



EXPLAINING MALAYSIA'S PAST ECONOMIC GROWTH AND FUTURE PROSPECTS

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Explaining Malaysia's Past Economic Growth and Future Prospects

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Abstract

Malaysia has witnessed growth even before independence in 1957 but per capita income has risen much faster since independence. In 2014, per capita GDP was 7.5 times what it was immediately after independence. But why didn't Malaysia grow as rapidly as its Northeast Asian neighbors? Had Malaysia been held back by specific government policies? And if government policies inhibited growth, how was it that Malaysia's economy still performed far better than the economies of most of Latin America and Sub-Saharan Africa?

The aim of this paper is to decipher the reasons behind these variations in Malaysia's comparative economic growth with other countries. This essay then seeks to attempt to answer the question of whether Malaysia will eventually catch up with the high income countries of the world or whether it will be caught in the 'middle-income trap'.

Introduction

Did Malaysia or any other country's economy perform well, or poorly, relative to that of other countries? One could also ask whether Malaysia made full use of its potential in promoting growth but a country's potential must also be looked at by comparing it to the highest performing economies at particular times in history. In Malaysia's case there was some growth even before independence in 1957 but per capita income has risen much faster since independence.¹ Per capita GDP in 2014 was 7.5 times what it was, immediately after independence.

But, how does Malaysia's growth performance compare to that of other countries in the world? Compared to the average growth performance of Latin America and Sub-Saharan Africa, Malaysia has done much better. Since 1960, Latin American countries taken together have increased per capita GDP by 2.6 times (2014/1960) and Sub-Saharan Africa by only 1.5 times. Put differently, Malaysia has grown at 3.8 percent per capita over the nearly six decades since independence while Latin America, over the same period, has grown at 1.8 percent a year and Sub-Saharan Africa at only 0.7 percent a year.

The difference between Malaysia's economic growth and that of the other members of ASEAN is less dramatic than the Latin American and Sub-Saharan African comparisons. In terms of per capita GDP Malaysia's per capita income is higher than that of all other ASEAN members except Singapore, but in terms of growth rates Malaysia's performance is similar to that of Indonesia but somewhat lower than that of Thailand over the entire 1960-2014 period (3.8 versus 4.3 percent per year). The data is presented in Table 1.

¹ For Malaysia's economic performance before independence, and its comparison with the period after independence see Nazrin Shah (2010, 2017).

Table 1: Growth Rates of GDP Per Capita (in percent)

	1961-70	1971-80	1981-90	1991-2000	2001-10	2011-15	1961-2015
Indonesia	1.8	<u>5.4</u>	4.4	2.7	4.0	4.2	3.2
Vietnam	N/A	N/A	N/A	<u>5.9</u>	<u>5.9</u>	4.8	N/A
Philippines	1.8	3.1	-0.9	0.8	2.8	4.2	1.7
Thailand	<u>5.1</u>	4.3	<u>5.9</u>	3.5	3.4	2.5	4.3
Malaysia	3.4	<u>5.3</u>	3.1	4.4	2.7	3.7	3.8
Cambodia	N/A	N/A	N/A	N/A	<u>6.1</u>	<u>5.5</u>	N/A
Singapore	4.4	<u>7.2</u>	4.9	4.6	3.4	2.2	<u>5.1</u>

The growth rate for Myanmar is not included in Table 1 because the data is too poor to use but in terms of both GDP growth rates and per capita income, Myanmar would be comparable to Sub-Saharan Africa. Vietnam, Laos and Cambodia have enjoyed higher rates but only since the 1990s. Due to decades of war before 1975 and the disruptions in the 1980s, when Vietnam attempted to impose a Soviet type economic system on Vietnam's south, economic growth there and in Laos and Cambodia was slow or negligible. Brunei is excluded because it is a very small one-commodity economy (petroleum). The reason Malaysia had a higher per capita income in 2015 than Thailand and Indonesia despite having roughly similar growth rates, is that Malaysia started after independence from a higher per capita income base than Thailand and Indonesia. Singapore, in contrast, in the early 1960s, had a per capita GDP almost three times that of Malaysia and it also grew much faster. The basic story of the ASEAN countries that avoided the wars of Indo-China, and the wars and isolation of Myanmar, therefore, is that four of these economies did well despite periods of economic disruption with the exception of a fifth, the Philippines, whose performance was more like Latin America.

When one compares Malaysia with its Northeast Asian neighbors (Table 2), the story is quite different. Japan, South Korea, Taiwan, and Hong Kong, all performing at levels comparable to Singapore and China for the past three plus decades, have done comparably

well but from a much lower per capita income base. The 1961-2015 annual average GDP per capita growth rates for the countries are in Table 2.

Table 2: Growth Rates of GDP Per Capita (in percent)

Countries	1961-70	1971-80	1981-90	1991-2000	2001-10	2011-15
China	1.0	4.3	<u>7.7</u>	<u>9.3</u>	<u>9.8</u>	<u>7.3</u>
Hong Kong	<u>7.7</u>	<u>6.9</u>	<u>5.4</u>	2.3	3.5	2.1
Taiwan	7.0	<u>7.9</u>	<u>6.4</u>	<u>5.7</u>	2.3	4.2
Japan	<u>9.8</u>	3.3	4.0	0.9	0.8	1.2
Republic of Korea	<u>5.7</u>	<u>5.4</u>	<u>7.5</u>	<u>5.1</u>	3.7	2.5
Malaysia	3.4	<u>5.3</u>	3.1	4.4	2.7	3.7

Source: World Bank: WDI online November 2015 except for Taiwan Province

A reasonable question is why didn't Malaysia grow as rapidly as its Northeast Asian neighbors? Was there something fundamentally different about the Malaysian economy that prevented it from doubling per capita income every seven or eight years as had happened in Northeast Asia and Singapore? Malaysia like Northeast Asia had peace and comparative political stability throughout this five-decade period, with natural resources that were far superior to those of Northeast Asia; Malaysia started from a per capita income base comparable at least to South Korea and Taiwan, and at a considerably higher base than that of China. Had Malaysia been held back by specific government policies? And if government policies inhibited growth, how was it that Malaysia's economy still performed far better than the economies of most of Latin America and Sub-Saharan Africa?

The challenge of this essay is to attempt to provide answers for these questions and then to speculate about Malaysia's economic future. In speculating about the future, we will attempt to answer the question of whether Malaysia will eventually catch up with the high income countries of the world or whether it will be caught in the "middle-income trap". The term "middle income trap", while widely used, is seldom defined. We will define it as experiencing a decline in the country's GDP per capita growth rate to a degree where a

country is no longer catching up with high income countries. The CUI or Catch-up Index measures the degree to which a country's per capita GDP falls short of that of the United States.²

In Malaysia's case, the evidence for the middle-income trap from the movements in their CUIs are mixed depending on the data source.³ When the PPP data from Angus Maddison are used, the CUI for Malaysia went from 30.1 percent in 1996 to 33.1 percent in 2010 (the last year that the Angus Maddison data are available), an increase of 3 percentage points from 1996.⁴ When the PPP data from the World Development Indicators (WDI) are used, the Malaysian CUI climbed from 28.6 percent in 1996 to 35.9 percent in 2010 -- an increase of 7.3 percentage points from 1996 -- and then to 41.4 percent in 2014 (the latest year that the WDI data are available).⁵ The data clearly indicate that the CUI for Malaysia has not been stagnant through 2014 at least, and this was also the case for most of the other nations of Southeast Asia, suggesting that Southeast Asia has not been caught in the strictest version of the middle-income trap where the value of the CUI had stayed unchanged over time (Myanmar was in a low income trap for several decades however). Much of Latin America, in contrast, has been in the middle-income trap for decades. Malaysia, however, is still a middle income country; there are reasons to be concerned that it may be heading for the trap.⁶ It is the most important question that this essay will try to answer.

