions and customary behavior” (Abramovitz, 1995, p. 35).

The development of social capability is an interactive and aggregate process. In the process, social capability supports economic development and then development strengthens the further advance of social capability. The interactive and cumulative figure of the process raises the probability that initially inadequate capability may baffle development and thus confine its own particular enlargement. However, if a country’s social capability is adequate to make a start, then it may grow from strength to strength. Then a country might be able to keep a high and even accelerating pace of convergence towards the technological leaders (Abramovitz, 1995).

In my research this theoretical framework was used in order to analyze the process of technological upgrade and economic growth in Malaysia. It allowed me to look on the reasons why Malaysian lagged behind the advanced economies. Among the social capabilities, the research will focus on the role of education needed by developing countries to catch up with advanced countries. Among them, education should be considered an important factor because knowledge of traditional, stable, and simple technologies in developing countries may not be a good base on which to learn how to master modern technologies. Therefore, developing countries need a skilled labour force and human capital during the process of catch-up. One of the components that can be relied upon to illustrate an economy’s capacity to assimilate information and new technology is the education of its populace. In this context, education may be viewed as a *threshold effect* in that a certain level of education input may be viewed as a fundamental condition for the obtaining of advanced technology. In addition, variable levels of schooling might be required to implement technologies of varying sophistication. On an econometric level, the correct specification would then relate the rate of productivity growth to the level of educational attainment.

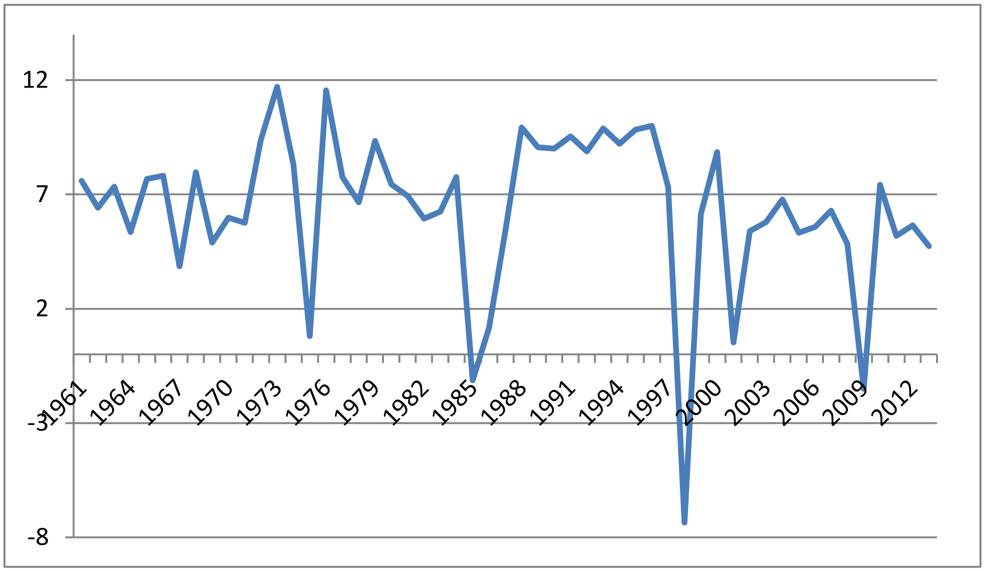
5. Empirical Analysis

This section aims to analyze empirical findings presented as combination of secondary and primary data. Starting with an overview on Malaysian economy since its independence, it will be followed by two sub sections of the findings about innovation performance and situation of education and human capital in Malaysia. The group of indicators assessed in the sub section of innovation performance suggests that Malaysia has yet to enter the phase of innovation-led growth. The innovation performance in Malaysia is in accordance with that of other middle-income countries but there is still a considerable gap with high-income countries. The analysis of these indicators is helpful to emphasize the point that Malaysia meets a growing challenge to innovate. Given Malaysia's innovation performance thus far, innovation capabilities will need to be upgraded—particularly in view of the progress other countries in the region are making on the innovation front. The second sub section discuss the situation of human capital in Malaysia because human capital is an essential prerequisite need to be fulfilled before innovation can take place.

5.1.Overview about Malaysian economics

Since independence in 1957, Malaysia has transformed significantly, moving from an economy based on primary commodities to one fuelled by manufacturing and services based on foreign investment. Malaysia steadily accomplished rapid growth rate, with more than 7 percent annual growth in gross domestic product (GDP) along with low inflation in the 1980s and the 1990s (Hill, 2012). Nonetheless, after the Asian financial crisis of 1997, Malaysia lost ground to many Southeast Asian economies and average economic growth was 4.8 percent over the decade 2000-2009, comparing to 4.1 percent of Thailand and the average growth rate 5.1 percent of Indonesia (World Bank data). Again in 2009, the global financial crisis hit the country particularly hard; the reduction in GDP growth was the steepest among middle-income countries in the region (WEF, 2010). However, it seems to gain its pattern since 2013 (Figure 1)

Figure 1: Malaysia annual GDP growth, 1961-2013



Source: World Bank Data

Nevertheless, this record of Malaysian economic growth is splendid but not exceptional in light of the fact that it has been matched or even surpassed by some developing economies. It is also not as good as the growth rate of economies in East Asia. Table 1 presents the growth rate in per capita GDP by decade. A comparison of GDP growth might give a better performance because Malaysia has one of the highest rates of population growth in Asia. Since 1980, China has had a growth rate twice faster than Malaysian rate. Its growth rate is also significantly lower than that of South Korea, especially during 1970s and 1980s. Malaysia trailed after Singapore and Thailand over the period 1970 - 1980, but since 1990 its average growth rate has respect to growth in per capita GDP (Table 1).