To begin to try to answer these questions about Malaysia's overall economic performance, we start with an analysis at a macro or economy-wide level looking at some of the characteristics of Malaysian society and institutions that have influenced growth. We then

² The CUI Index was first used to our knowledge by Wing Thye Woo (2011) to express the standing of living in a country as a percentage of the US standard of living, with GDP measured in PPP\$.

³ More details are available in Woo (forthcoming)

⁴ The original historical dataset constructed by the late Angus Maddison has been updated to 2010 by the Groningen Growth and Development Centre, and the revised version is available at: <http://www.ggdcc.net/maddison/maddison-project/home.htm>

⁵ In the 1996-2010 period, the CUI for Thailand went from 27.0 percent to 30.7 percent according to the Maddison data (an increase of 3.7 percentage points from 1996); and from 21.3 percent in 1996 to 25.5 percent in 2010 (an increase of 4.2 percentage points from 1996) and then to 26.3 percent in 2014 according to the WDI data.

⁶ A more detailed exploration of the CUI measurements from the two different datasets is found in Woo and Lee (forthcoming). Woo (2014) is a discussion of the challenges that China faces in order to avoid the middle-income trap.

turn to a quantitative analysis of the degree to which Malaysian growth resulted mainly from high levels of investment; or whether it also enjoyed rising productivity. These macro level analyses, however, take us only a limited distance toward an answer so we then turn to an in depth analysis at a more micro level of Malaysia's industrial and service sector performance. That analysis provides a basis for an analysis of the prospects for Malaysia avoiding the "middle income trap" and moving steadily up to high income status.

Analyzing the Sources of Malaysia's Growth Performance

The central issue of this essay is whether the growth performance of Malaysia described above reached its full potential or not, but before turning to that question it should be noted that by any reasonable standard Malaysia's economy has grown fast enough to fundamentally change both the structure of the economy and the standard of living of most of its people. In a period of nearly six decades Malaysia has risen from a country where a large majority of the population was quite poor and average per capita income of the entire population, calculated at the official exchange rate with the US dollar, was US\$1400 (in 2010 prices). The structure of the Malaysian economy has been transformed from one dependent on agriculture and tin mines to one dominated by the growth and share in GDP of industry by the 1990s. That transformation was followed by a second shift where growth since 2000 is driven more by services. The share of manufacturing in GDP leveled-off, and then in 2006, began to slowly decline. Agriculture, despite a country covered with palm-oil plantations and small holders, has fallen to only 10 percent of GDP (see Figure 7). Mining has remained a large share of GDP at 16 percent largely because of the rise of the petroleum sector beginning in the 1980s.

Malaysia's growth, however, has been quite volatile at least in comparison with the Northeast Asian economies that were going through a similar transformation of their economic structure and doing so at roughly the same time. As Figure 1 shows, the Malaysian growth in the 1960s when rubber and tin dominated the economy fluctuated from year to year with the prices of those two commodities. Since then commodity price movements have played a lesser role although fluctuations in the price of oil still have significant influence on Malaysia's economic growth rate. The rising role of exports of

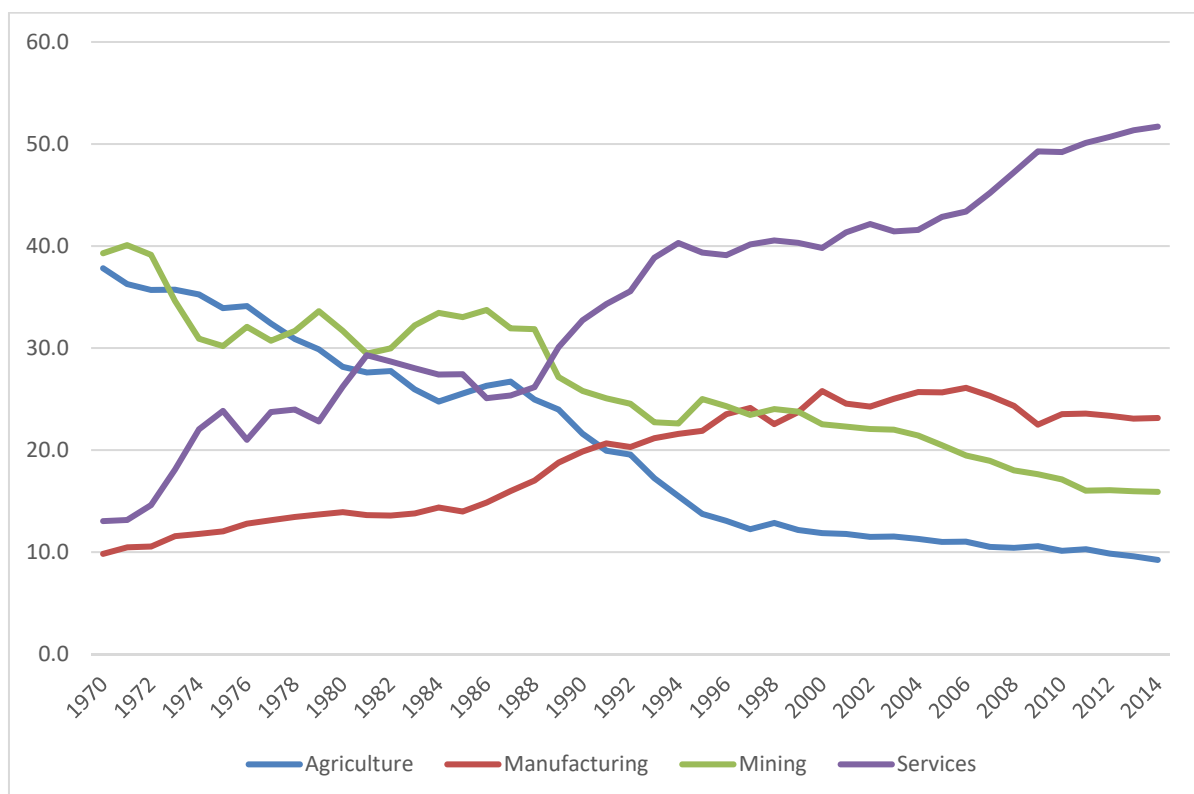
manufactures, however, has made Malaysia subject to income fluctuations in high income countries that buy most of Malaysia's exports and that accounts for recessions in Malaysia in 1975, 2001 and 2009. Two major recessions in Malaysia, however, were generated mainly by actions within Malaysia itself. The sharp downturn in 1985 was directly due to a government austerity policy made necessary by the rapid buildup of debt resulting from the heavy industry program. The much sharper recession of 1998 was driven by policies of government and business that made Malaysia subject to the panic that also engulfed a number of other financially vulnerable countries around the world.

Growth instability and even sharp recessions such as that which occurred in Malaysia in 1998, however, do not necessarily lower the long term growth rate over what it would have been in the absence of a downturn. Malaysia recovered quickly from the two recessions of 1985 and 1998 that largely resulted from its own policies. Recessions in Malaysia generated by global recessions largely reflect the fact that it is difficult to increase exports rapidly if global incomes are stagnant or falling. Put differently, Malaysia potential growth rate as well as its actual growth rate falls in such circumstances.

The fact remains that the GDP growth rate of Malaysia since independence has been slower than that of the northeast Asian economies and by a substantial margin. The data are in Figure 1. In only one decade, the 1970s, did Malaysia match the 5 to 9 percent per capita GDP growth rates that characterized the northeast Asian countries' catch up decades. At the beginning of the 1960s Malaysia had roughly the same per capita GDP as Taiwan and Korea while by 2014 Korea and Taiwan's per capita income was three times higher.⁷ Hong Kong and Singapore had even higher per capita income in 2014 relative to Malaysia (roughly 5 times higher), but their income in 1960 was already roughly 2.5 times higher.

⁷ This comparison using data from WDI online is in terms of per capita GDP in constant 25 US dollars converted into US dollars at the official exchange rate. A comparison using GDP measured in purchasing power terms might be more reliable but is only available beginning in 1990. By 1990s Malaysia's GDP per capita in purchasing power parity terms was already roughly half that of Korea.