Table 1: Average annual growth rate, Malaysia and selected Asian countries.

Year	Malaysia	China	Singapore	South Korea	Thailand	Indonesia
1970-79	5.2	5.3	7.8	8.6	4.8	5.2
1980-89	3.0	8.2	5.6	7.3	5.3	4.2
1990-99	4.5	8.8	4.1	5.7	4.2	3.2
2000-09	2.8	9.6	2.9	4.1	3.3	3.6

Source: World Bank Data

The 1970s is the period of high growth which marked aggressive attempts by the government on bringing in foreign direct investment (FDI) in order to boost the industrialization in the country. These consisted of hospitable incentives, tax relief and funded investment loans and succeeded in drawing a number of multinational enterprises (MNEs) to Malaysia. Foreign investment supports the transition of Malaysian economy from the predominantly mining and agricultural one to a more diverse production profile that included both heave manufacturing and services (Zainal Abidin, 1990).. Nonetheless, due to the 1997-1998 Asian financial crisis, there were huge outflows of foreign portfolio and FDI, which also plunged amid the global financial during the period 2008-2009 (Jomo, 2003).

Since the 1980s, Malaysia's growth has been driven by the industrial sector. Malaysian government started industrialization programme which aim at implementing large-scale and capital-concentrated projects including steel, machinery and equipment, petrochemicals, cement and automobile manufacturing (Gustafsson, 2007).Hence, industry developed from 27.4 percent of GDP in 1970 to about 41.2 percent in 2010, while agriculture had shrunk from 29.4 percent of GDP in 1970, dropped to 10.4 percent in 2010. The remainder of GDP is contributed by the services sector, though growing slowly from 43.2 percent in 1970 to 48.5 percent in 2010. Malaysian economy has quite similar processes of structural transformation occurred in Thailand, but its transformation is slower than other countries of the first generation of newly industrialising economies or countries such as South Korea and Singapore (table 2).

Table 2: Structural change, Malaysia and selected Southeast Asian countries 1970-2010 (percent of agriculture, industry and services in GDP in current prices)

Sector	*Malaysia*	*China*	*Singapore*	*South Korea*	*Thailand*	*Indonesia*
Agriculture						
1970	29.4	35.2	n.a.	27.5	25.9	44.9
1990	15.2	27.1	0.3	8.2	12.5	19.4
2010	10.4	10.1	0.0	2.5	12.4	15.3
Industry						
1970	27.4	40.5	n.a.	24.5	25.3	18.7
1990	42.2	41.3	32.3	38.2	37.2	39.1
2010	41.2	46.7	27.6	38.3	44.7	47.0
Services						
1970	43.2	24.3	n.a.	48.0	48.8	36.4
1990	42.6	31.5	67.3	53.6	50.3	41.5
2010	48.5	43.2	72.3	59.3	43.0	37.7

Source: World Bank data

Meanwhile, the growth and structural transformation of the Malaysian economy since Independence has helped to branch out the economy significantly. With the exception of import-substituting industrialization attempts in the first decade after Independence, and the Green Revolution in the 1970s to accomplish near self-supporting in rice production, Malaysian economic diversification has mainly result in diversification of the range of primary commodity exports and export-oriented industrialization. Thus, diversification has changed the scope of Malaysian exports, and really expanded, as opposed to diminished, the openness of the Malaysian economy. Exports have turned into the nation's essential development tool with trade at its high reaching double the value of GDP (Jomo, 1990). During 1970s and 1980s, major commodity exports are tim, rubber, palm oil, petroleum and natural gas. At the same time, manufactured exports has gradually become more significant, and electrical and electronics products play the most important share among manufactured exports (Jomo, 1990). In 2014, electrical and electronics products account for the largest share representing about 33.4 percent of all exports. This was accompanied by a parallel drop in the importance of the agricultural sector and mining sector (MATRADE, 2015). The proportion of high-tech exports to total exports and also Malaysia's manufactured exports to total exports is significant and might be considered as being at the high level compared to others countries. However, the ratio of domestic value-added to total output value suggests that Malaysia are still relied on low- and semi-skill concentrated assembly-type manufacturing (Rasiah, 2009). In 2014, higher demand of intermediate goods for manufacturing activities was the main reason for increase in Malaysian imports. Intermediate goods valued at around 101.4 billion dollar or 59.8 percent of total imports compared to gross value of manufactured exports of about 145.8 billion dollar (MATRADE, 2015). Low domestic value-added share seems not to be the recent problem for Malaysian economy because 36 percent of the import bill in 1987 consisted of intermediate goods, which accounted for $11.6bn, while the gross value of manufactured exports is about $20.3bn (Jomo, 1990). There has been a slowdown or decrease in The value-added ratio for most industrial sectors most industrial sectors over the 1981-2002 period for which a consistent set of data is available. Only in a couple of sectors (footwear, apparel, plastics, rubber and nonferrous metals) did the proportion of domestic value added increase. In other imperative sectors (especially machinery, food products and equipment products) the ratio fell substantially. The reduction was more affirmed where value-added was at first high in respect to output value, most eminently in the production of machinery. The share of domestic value-added in machinery, for example, is one of the lowest in the region (Rasiah, 2009).