Figure 1: Sectoral Share, Gross Domestic Product, Malaysia, 1970-2014 (percent)



Source: Bank Negara Malaysia, various issues

But we still don't have an explanation for why Malaysia's growth was significantly slower. For that purpose, there are several different methodologies that can get us to a tentative if far from definitive answer. Those methodologies are,

- (a) There have been many attempts to run regressions where GDP per capita is the dependent variable explained by a number of independent variables. These equations have tested a wide variety of variables using this approach. Many of the results are not robust but they do give some indication of what is important for growth.
- (b) There have also been many calculations using the methodology first developed by Solow (1956, 1957) that attempted in what is basically a growth accounting exercise to differentiate the sources of growth between those brought about by increases in capital. The labor force from those brought about by increases in the productivity of those inputs is called total factor productivity.
- (c) Because productivity growth has been a central element in GDP growth, it is important to understand the nature of that productivity growth. Productivity

growth in high income countries is largely driven by technological innovation. In middle income countries the role of technological innovation becomes increasingly important as a nation approaches high income status and is in fact essential to attaining that status. Malaysia is near to becoming a high income economy; thus understanding innovation there is essential for understanding not only its growth performance during the last two decades, but also understanding whether or not the country has the innovation potential to continue growing rapidly as it approaches high income status. To understand innovation in Malaysia, one must not only understand Research and Development (R&D) in the country and the quality of the institutions doing R&D, but also go beyond this to an understanding of the educational institutions that are producing the people who are carrying out innovation through R&D. The discussion of these issues will make up the last part of this essay since it is not only necessary for understanding past performance but is essential for understanding Malaysia's future prospects.

Variables identified econometrically that explain GDP growth

The challenge in using regression techniques to identify the sources of GDP growth is that there are a great many policies and institutions that have some influence on growth and they interact with each other as well as independently. Furthermore, many critical institutions such as governance and the quality of governance are very difficult to quantify so that they can be included in an equation. Even a variable such as education where it is possible to measure such things as enrollment, the data simply don't exist in sufficient quantity to measure the quality of the education received by those enrolled and the quality of education for such things as R&D innovation is more important than the quantity. That said, the method does allow one to identify key policies and institutions that are likely to influence growth either positively or negatively.

Our approach will be to discuss Malaysia's performance with respect to the variables that have proved to be the most robust in explaining growth of those estimated by the many scholars who have run these regressions. In deciding which variables have been the most robust, we will follow the work of Xavier Sala-i-Martin who tested these variables against

thousands of different combinations.⁸ In discussing these variables we will also use our own historical knowledge both in the order in which we present the variables and in interpreting what the variables actually mean in terms of how they influence growth.

We will begin with the political variables, variables that cover a wide range of different political activities and institutions and include the rule of law, political rights, civil liberties, and the number of revolutions, military coups, and wars. These are significant contributors to growth when the investment rate as a fixed variable is left out of the equation and some are not significant when the investment rate is included. This latter estimate results from the fact that the investment rate is a clearly endogenous variable because the investment rate is determined mainly by the opportunities for profitable investment in the country and that in turn is heavily influenced by the other variables, including the level of per capita income, the dependent variable being estimated. We will ignore this statistical problem and discuss the level of investment separately; using the results mainly from the regressions that were run without the investment rate variable.

Malaysia has had a stable government throughout most of its independent history. There have been no wars, coups or revolutions, and the only major political disturbance that influenced the nation in a major way were the riots of May 13, 1969. Those riots, while leading to major policy changes, did not lead to a change in government other than the retirement of one Prime Minister and the succession of a Deputy Prime Minister. Elections in Malaysia have been relatively free, and the votes as accurately counted as in many other democratic countries, although incumbent governments also use their power and resources to tip the scales in the government's favor. Civil liberties and political rights are not as respected as in, say, the Scandinavian countries or Western Europe more generally, but they are as or more protected than in a wide spectrum of developing countries. Malaysia also began independence with a strong legal system and, while the rule of law in

⁸ Sala-i-Martin (1997a) "I Just Ran Four Million Regressions," In this work he uses three different criteria for judging. The extreme bounds calculation in essence produces no significantly robust variables, but the methods that use more conventional methods such as 95 or 99 percent, the probability of being different from zero do produce over 60 variables. These more conventional criteria in this essay start with three fixed variables (level of income in 1960, level of education in 1960, and life expectancy in 1960). One additional fixed variable (the investment rate) is included in one set of regressions and excluded in another.

the country was clearly weakened during the 1980s and 1990s, the Malaysian legal system in 2016 is still much stronger than in most other ASEAN countries, Singapore excepted.

The one political variable that was not tested by Sala-i-Martin but is almost certainly significant in the Malaysian case is that the country has deep ethnic divisions and the government has been dominated throughout post-independence by the most economically disadvantaged economic group. There have been regressions run with ethnic differences as a variable, but there are only a few where the disadvantaged ethnic group ruled the country. This variable has clearly shaped much Malaysian economic policy as our brief review of Malaysia's growth history will make clear.

The second set of significant variables that also clearly helps explain Malaysian growth are those that deal with a country's approach to policies that make markets work efficiently and avoid policies that distort market signals in a major way. Those variables include "real exchange rate distortions", "deviations of black markets" from legal markets, and the "number of years the economy has been open" (meaning mainly that international trade has not been restricted by major barriers to imports or foreign investment). Malaysia has been relatively open throughout its history, in part because it began independence as a country with strong exports and foreign exchange earnings and has continued to actively promote exports ever since. Malaysia has also had a Central Bank and Ministry of Finance, that, for the most part have conducted stable macroeconomic policies that avoided major government deficits and high inflation that in turn would have led to distortions in the exchange rate and other markets.

Malaysia has also to a substantial degree remained a country that has relied on the private sector rather than on state owned enterprises and thus scores relatively well on the "degree of capitalism" variable. There have been notable exceptions such as the early years of the heavy industry drive that relied on state-owned enterprises but these periods were relatively brief. In addition, as we shall see later, the government has played a very large role in the economy even if much of the ownership remains private.

A variable that has a clear negative impact on growth is the “fraction of primary products in exports” or the “fraction of mining in GDP”. The larger the fraction, the lower is the growth rate. This is the “resource curse” that has been written about for many decades and has often been labeled the “Dutch disease” because of the impact large oil discoveries in the North Sea had on Dutch manufacturing. Natural resources or commodities are a problem mainly because their prices fluctuate widely. When prices are high a country’s exchange rate tends to strengthen, thus weakening the competitive position of manufactured and agricultural exports. More importantly high prices, particularly if the profits or rents go directly into government coffers, lead to booms in spending that are often poorly planned. Booms also tend to generate corruption opportunities as government officials and companies close to them take steps to move the surpluses into their own pockets. When prices fall, the boom comes to an end and half-finished projects often have to be stopped but corruption remains even if the returns are lower.

Because Malaysian macroeconomic policies have generally been well managed, the exchange rate has not been a major problem and manufactured exports, notably electronics, have remained highly competitive. High oil prices, in contrast, have created large rents that have helped fuel such problematic policies as heavy industry drive. More importantly they have, to some degree, been indirectly siphoned off to pay for many of the large subsidies to Bumiputera companies and the goal of increasing Bumiputera ownership, that, among other things, made Malaysia vulnerable to the 1997-1998 financial crisis. Whether the impact of oil rents in Malaysia was positive or negative for growth depends on what would have happened if the rents had not existed. Would the large subsidies to Bumiputera been pursued with equal vigor, in which case, the oil rents helped to relieve what otherwise might have been a large budget deficit or cuts in essential investments and services? If those Bumiputera subsidies had been cut back, such events, such as the 1997-1998 financial crisis, might have been avoided, although the political implications of those cutbacks could have led in other unpredictable and possibly damaging directions. Overall, one can clearly state that the handling of Malaysia’s resource wealth in general, and petroleum rents in particular, may have been flawed, but not to any

degree comparable to what happened in Nigeria or in Iran under the Shah, among the many other countries that have mismanaged their resource wealth.