Fast economic growth in Malaysia has contributed to large rises in per capita income and a decrease in the share of the population living below the national poverty line from 10 percent in 1995 to 3.8 percent in 2008 (World Bank, 2012d). However, there is still inequality in Malaysia, income distribution and the extent of poverty are diverse within Malaysia due to regional and urban-rural disparities. Urban poverty is evaluated at about 2 percent and rural destitution is above 8 percent (World Bank, 2012d). disparities. Urban poverty is estimated at nearly 2 percent and rural poverty at over 8 percent (World Bank, 2012d). The export-oriented industrialization process, equity ownership restructuring, and unevenness in access to education and training underlie the persistence of inequality in the country, as indicated by a GINI ratio of 46 percent in 2009 (World Bank, 2010).

5.2.Innovation performance in Malaysia

The innovation performance of Malaysia is in accordance with other middle-income countries in Southeast Asia, however there is a considerable gap with high-income countries. Malaysia has yet to enter a stage of innovation-led growth and research performance has not significantly improved in the last decade. Malaysia's position in the World Bank's Knowledge Economy Index 2009 is generally the same as a decade ago (48^{th} out of 145 countries). This index records the capacity to produce, embrace and diffuse knowledge, and to make an environment that allows the effective use of knowledge. Comparison with high-income and other East Asian countries proposes that Malaysia lags in the areas of innovation and education (World Bank's Knowledge Economy Index report).

R&D expenditure grew over the last two decades (MASTIC, 2012). There was a steady increase in gross domestic expenditure on R&D (GERD) from 0.50 percent of GDP at the beginning of the decade to about 1.07 percent in 2010 (Table 3).

Table 3: Malaysia's gross expenditure on R&D (GERD) by sector, 1996-2011

	1996	1998	2000	2002	2004	2006	2008	2009	2010	2011
R&D expenditure (MYR million)										
Total GERD	549.3	1127.0	1671.5	2500.6	2843.8	3646.7	6070.8	7199.9	8510.7	9422.0
Ratio GERD/GDP	0.22	0.39	0.50	0.69	0.63	0.64	0.82	1.01	1.07	1.07
Government agencies and research institutions	108.7	247.3	417.5	507.1	296.9	189.5	603.1	459.3	514.8	1357.4
Institutions of higher learning	40.4	133.6	286.1	360.4	513.3	360.8	1188.3	1711.1	2464.4	2725.6
Private sector/Business enterprise[1]	400.1	746.1	967.9	1633.1	2033.5	3096.4	4279.4	5029.5	5531.5	5339.0
Proportion of R&D expenditure (percent)										
Government agencies and research institutions	19.8	21.9	25.0	20.3	10.4	5.2	9.9	6.4	6.0	14.4
Institutions of higher learning	7.4	11.9	17.1	14.4	18.1	9.9	19.6	23.7	29.0	28.9
Private sector/Business enterprise[1]	72.8	66.2	57.9	65.3	71.5	84.9	70.5	69.9	65.0	56.7

Source: Malaysian Science and Technology Information Centre (MASTIC), National Survey of Research and Development various years, Expenditure are nominal

[1]Change name to business enterprise since 2011 report.

The business sector has steadily been the largest performer of R&D in Malaysia. Of the gross R&D expenditure in 2011, business enterprise contributed around 56.7 percent . In 2011, the business sector is assessed to have spent RM5.3 billion on R&D activities, which was about four times the estimated amount spent by government agencies and research institutions (RM1.4 billion) and double that by institutions of higher learning (RM2.7 billion). However, despite of being the major contributor to R&D in the country, the reported amount for 2011 declined from the prior spending of RM5.5 billion in 2010. Second to the business sector in R&D expenditure was the higher education sector, including both public and private institutions of higher learning, whose spending has grown throughout the years, recording roughly 29 percent of the GERD in 2010 and 2011. While the R&D expenditure of the higher education sector kept on expanding, indicating the expanded significance of academia as main players in Malaysia's R&D, that of the government agencies and research institutions varied in the range of 5.2 percent to 14.4 percent between 2006 and 2011, with 2011 reporting the highest spending over the five-year period.

Malaysia's R&D activities covered the research of many fields including ICT, engineering and technology, natural sciences, agriculture and forestry, biotechnology, medical and health sciences, social sciences, humanities, economics, business, and management. In 2011, the information acquired from the number of companies that responded to the National R&D Survey (2009 - 2011) demonstrated that Malaysia invested the most in ICT research, accounted for around 38.3 percent of the GERD (RM3.6 billion). The natural sciences got a portion of about 13 percent, or RM1.2 billion, of the financial share, while agriculture and forestry received slightly more than 7 percent of the total R&D expenditure (MASTIC, 2012).

Although the private sector represents the largest share of R&D expenditure, there is only 5.5 percent of firms, mostly multinational enterprises (MNEs), involves in R&D activities, and the quantity of patents given to foreign companies is larger than that of Malaysian companies. There is a good deal of research performing MNEs present in Malaysia, including worldwide brands, for example, Hewlett Packard, Motorola, Intel and Dyson, but recognizing what share of their activities in Malaysia is R&D-oriented instead of manufacturing or after-sales support is difficult. It is also difficult to confirm the number of scientific staffs employed in these firms (Rasiah, 2008).

Among domestic firms, the large state-owned enterprises, including the automobile manufacturer Proton, the oil and gas company Petronas, and the large palm oil firms, operate most R&D. They depend on government subsidies for their research investments. While most R&D in the electronics sector is contributed by foreign enterprises, the National Automotive Policy and local content requirements have supported automotive research. The state-owned automobile company Proton represents about 76 percent of Malaysia's R&D spending in this sector. Foreign corporations such as Honda and Toyota tend to keep their research main center in Thailand (Wad and Chandran, 2011). Meanwhile, little research or innovative activities are conducted by small medium enterprises (SMEs), which represent 95 percent of firms in Malaysia and amount to about 32 percent of GDP (Boon-Kwee, 2011). Regarding total national R&D expenditure, enterprises with revenues under RM 10 million record for only around 9 percent of research expenditures. The reason for this might be that most of SMEs (86 percent) are concentrated in the services sector rather than in manufacturing or agriculture, but it also reveals inertia and the limited capabilities of smaller firms (Rasiah, 2008).

The evolution of the number of personnel engaged in R&D in Malaysia (Table 4) has mirrored developments in research spending. Since 2008, there has been a marked growth in the country's R&D personnel (which includes researchers, technicians, and support staff). The total headcount of R&D personnel grew by 137.4 percent, from 40,840 persons in 2008 to 88,314persons in 2010.

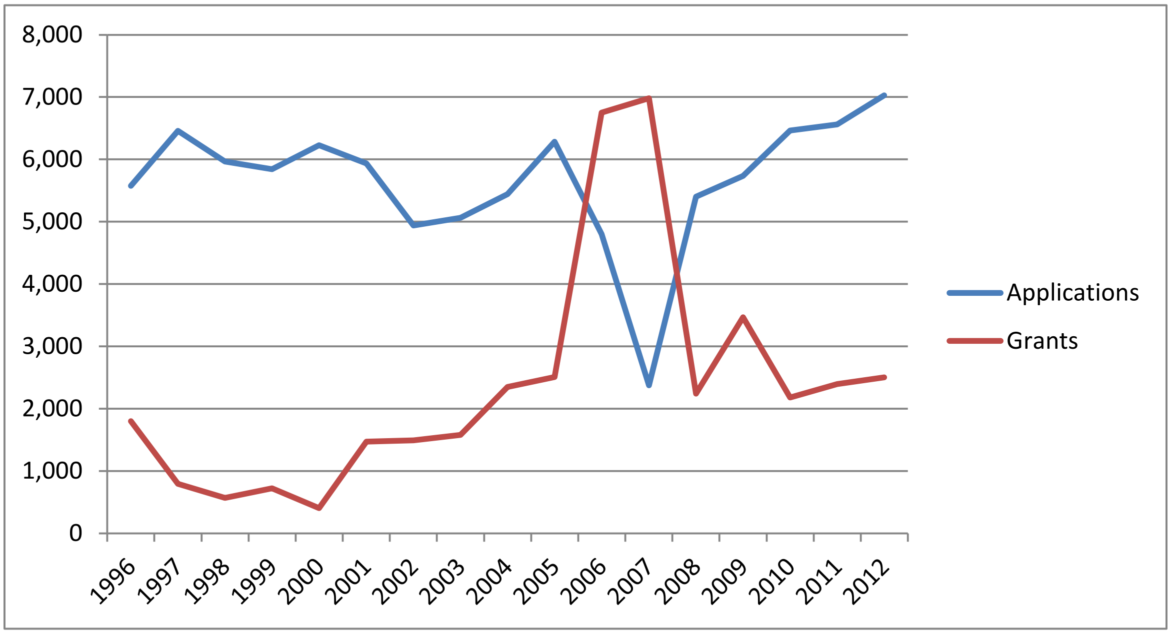
Table 4: Researchers to labour force/population ratios, headcount and full-time equivalence, 1994-2010

	1996	1998	2000	2002	2004	2006	2008	2010
Total population (millions)	21.2	22.2	23.3	24.5	25.6	26.6	27.7	28.6
Total labour force (thousands)	8616	8883	9616	9886	10856	10628	11028	12100
Researcher per 10 000 labour force	5.1	7	15.6	18	21.3	17.9	28.5	55.4
Headcount (researchers, technicians, and others)	9233	12127	23262	24937	30983	24588	40840	88314
Full-time equivalence	4437.3	6656.3	10059.7	10730.9	17886.5	13415.9	22287.3	50483.9

Source: Malaysian Science and Technology Information Centre (MASTIC), National Survey of Research and Development various years.