In the Sala-i-Martin analysis, there were also three fixed variables that had a significant relationship with growth: the per capita GDP at the beginning of the growth period (1960), the level of education in 1960, and life expectancy in 1960. The lower is the level of per capita GDP, the faster is the rate of growth relative to high income countries. This may explain in part why China grew more rapidly since it had a much lower level of income in 1960 (or 1978) than did Malaysia. On the other hand, Korea and Taiwan had incomes similar to those of Malaysia in 1960 but they grew more quickly. Furthermore, growth rates do not come down gradually in most cases as the typical regression implies, they come down more abruptly as in Japan in the 1970s and Korea in the 2000s and China in 2014 and 2015.

A country with a higher level of education at the beginning of the period being measured clearly has an advantage over a country with a lower level of education; the faster the quantity and quality of education increase over subsequent years give even greater advantages. The regression equations, however, can only measure the impact of the initial level of education because the increase in the quality of education is clearly endogenous. A similar situation exists with the life expectancy variable. Healthy individuals clearly are more effective members of the work force both physically and mentally and the healthier the better, but only the initial level is measured. Malaysia by the standards common in the world in 1960 had both a fairly high level of education and of health, but not the level and quality of education found in Korea, Taiwan, Hong Kong and Singapore in 1960. We shall return to Malaysia's education situation at length later since it is almost certainly even more important for the country's future performance than it has been for its performance over the past half century.

Finally, a few variables such as religion and whether a country was a former colony of Spain rather than Britain or France have some significant influence on economic growth. The Confucian religion variable is in fact the only variable that is significant using the

extreme bounds test. It is highly unlikely that the religious variables have anything to do with the actual content of the religion for reasons that would sidetrack us from the main purpose of this essay. Religion is probably, in this context, a proxy, for the overall culture of a society and culture does affect politics often in significant ways. Politics, in turn, affects such things as economic policies. But one cannot talk of a single religion in Malaysia since there are Confucians (which is more a philosophy than a religion), Moslems, and Hindus among others. There are certainly substantial differences between the cultures of Malaysian Malays, Chinese, and Indians, and in how they interact, but the regression analysis is of no help in assisting us to understand how these differences and interactions affect growth. For that purpose, in depth historical analysis is far more useful.

To sum up this discussion of where Malaysia fits into the cross country regression analysis of economic growth, overall Malaysia has performed favorably in the dimensions measured by these equations. The political institutions, the lack of major distortions in key prices such as the exchange rate, the reliance on the private sector rather than state enterprises, and the level of education and health, all help explain why Malaysia has experienced a level of sustained economic growth far above that of most of Sub-Saharan Africa and most countries in Latin America. These equations, however, do not provide much of a guide as to why Malaysia has performed substantially less well than most of the northeast Asian economies or Singapore. They also tell us little about what Malaysia should do if it wanted to accelerate growth closer to the levels of the northeast Asian economies.⁹

It is also the case that the significant variables in these regressions were significant for a particular moment in time, the last half of the twentieth century and the beginning decade of the twenty-first. There is no reason to believe that all of these same variables would apply equally well to explaining growth, such as it was, in the first half of the twentieth century that was dominated by two world wars and the great depression. Nor are they

⁹ The variables used in the regressions confirm that certain approaches such as reliance on state owned enterprises, large restrictions on international trade, or low levels of education are bad for growth. But they don't give much guidance as to how to improve policies and performance if the desired general approaches are in place.

necessarily all of the right variables to explain growth over the next several decades if those decades turn out to include long periods of economic stagnation in most of the high income countries, together with rapidly aging populations in those same countries. We will return to this subject at the end of the essay.

Growth Accounting Explanations of Economic Growth

A very different approach to explaining how countries achieve higher growth is the growth accounting method pioneered by Robert Solow. The basic idea of this method, as explained earlier, is to separate out the contributions to growth of inputs of capital and labor from the contribution of the productivity of these inputs termed total factor productivity. One virtue of this methodology is that it brings investment back into the discussion, and, more importantly, it brings back technological change including improvements in management efficiency and government policies. The central question Solow attempted to answer for the United States and the one that we are most interested in is whether Malaysian economic growth has been determined by large levels of investment and a rapid increase in the labor force, or has it been largely driven by increases in productivity. For Solow higher productivity largely meant improvements in technology, but for developing economies such as Malaysia, it clearly includes much more than technology such as improvements in management practices within firms and in government policies toward the economy.

In the cases of Korea, Taiwan, and China, there is no question that what led them to decades of near double digit growth started with major changes in government policies that in turn led to a large jump in total factor productivity (TFP). Over time, the impact of major policy reforms tapers off and capital investment plays a larger role. In the cases of South Korea and Taiwan, the large jumps in TFP occurred first in the early 1960s when both economies went from inward looking policies and overvalued exchange rates to open economies, at least for exports, including major devaluations of their currency. As time passed, the role of TFP fell and that of investment or capital formation rose until the mid-1980s, when there was a major effort to further open and liberalize the two economies with another jump in TFP followed by another tapering off in the role of TFP. For China, the late 1970s was a major turning point as China began to abandon the policies and institutions of a Soviet

type economy in favor of opening up the economy and relying more on market forces. The investment rate before and after these radical reforms was much the same but the growth rate roughly doubled initially because of large jump in productivity. The large jump in productivity, as in Korea and Taiwan, created more and better investment opportunities, and over time the contribution of investment capital rose until the next major reform.

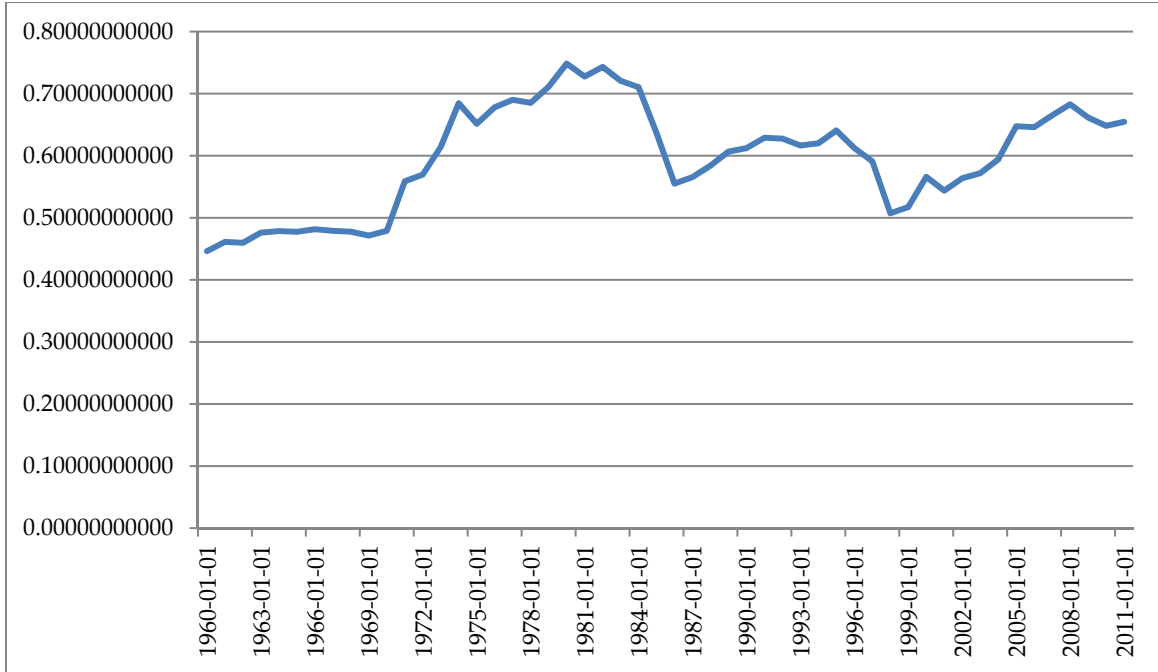
Many growth accounting exercises simply mechanically measure the contributions of capital, labor, and TFP over a long period of time and reach conclusions about the nature of growth from whether the long term contribution of capital or TFP is higher or lower than some other country or that the contribution of capital is larger or smaller than the contribution of TFP. These calculations often ignore data from earlier years when major reforms were undertaken usually because the data for those earlier years are not as reliable as for later years. There seldom is any effort to relate the periods covered by the calculations to major changes in policies or other conditions that could have a major impact on economic performance.

In the case of Malaysia, there are three major changes in policies, institutions, or the stage of development that plausibly could have a significant impact on the sources of growth. They are first, the introduction of the New Economic Policy (NEP) after the riots of May 13, 1969 that coincided with the beginning of a larger effort to promote manufacturing and manufactured exports mainly by foreign direct investment firms.

The second major policy change was the push to develop heavy industry that began with Prime Minister Mahathir's term in office that started in 1981. That term ended in 2003 but by then Malaysia's per capita GDP was at a level where the period of catch-up growth largely had come to an end and growth from then on was likely to slow down and future Malaysian growth would depend increasingly on innovation. Another large influence that should affect the relative role of capital and TFP was the price of natural resources, notably the price of petroleum in the years after the 1960s. A major jump in prices of natural resource exports, other things being equal, will lead to higher growth even if the rate of investment does not itself increase. Figure 2 presents separately one estimate of the

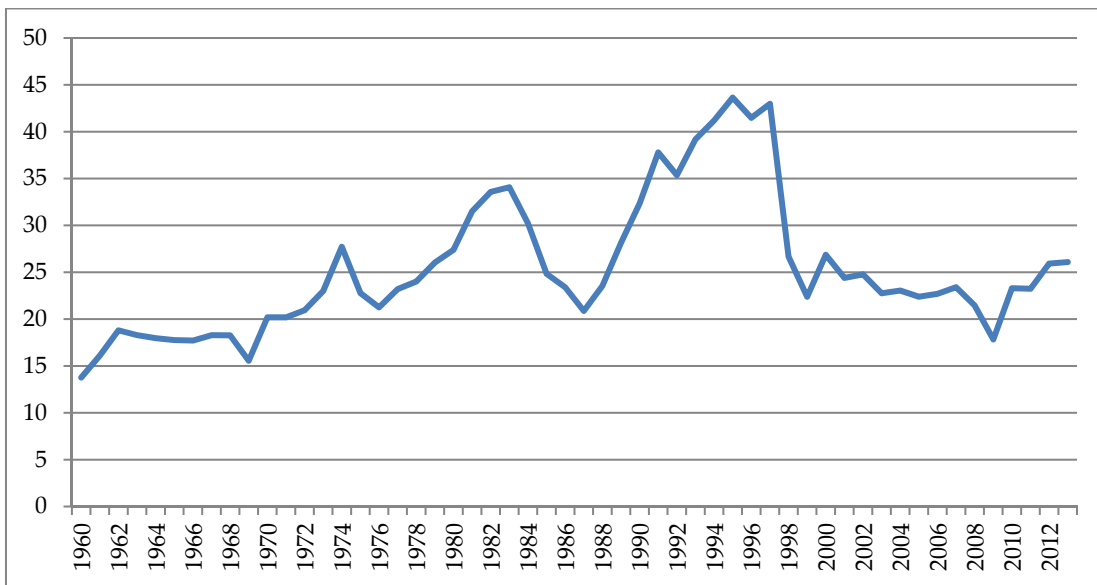
contributions of TFP to Malaysian growth and another (Figure 3) of the rate of gross capital formation as a share of GDP.

Figure 2: Malaysian Total Factor Productivity



Source: University of Groningen, University of California, Davis, "Total Factor Productivity Level at Current Purchasing Power Parities for Malaysia" at research.stlouisfed.org (January 2016). The data are from Robert C. Feenstra, Robert Inklaar and Marcel P. Timmer (2013), "The Next Generation of the Penn World Table" available for download at www.gdc.net/pwt.

Figure 3: Gross capital formation (percent of GDP)



Source: World Bank, WDI online (January 2016)

Both the rate of gross investment and the level of total factor productivity began rising in the early 1970s despite the introduction of the NEP which many probably expected would both hurt investment and lower productivity. This is also a period when foreign direct investment rose from two percent of GDP to six percent in 1974 and then fell in the mid-1970s, no doubt mainly because of the OPEC generated increased prices of oil and the resulting global recession (Malaysia was not yet a large producer or exporter of petroleum), but these investments quickly renewed their rise.

Total factor productivity continued its rise peaking in 1980 but staying at that level until it plunged in 1985 and the rate of gross capital formation rose similarly but began falling a bit earlier. Gross capital formation then rose to its highest level, either before or since, of over 40 percent of GDP before plunging, during the 1997-1998 financial crisis, to 18 percent (in 1999) and has hovered mostly just below 25 percent in the years since then although it rose to 26 percent in 2012 and 2013. The pattern of TFP was similar except for the investment boom of the 1990s when TFP rose only modestly before falling during the financial crisis. Foreign direct investment peaked earlier in 1992 then fell sharply and has averaged below 4 percent of GDP ever since.

Basically these patterns are consistent with the view that the initial drive for manufactured exports in the 1970s made possible rises in both investment and TFP but while investment during the activist government industrial policies of the 1980s and 1990s rose for a brief time to a very high level, productivity first leveled off and then fell sharply in the mid-1980s and stayed down although it remained positive. With the end of the activist industrial policies, productivity did rise and did so despite the global recession that began in 2007-2008. Oil prices it should be noted remained relatively low from the mid-1980s until just after the 1997-1998 financial crisis when they began rising rapidly.

Table 3: Malaysian TFP Growth Rate Estimates (percent)

	1960s	1970s	1980s	1990s	2000s
Economic Planning Unit				1.1	1.3
Jungsoo Park		2.52	0.77	1.99	2.32
University of Groningen, et al	0.471	0.632	0.66	0.597	0.745
Raja Nazrin	2.4	1.4	3.2		
Chan	0.09	-0.26	3.79		
Collins and Bosworth	1	0.4	1.4		
	1960-1994				
Nicholas Crafts	0.9				
	1960-1989				
World Bank	1.1				
		1970-1985			
Alwyn Young		1			
	1960-1994				
Collins and Bosworth	0.9				
					2000- 2012
Ismail, Sulaiman and Jajri					1.6

Source: Economic Planning unit data are for the 7th and 8th Malaysia Plans and cover the years 1996-2000. Jong Soo Park (2010) data for 2000s are for 2000-2007. University of Groningen, et. al. is for 2000-2011 in 2000s column. Collins and Bosworth year breakdown is 1960-1973, 1973-1984, 1984-1994. Rajah Nazrin year breakdown is 1962-1970, 1971-1986, 1987-1997. Shen Ai Esther Chan year breakdown is 1961-1970, 1971-1986, and 1987-2000.¹⁰

It is impossible to attribute causality to these correlations although the domestic investment boom of the 1990s was clearly driven mainly by domestic forces including the government. Overall total factor productivity was positive but modestly so. How that compares with other developing countries requires explicitly comparative estimates using similar methodologies. A number of the many growth accounting estimates for Malaysia are

¹⁰ Economic Planning Unit, Ninth Malaysia Plan (Putrajaya, 2006); Shen Ai Esther Chan, "Multifactor Productivity and Idea Transmission Channels in the Malaysian Economy", Masters Thesis, Singapore Management University, 2009), Rajah Nazrin, "Essays on Malaysian Economic Growth in the Twentieth Century," Doctoral Dissertation, Harvard University, 2000; Nicholas Crafts, "East Asian Growth Before and After the Crisis," International Monetary Fund Working Paper, 1998; Jongsoo Park, "Projection of Long-Term Total Factor Productivity Growth for 12 Asian Economies, Asian Development Bank, Working Paper Series No. 227, 2010; Rahmah Ismail, Noorasiah Sulaiman, and Idris Jajri, "Total Factor Productivity and Its Contribution to Malaysia's Economic Growth," Research Journal of Applied Sciences, Engineering, and Technology, 7(23), pp. 4999-5005, June 2014; Susan M. Collins and Barry P. Bosworth, "Economic Growth in East Asia: Accumulation versus Assimilation," Brookings Papers on Economic Activity, 1996, Volume 27, issue 2, pp. 135-204;

presented in Table 3. The specific TFP estimates often differ in part because the methodologies used differ. The primary conclusion from these various estimates is that most estimate that total factor productivity was fairly low in Malaysia throughout the post-independence period at around one percent per year.