The performance of Malaysia's patenting is mixed. Patent filings showed continued strong growth, although patent applications had the 23 percent fall in 2006 and patent applications (50.6 percent) in 2007. The reason for the radical decrease is Malaysia's accession to the Patent Cooperation Treaty, which has given another option for foreign applicants to file their patents in countries other than Malaysia. However, the position returned to pre-crisis high in 2008—with 5,403 applications (an increase of 17.8 percent)— before it recorded a 12.7 percent increase in 2010 to 6,464 applications. 2012 signifies the peak of patent applications during the period when the total number of applications reached a record number of 7,027. However, the accessibility of expedited examination has not brought about a noteworthy increment in patent grants as the facility is underutilised. The enormous gap between the quantity of filings and the quantity of granted patents means the proceeded with expansion in pending applications and pendency period for patent examination in Malaysia as shown in following figure (Figure 2).

Figure 2: Total Applications and Granted Patents and Utility Innovations from 1996 - 2012

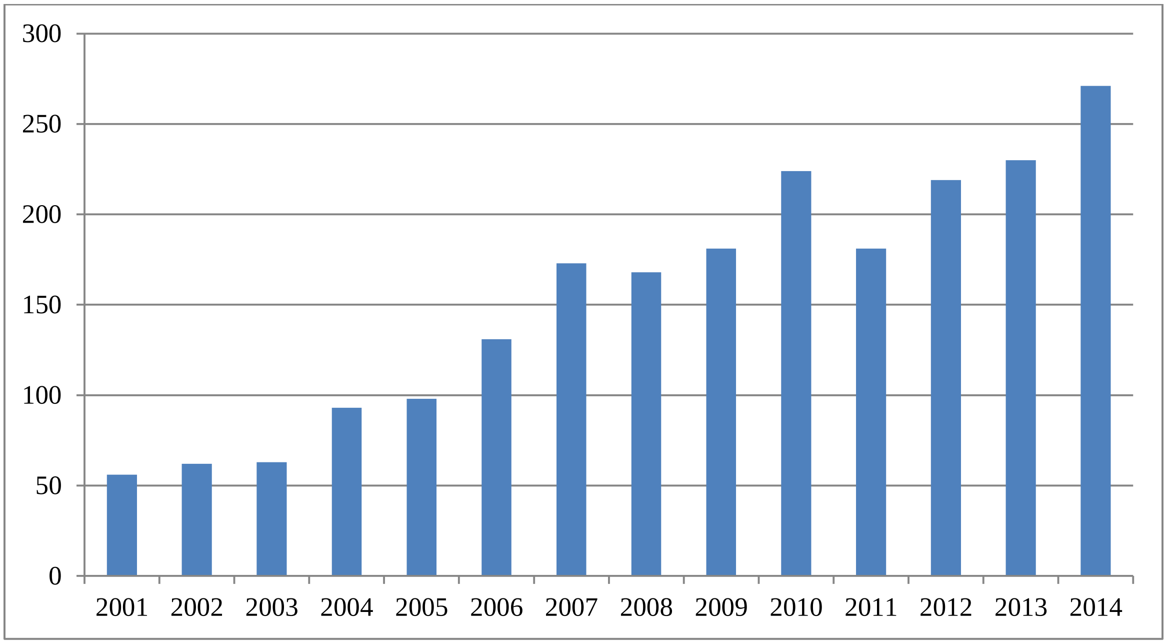


Source: Intellectual Property Corporation of Malaysia (MyIPO)

Despite the fact that there has been a consistent growth in patent filling by Malaysians since 2009 (from 7.4 percent in 2003 to 21.5 percent in 2009), the share of patent applications filed by non-Malaysians was significant . In 2003 the rate of of applications by non-Malaysians was 92.6 percent of the total applications. Though this share has consistently diminished throughout the years, it still played the major part compared to that of Malaysian applicants. The decrease by 23.6 percent in 2006 and the sharp fall by 50.6 percent in 2007 was an aftereffect of the the accession to the Patent Cooperation Treaty (MASTIC, 2012). From the quantity of patent grants, a significant share of patents that have been discarded are foreign patents. The proportion of foreign patent grants varied from 98.3 percent in 2003 to 87.7 percent in 2012. This could be ascribed to the reformed substantive examination process, which permits foreign patents with priority dates from certain recommended nations to be scanned in a speedier manner. In February 2011, the patent expedited examination process was presented, and this has cut down further the pendency time of a patent to 20 months from the date of documenting (MASTIC, 2012).

The number of USPTO patents granted to applicants residing in Malaysia has improved steadily from 56 granted patents in 2001 to 271 granted patents in 2014.