The Collins and Bosworth, Chan and Nazrin estimates all show a decline in TFP that appears in Table 3 as in the 1970s, but is actually probably mainly a reflection of the early 1980s since their period breakdown goes from 1971 through 1984 or 1986, thus capturing the impact of the first years of the heavy industry campaign. There also appears to be a modest pickup in TFP growth after the year 2000. Is one percent a high or low rate of productivity growth? It is lower than that of China in recent decades, or South Korea and Taiwan during their high growth decades, but higher than that of Africa where TFP growth has been negative throughout the post-independence period, and of Latin America which averaged only 0.2 percent per year from 1960 through 2000.¹¹

The overall conclusion from this brief look at the growth accounting literature for Malaysia, therefore, is that Malaysia's productivity performance has been consistent with its GDP growth rate performance. Malaysian has done better than large parts of the developing world, but has fallen short of the high performance of the Northeast Asian economies during their high growth period. TFP growth during a country's rise from low income to lower middle income and then to higher middle income status is driven by improvements in policies, incentives, and management that accelerate the adoption of well-known technologies and uses them with increasing efficiency. It is largely not due to the development of major advances in that technology. To understand how Malaysia has performed in that regard, however, this aggregate analysis is inadequate. We need to look more closely at a more micro level as to just what Malaysian technology upgrading has involved particularly in the manufacturing sector. Before looking in depth at the micro level at Malaysia's technological performance, it is first necessary to review the fundamental changes in development policy over the past decades and in the structure of ownership of Malaysia's modern sector.

¹¹ Barry P. Bosworth and Susan M. Collins (2003), Table 1.

Economic Growth and Evolving Shifts in Ownership: A Brief History

At the time of independence in 1957 and throughout the 1960s Malaysia was a classic natural resource dependent economy. Tin had been discovered long before independence and had been developed at first by Chinese miners using the chain pump, followed by gravel pumping and hydraulic sluicing technologies, and since 1912, increasingly by large mostly British owned dredges (Thoburn, 1977). Demand for tin rose rapidly with the development of such products as tin cans used by the Western food processing industries. The development of the automobile, and the resulting need for rubber for tires, led to the rapid development, in Malaysia, of large rubber plantations, mostly British owned, and also many of Malaysian small holder rubber planters. GDP growth was higher when rubber and tin prices were higher and slowed when these prices fell. Private investment fluctuated with tin and rubber prices with a one-year lag. There was a modest effort to develop manufacturing following the enactment of the pioneer industry ordinance that involved some restrictions on trade designed to promote infant industries and was also in part designed to attract foreign investment. Overall, however, the economy was generally open, with few restrictions on imports, thanks in part to the large foreign exchange earnings from rubber and tin.

Urban businesses were largely in the hands of foreigners, mainly British, or local Chinese-Malaysians. Agriculture was primarily a Malay occupation of small holders, some of whom owned their land, but many who rented from mainly Malay landlords. Occupations generally were closely associated with ethnicity, with Chinese-Malaysians dominating most urban commerce, construction, and what little industry existed, while foreigners dominated the large rubber estates and tin mines, and Malays dominating government employment, food based agriculture and most rubber smallholders. Politically the country was ruled by an alliance of the United Malay National Organization (UMNO) (the dominant partner representing the Malays), the Malaysian Chinese Association (representing the Chinese) and the Malaysian Indian Congress (representing the Indians) and was friendly to private business and foreign investors. This alliance mainly carried on the economic policies of the past but with some modest efforts to

improve the low economic status of the majority Malay population. Singapore, Sarawak and Sabah joined Malaya to form Malaysia in 1963, but Singapore left to become independent in 1965. Since that time, there have not been any changes in the boundaries of the Malaysian state.

The elections of 1969 brought about a fundamental political change that had immediate and large ramifications for economic policy and ownership of the economy. The change, however, was not through the ballot box but resulted from the large scale riots and killings caused mainly by response to the elections in the state of Selangor. The fear that the violence connected with these riots instilled in all parts of the population led to a consensus, or at least acquiescence, on the part of not only the Malay majority, but also the Chinese-Malaysian minority; a major effort was needed to deal with the disadvantaged economic position of the Malays. This took the form of the New Economic Policy (NEP), which was designed not just to raise the economic position of the poorer parts of the Malay population (hereafter referred to as Bumiputera), but also had the stated goal of eliminating the relationship between ethnicity and occupation. Introduced in 1971, the NEP controversially called for the elimination of the relationship between ownership of business assets and ethnicity since most of these assets up to that time had been in the hands of foreigners and Chinese-Malaysians (Malaysia, 1971).

The NEP itself was eventually replaced by other programs and laws but the principles it enunciated have remained in force up to the present. Some of the provisions of NEP were not particularly controversial. Affirmative action and outright quotas designed to hire more Bumiputera in manufacturing and in urban business fit well with the boom in labor intensive manufacturing that was getting underway in earnest in the 1970s. Young Bumiputera women, for example, were quite suitable for the kinds of assembly jobs then opening up in export-oriented manufacturing firms. Expanding Bumiputera education at the primary and secondary level was not an issue either, although there was controversy over the increased use of the Malay language in instruction at those levels. The Chinese and Indian minorities, however, had little difficulty mastering Bahasa Malaysia when required. There were complaints that the less well educated Bumiputera experienced a

decline in English language ability, but, even if true, it is unlikely to have affected economic growth in a major way, at least initially. Education policies at the tertiary level were a bigger issue but they will be discussed in a later part of this essay. The main negative aspect of policies concerning the public universities since was the lowering of qualifications for admitting Bumiputera using the argument that their performance would only be better if they had enjoyed the same resources. Once weak Bumiputera students were admitted into university, especially in the professional disciplines of medicine, engineering and business, the pressure to pass them was considered to have undermined standards of graduates entering the job market in Malaysia (Selvaratnam, 2015; Rasiah, Norma, and Chandran, 2015).

The ownership component of the NEP was not only controversial but had a direct and more or less immediate impact on the structure of industry. It became official when the Industrial Coordination Act was promulgated in 1975 (Chee, 1986). The provision required firms with a certain size, which was raised from RM100,000 in 1975 to RM1 million in 1986, when they invested in new capacity to set aside 30 percent of the shares generated to finance the expansion for sales to Bumiputera. Initially this meant subsidized selling of shares to the few rich Bumiputera who could afford them but the Bumiputera who received the shares often simply then sold the shares on the market at market prices, taking their profits and leaving the firm's owner to find another group of Bumiputera shareholders. That problem was remedied by creating unit trusts that would buy shares for the Bumiputera who would be given shares in the unit trusts. The unit trusts were managed by PNB, a generally well-run public company. Still the incentives for Chinese-Malaysian owned firms were clearly negative although it would require large scale micro analysis of firm behavior if one were to attempt to measure the impact of this ownership measure on the level of investment by private non-Bumiputera firms.

Firms that exported at least 80 percent of their output were exempt from this ownership provision. Few domestically owned firms in Malaysia, however, were exporters. This provision was mainly designed to avoid scaring off foreign direct investment in manufacturing for export. Also the government created Free Trade Zones and Licensed

Manufacturing Warehouses to attract foreign export-oriented firms who largely exported. The purpose was to create jobs as Malaysia's market was too small for these firms. Examples include National Semiconductor, Intel, Texas Instruments, Penfibre and Penfabric. The location choice of foreign export-oriented firms also was determined by ease of policing tariff-free operations (Malaysia, 1976). Foreign investors in rubber and tin and later palm oil were of less concern to the government but the Bumiputera ownership objective for some of the large estates and mines was handled differently. The Malaysian government itself together with private domestic firms took the initiative to transfer these assets to domestic ownership with such actions as the Dawn Raid on Guthries where the government bought majority shares in a number of major plantations. Seizing these assets by legal means probably had little impact on their contribution to economic growth because they were commodities that sold on world markets at world prices and the technology of production was well understood locally. There was no particular benefit to Malaysia of foreign ownership in these areas by the 1970s.

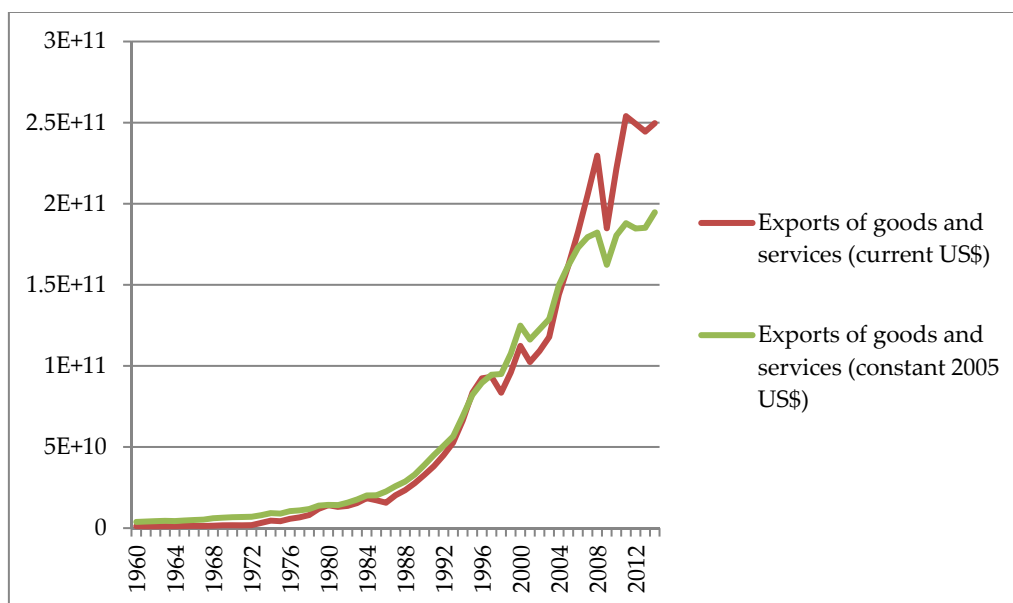
For manufacturing it was a very different story. Malaysian businesses on their own did not have easy access to foreign markets nor did they have much experience producing manufactured products for foreign markets. Domestic firms could have made arrangements to work with foreign buyers to gain access to markets in the US and Europe and they could have bought the necessary technology and management expertise as happened in South Korea and Taiwan. But, for the most part Malaysian did not do so. Most domestic manufacturing firms around the world first develop products for their local markets often behind trade barriers that protect them from outside competition. Some import substituting firms of this sort remain content behind these barriers, but if the incentives are right as they were in South Korea, Taiwan, and later China, they expand to overseas markets as their increasing efficiency and falling costs make them internationally competitive. Any measure that inhibits steady expansion, and Malaysia's NEP ownership provisions certainly did inhibit expansion, makes it that much more difficult for domestic firms to become exporters. Also, institutional change, especially in education and R&D support, facilitated technological upgrading in South Korea and Taiwan (Vogel, 1991). Despite aggressive efforts investment into such activities failed to provide the same

support for Malaysian firms. Whatever the cause, most exports of manufactures coming from Malaysia have from the beginning been dominated by Foreign Direct Investment firms mainly from Japan and the United States. Malaysia was attractive to foreign investors for a number of reasons. It had inherited a comparatively good physical infrastructure from the colonial period, most educated people were fluent in the English language, and the economy was open and repatriation of profits was not difficult. Over the next several decades Malaysia has steadily improved its physical infrastructure particularly in the transport area, and the economy, including capital markets, has remained open, with notable exception of the immediate aftermath of 1997-1998 financial crisis.

As the data in Figures 4 and 5 make clear, Malaysia's exports rose rapidly in constant dollar terms dipping modestly in 1999-2002 and then, after recovering and growing rapidly, dipped more sharply during the global economic recession of 2007-2009. Manufacturing exports rose from a miniscule 5 percent or less of total merchandise exports in the 1960s to over 20 percent by the end of the 1970s, and 80 percent by the end of the 1990s. With the exception of petroleum and palm oil exports, most of Malaysia's export growth in constant prices over four plus decades (2014/1970) resulted from Foreign Direct Investment and not domestic manufacturers. In the absence of this rapid FDI generated growth in manufactured exports, Malaysia's overall economic growth would almost certainly have been much slower and there is no reason to think that domestically owned manufacturers would have been in a position to step in and replace the FDI exporting firms.¹²

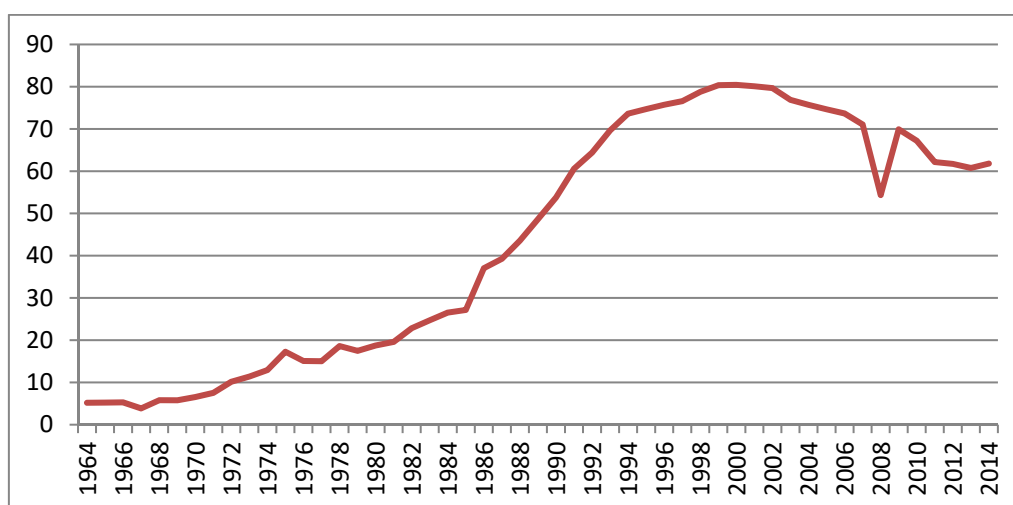
¹² Any attempt to measure what would have happened to growth in Malaysia in the absence of FDI in manufacturing for export would require building a general equilibrium model since the impact would have been felt throughout the economy, notably in the service sector, and not just in manufacturing. But even with such a model there would have to be in depth analysis of a highly speculative nature as to just how domestic, mostly Chinese-Malaysian owned manufacturing firms, would have responded and that in turn would depend on a wide range of policy variables such as the exchange rate, the nature of protection of the domestic market, etc.

Figure 4: Malaysian exports of goods and services (Current and constant 2005 US\$)



Source: World Bank, WDI online, January 2016.