Figure 3: USPTO patents granted to Malaysia, 2001 - 2014



Source: US Patent and Trademark Office (USPTO, 2012). The origin of a patent is determined by the residence of the first-named investor.

Most US patents are granted to MNEs situated in Malaysia. Between 1995 and 2008, US patents issued to inhabitants of Malaysia increased 20- from a low base. On the other hand, Malaysia's improving patenting record, although second among countries of the Association of Southeast Asian Nations (ASEAN), is weak in international comparisons. With the exception of individually owned patents, four Malaysian organisations – Silterra, Malaysian Palm Oil Board (MPOB), Harn Marketing and Universiti Putra Malaysia (UPM) – were granted five or more patents each between 2003 and 2007. The patents issued locally are principally for chemistry and metallurgy, operational technology, electricity and physics (Chandran and Wong, 2011).

Although innovation performance of Malaysia has been improved but in order to catch up with developed countries, this performance might be not enough. R&D spending and personnel in Malaysia improved over the last two decades but remains low when compared internationally. One of indicators of a country's R&D activities is the gross expenditure on R&D (GERD) which is based on the expectation that the more a country's R&D expenditure is, the greater are its R&D activities. However, using GERD figures to compare R&D activities across countries might not be suitable. Therefore, measures of R&D intensity which provides a means of adjusting for the differences in the sizes of national economies, are used. One of these measures is the GERD per GDP. Malaysia's GERD per GDP for 2011 was 1.07, which implies that the gross expenditure on R&D made up 1.07 percent of its GDP. The highest GERD/GDP ratio belonged to Israel, at 4.4 percent, while while Finland, Korea, Japan, Sweden and Denmark all have research intensities (GERD/GDP) of above 3.0 percent. The rate GERD/GDP of Malaysia is close to those of Brazil, Hungary and Russia, with a GERD per GDP of 1.16 percent, while the average for the OECD countries stood at 2.3 percent in 2009. Its geographic neighbor Singapore had a GERD per GDP of 2.09 percent, twice that of Malaysia, while the GERD/GDP recorded for Thailand, the Philippines and Indonesia is below 0.3 percent (IMD WCC, 2012). In 2011, there were around 73,752 researchers in Malaysia. However, it should be noticed that the headcount of researchers is an operation of the size of the economy and the size of the population; consequently countries with large populations will have a tendency to have more researchers. In order to ensure comparability, an indicator of researcher intensity, researchers per 10,000 labour force, which compares the proportion of researchers in the labour force across countries, was used. In 2011, Malaysia had 58.2 researchers out of 10,000 labour force. Despite the fact that this achieved the target set by the Ninth Malaysia Plan, it is still smaller than the share of researchers in most of advanced economies. For example, South Korea and Singapore had 142.5 and 127.4 researchers per 10,000 labour force respectively, while the OECD average rate was 76.0 researchers per 10,000 labour force (MASTIC, 2012).

In the past, factor accumulation, especially of low skilled workers, are the main role behind Malaysia's economic growth. However this model is not maintainable, and is conflicting with the economic structure of most advanced countries. A transformational is required for Malaysia to be among the advanced economies (MASTIC, 2012).

5.3. Education and human capital in Malaysia

The quality of human capital can be found in the output of an educational system. Education is one of the primary mechanisms utilized by the Malaysian government to enhance the socioeconomic status of its population and sustain general development. Malaysia has policies to implement free education at the primary and lower secondary levels since the early 1960s, and at the upper secondary level since the early 1980s, connected with increased provision of higher education since the 1990s (Lee & Nagaraj, 2012). Malaysian government has invested heavily in education since 1980. Its public education expenditure as a percentage of GDP has remained high through the decades since then (World Bank, 2013). In recent years, Malaysia had overall expenditure as a proportion of both GDP and total government expenditure is about the same as, or higher than, that of its immediate geographical neighbours (including Singapore) as well as developed countries such as United States and the United Kingdom (Table 5).

Table 5: Public expenditure on education, selected countries, 2001 and 2011

Country	*Expenditure as percent of GDP*		*Expenditure as percent of total government expenditure*	
	2001	*2011*	*2001*	*2011*
Malaysia	7.5	5.9	24.3	21.0
Indonesia	2.5	3.4	11.6	18.1
Singapore	3.6	3.1	18.1	20.6
Thailand	5.0	5.2	24.2	22.0
United Kingdom	4.4	5.8	12.3	12.7
United States	5.5	5.2	n.a.	12.9

Source: UNESCO Institute Statistics database

This investment has contributed to better educational attainment among its people. Gross enrolment ratios at all levels have increased since 1970, the greatest increase being recognized at the tertiary level. Enrolment at the primary level has been nearly-universal for decades while post-secondary enrolment has also expanded rapidly, with the share of enrolment increasing from 8.3 percent in 1975 to 36 percent in 2005. Gross enrolments in lower secondary education are estimated to stand at nearly 84.4 percent in 2005, while net enrolments in upper secondary education are estimated to have increased from 32.7 percent to 71.7 percent between 1975 and 2005. Since 1985, the rate of children enrolled in primary school has been more than 95 percent of children in the 6 – 11 age group (Table 6).

Table 6 : Enrolment ratios by educational level, 1975 – 2005

Enrolment ratios	1975	1980	1985	1990	1995	2000	2005
Primary (ages 6-11)	96.0	93.6	95.4	99.8	96.7	96.8	94.3
Lower secondary (ages 12-14)	66.8	81.9	84.6	83.0	82.5	85.0	84.4
Upper secondary (ages 15-16)	32.7	40.8	47.7	49.1	55.8	72.6	71.7
Post-secondary (ages 17-18)	8.3	9.7	13.8	18.9	23.2	16.2	36.0
Tertiary (ages 19-24)	1.5	1.8	2.2	2.9	3.7	8.1	8.7

Source: Ministry of Education, Education Statistics various year

The enhancements in educational attainment are mirrored in the structure of the labour force. There has been rises in the share of employees in all occupational categories except agriculture. Particularly, the proportion of professional, technical, administrative and managerial workers rose from 5.5 percent to 27.3 percent of the workforce from 1970 to 2005. In contrast, there was a decrease in the agricultural workforce from 53.6 percent to 12.6 percent over the same period (Table 7).

Table 7: Employment by occupational group, Malaysia, 1970 – 2005 (%)

Occupational group	*1970*	*1980*	*1990*	*2000*	*2005*
Professional & technical	4.8	6.0	8.8	11.0	19.3
Administrative & managerial	0.7	1.0	2.4	4.2	8.0
Clerical	5.0	7.3	9.8	11.1	9.1
Sales	8.3	9.8	11.5	11.0	11.6
Service	8.2	8.7	11.6	11.8	14.3
Agricultural	53.6	38.7	28.3	18.1	12.6
Producation	19.4	28.5	27.6	32.8	25.1
Total employed (thousand)	**2,794.0**	**4,816.0**	**6,621.0**	**9,271.2**	**10,894.8**

Source: Malaysia Plan various year

Educational attainment of the labour force has also improved. There were a significant decrease in the share of the labour force with no formal education from 14.1 percent in 1985 to 4.6 percent in 2005. The workers with only a primary school education also reduce from 39.7 percent in 1985 to 20.6 percent in 2005, while the proportion with a tertiary education grew from 4.7

percent (1985) to 19.2 percent (2005). Significantly, around 75 percent of the labour force in 2005 had a secondary education or higher (Department of Statistics, 2005).

The number of public universities increased from six in 1990 to 20 in 2010 and the number of private universities from one in 1999 to 26 in 2010 with a large number of private and public institutions offering certificate, diploma and degree programs (Lee & Nagaraj, 2012). Public institutions still made up the majority of higher education enrollment from 2002–09. They had 521,696 students out of the total higher education population of 921,548 (MOHE, 2015)

However, there is long debate about the efficiency of the investment in Malaysia's investment in human capital development. Firstly, the investment is very unevenly distributed across educational levels. The public expenditure on tertiary per student as a share of per capita GDP is about five time more than on primary education in 2001. Although the rate decreased to around three time higher than the rate of primary education, it is still a higher ratio than in high-income countries such as Singapore, the United States and the United Kingdom (Table 8)

Table 8: Public expenditure on education per student as a share of per capiata GDP

Country	Primary		Secondary		Tertiary	
	2001	2011	2001	2011	2001	2011
Malaysia	16.4	17.1	26.6	19.8	110.1	60.9
Singapore	n.a.	11	n.a.	16.7	n.a.	26.1
Thailand	16.8	34.3	16	15	32.7	20.5
United Kingdom	14.1	25.1	23.4	30	21.7	32
United States	19.9	20.9	23	23.9	29.8	20.1

Source: UNESCO Institute Statistics

Secondly, despite of high expenditure in tertiary education, there has been concern about the research capability and the related issue of the quality of Malaysian universities. As the pool of universities in the Times Higher Education rankings expanded, the University of Malaya (one of the most acclaimed university in Malaysia) fell out of the top 200 in 2008. None of the other rankings of world universities that rely on more objective criteria rank any Malaysian university highly. Even if only regional comparisons is conducted, there were no Malaysian university has made the top 30 list. The premier Malaysian university, University of Malaya, stood at number 39 (Lee & Nagaraj, 2012).

Furthermore, the official statistics on secondary enrolments , though do not show an expansive quantity of adolescents out of school, they do imply a fairly small number of students going into secondary education. Two perceptions identified with secondary enrolments propose that further progresses in coverage are required. First, even at the adjusted gross rate of 80 percent secondary enrolment is still beneath the normal for high-income OECD economies (101 percent) (World Bank, 2013). Second, in light of the above data from the amount of enrolment in Malaysia by education level suggests a high dropout rate in secondary sector. There are relative few adolescents go on to complete a post-secondary education (MOEM, 2015).

Despite the fact that the Malaysian labor force has steadily become more highly educated, firms report expansive shortfalls in skills. In the Productivity and Investment Climate Survey conducted in 2007, there were 48 percent of firms informed about facing deficits in Information Technology and 46 percent of them reported the deficits in English (World Bank, 2010). With regards to soft skills, communication, creativity/innovation, and problem solving skills mentioned were the popular lacking skills. In National Key Economic Areas (NKEAS), Tthe skills most in deficit among firms were recorded to be IT, language, and communication. Those skills (computer, language, presentations skills) also tend to be required for the largest wage positions, proposing that despite the fact that organizations are willing to pay for these abilities, they cannot always meet their demand (World Bank, 2013).

Resources of job vacancies and job placement in Peninsular Malaysia in 2012 indicate that job vacancies are increasing annually. However, these positions are filled by only a part of the workers. This demonstrates that the unemployment issue is happened not on account of the absence of job opportunities instead it happens because of other reasons, for example, the low quality of a graduate. Although the unemployment rate in Malaysia is regarded low in comparison with countries like the United States and other countries in Europe, it is not an matter to be disregarded. This is on account of graduates are human workforce that is crucial and turn into the center for innovative and productive high-income economy (Zaliza Hanapi & Mohd Safarin Nordin).

The high unemployment rate among late graduates gives additional proof that the instruction framework is not constructing the abilities requested by the work market. Unemployment in Malaysia is most astounding among youthful employment seekers. In 2011, unemployment rates for Malaysians matured 25 or more were amazingly low The same was not valid for more youthful Malaysians. In 2011, among the aggregate work power ages 15 to 24, 9.9 percent were willing to work yet made not have a showing, and the biggest number of unemployed were matured 20-24. The unemployment rate for youthful Malaysians over all instruction levels is moderately high, cresting at 19.8 percent among college degree holders and never dropping underneath 10 percent. 27 The rate of under-business (i.e. those working under 30 hours a week yet willing to work more) for those matured between 15-24 is was 15.1 percent starting 2012 contrasted with 4.6 percent general, proposing that the youthful are likewise disproportionally spoken to in this gathering. During a period when superintendents report troubles discovering high-talented specialists to fill opening, the unemployment rates for late college graduates focuses to potential befuddles in the sort of abilities created by the training framework, and additionally inefficiencies in the conveyance arrangement of aptitudes development (World Bank, 2013).

6. Conclusion

The study initially aimed to investigate to the reason why Malaysia has lagged behind in technological performance.

Firstly, Malaysia's innovation performance are notable but this improvement occurred from a low base. These achievements are not sufficient to allow Malaysia to reach the goal of being a high-income nation by 2020 as stressed in the 10th Malaysia plan. International comparison does not indicate that Malaysia has significantly improved its position relative to other middle-income countries. R&D activities in business enterprises are mainly carried on by foreign enterprises instead of local companies. The presence of MNEs has provided export-oriented platforms, but Malaysia has had limited success in transferring the technological capabilities of MNEs to domestic companies and in creating linkages between MNEs and the domestic economy The share of Malaysian researchers and technicians in R&D remains a fraction of that in industrialized nations.

Second, the quality of the education system is central to the process of technological upgrading. However, the quality and efficiency of education system in Malaysia is still debatable despite of high public sector spending on education relative to GDP. Skills shortages have increased because of the mismatch between the type of education supplied by Malaysian universities and the type of skills demanded by Malaysian industries. Some critics have argued that the real reason for poor performance has been the heavy reliance on foreign companies, especially in the export-oriented manufacturing sector. Moreover, although the rate of tertiary education students in Malaysia is far below the developed countries, the unemployment rate among higher education is quite high. The economic development seems not to be fast enough to stimulate the catch-up process, drive the progressiveness to higher value-added activities associated with design and R&D. Uneven distributed expenditure on education might create an incomprehensive education systems.

The second aim of the research would like to suggest how a middle income country such as Malaysia can catch up using high-tech innovations. In today's quick paced globalized world, the innovation challenge is not an erratic test. Supporting intensity on the premise of expenses has turned into a hazardous suggestion. New players have entered the round of low-cost high-volume production. The Malaysian economy needs to move its comparative advantage from one based on relatively low costs to one based on high value and innovation.

Firstly, strengthen the education system is evitable task. There is a need to allocate more public funding to other level education rather than tertiary education. However, improving the education system inevitably takes time. In the meantime, Malaysia can tap the global talent pool. Nevertheless a comprehensive education system is still a preconditions in order to catch up with the advanced countries. Furthermore, the technological abilities of firms are basic to the advancement process. Technological improvement is not a procedure that can be advanced quickly, but rather requires nonstop ventures by firms in their own particular innovative abilities. Just obtaining new machinery or entering into a partnership with MNEs is likely insufficient to enable catch up with global leaders. Development of technological capabilities additionally augments past the firm level and needs to consider the linkages between firms and other economic agents, joined with every one of the elements and organizations that backing the innovation empowering environment. Notwithstanding helping firms' endeavors to enhance innovative capacities, government can likewise put set up a steady foundation for technological development. . While investment in transport and other energy infrastructure helped in the advancement of conventional commercial ventures and administrations, the accentuation is presently moving to laying the ‘soft’ infrastructure basis for a knowledge-based economy– such as the regulatory and institutional framework for new information and mass communication technologies– and the hard infrastructure necessities, for example, the communications infrastructure.

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