Figure 5: Manufactured exports (percent of merchandise exports)



Source: World Bank, WDI online, January 2016

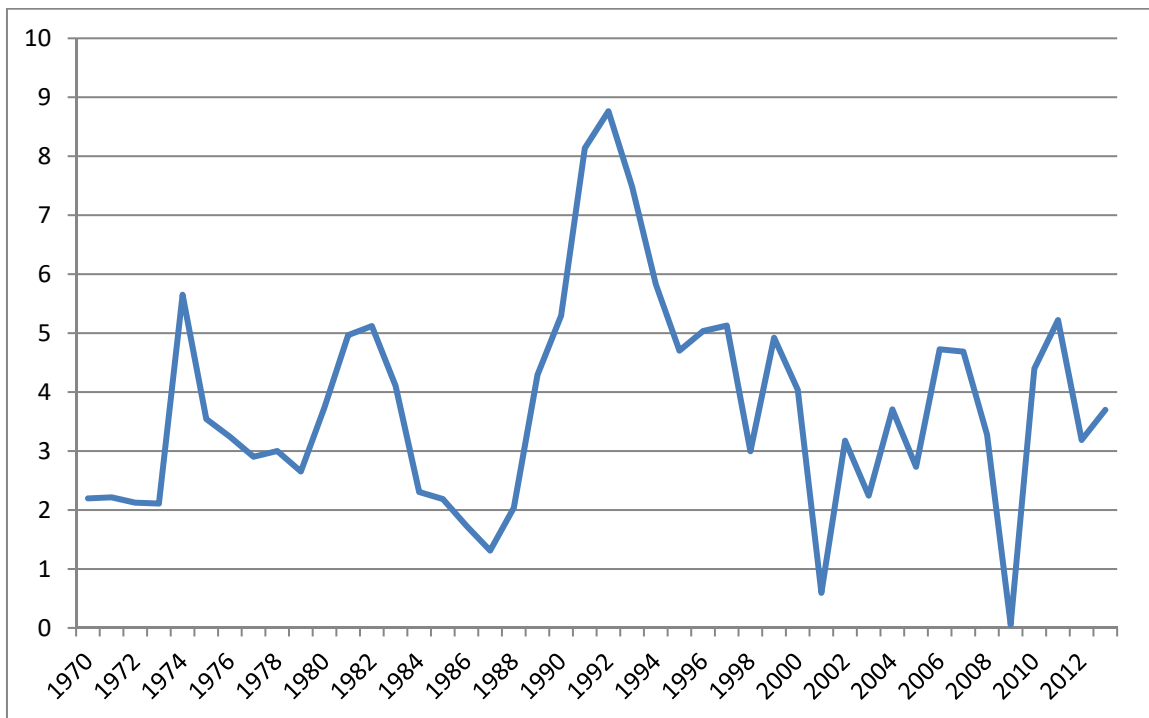
There is nothing inherently wrong with an economy relying to this degree on FDI if the FDI investors are committed to staying with the local economy indefinitely into the future or alternatively if they take steps to replace themselves over time with domestic managers and investors who could continue development of manufacturing and modern sector services (such as information technology) after the FDI has left. FDI also has to be a large and growing share of total investment in the country if it is to have a major continuing

influence on growth. Hong Kong and Singapore have basically risen to high income status relying to a large degree on FDI fueled growth.

FDI in Malaysia up to this time has held up. In the 1970s, as Figure 6 indicates, it fluctuated around 3 to 4 percent of GDP or roughly one-sixth of total gross capital formation, rising well above that level in the early 1980s but coming back to that level since the financial crisis of the late 1990s. Whether it is likely to continue at that level as a share of GDP and total investment will be discussed later in this essay. There was a big jump in FDI in 1986-91, then a falling trend followed by a rising trend again in 2001-2005 as FDI entered services and consumer markets. The sharp rise in FDI was also felt by Indonesia, Philippines and Thailand following the Plaza Accord of 1985 and the withdrawal of GSP from the NIEs in 1988 (Rasiah, 1989). To a large extent, Malaysia's competitiveness declined eventually in these years as the rising national currencies during that period exacerbated current account deficits while squeezing manufacturing. Malaysia and Thailand imported cheap foreign labor to sustain manufactured exports (Rasiah, 2011).

There have been Malaysian firms that have developed activities outside of Malaysia, but for the most part, this has involved investing in enterprises located elsewhere rather than exporting goods and services from Malaysia. YTL has built power plants outside the country and Petronas, the state oil company, has also invested extensively abroad. The Kerry Group (which includes the Shangri-La Hotel chain) has large investments in property and hotels around the world, but the headquarters of the Kerry Group has moved to Hong Kong and is no longer a Malaysian multi-national firm. The budget airline Asia Airlines has also moved its headquarters out of Malaysia. United Engineers Malaysia (UEM) has successfully built highways abroad, including in India. Malaysian clothing firms have successfully relocated in Cambodia to export. In electronics, Globetronics has successfully started a subsidiary in Singapore to manufacture semiconductors for export.

Figure 6: Foreign direct investment, net inflows (percent of GDP)



Source: World Bank, WDI online, January 2016.

The Malaysian government has attempted to build a manufacturing base where ownership was locally owned. The major activity of this sort was the heavy industry drive initiated by Prime Minister Mahathir in the early 1980s and continued through the 1990s. The way that was carried out is instructive as to why Malaysian owned manufacturers have had trouble becoming exporters. The Proton automobile was the center piece of the heavy industry drive together with a number of machinery manufacturing firms designed to provide inputs to Proton. Subsequent national automotive firms such as Perodua, Naza Motors and Inokom have followed less indigenization to supply largely to a domestic market. The other enterprises supported included Perwaja Steel and cement producers. The objective was to assist Malaysia to move up the manufacturing ladder to more sophisticated industries and to do so under Malaysian ownership. Up to that point, automobile producers in Malaysia were foreign automobile firms, many of which assembled cars in Malaysia but almost entirely with imported components, what is known as CKD or complete knockdown kits. Their contribution to Malaysian GDP was negligible and in some cases, their value added to Malaysia was negative. YTL's acquisition of Perak

Hanjoong (Korean owned) and further downstream integration allowed the firm to produce high quality clinker and cement, but only for the domestic market.

The heavy industry effort began as an import substituting program. Unlike the South Korean heavy industry drive of the 1970s, there was no expectation that Proton or the other heavy industries would become exporters within a short span of time such as five years. Proton and its component manufacturers received a high level of protection and that protection continued into the twenty-first century. Furthermore, the ownership goal was to have domestic Bumiputera ownership, not just Malaysian ownership. To that end, these heavy industries began as state-owned firms in a state that had little experience with manufacturing of any kind. The problems that caused led the government to privatize these enterprises (together with several other large state-owned firms not involved in the heavy industry drive) but to do so in a way that would ensure Bumiputera ownership even though there was virtually no Bumiputera experience with manufacturing. Since there were also few Bumiputera that had the personal resources to purchase a major or controlling share in these privatized enterprises, the government made sure that the banking system lent them the money. The privatized ownership was thus both relatively inexperienced in managing these large enterprises and highly leveraged. This situation was to contribute to Malaysia being hit hard by the 1997-1998 financial crisis.

Well before the 1997-1998 crisis in the mid-1980s, however, the heavy industry program had caused a fiscal crisis. The first years of the program in the early 1980s involved large government expenditures paid for in part out of the revenues from petroleum, but these revenues were not sufficient and therefore, the government began borrowing heavily against future oil revenues. But in 1985-1986 the price of oil plunged to half and less of the price spike caused by OPEC in the 1970s. The then finance minister, Tun Daim Zainuddin, introduced a major austerity program to rein in the growing debt and GDP growth became negative. Thus the heavy industry program during the 1980s was producing little but became a drag on the economy. The drag on the economy was short lived, however, and during the rest of the 1980s through the mid- 1990s Malaysia experienced both an investment boom and enjoyed its highest rates of GDP growth averaging 6 to 7 percent a

year. The rate of investment rose to over 40 percent of GDP before plunging in 1999 to 22 percent.

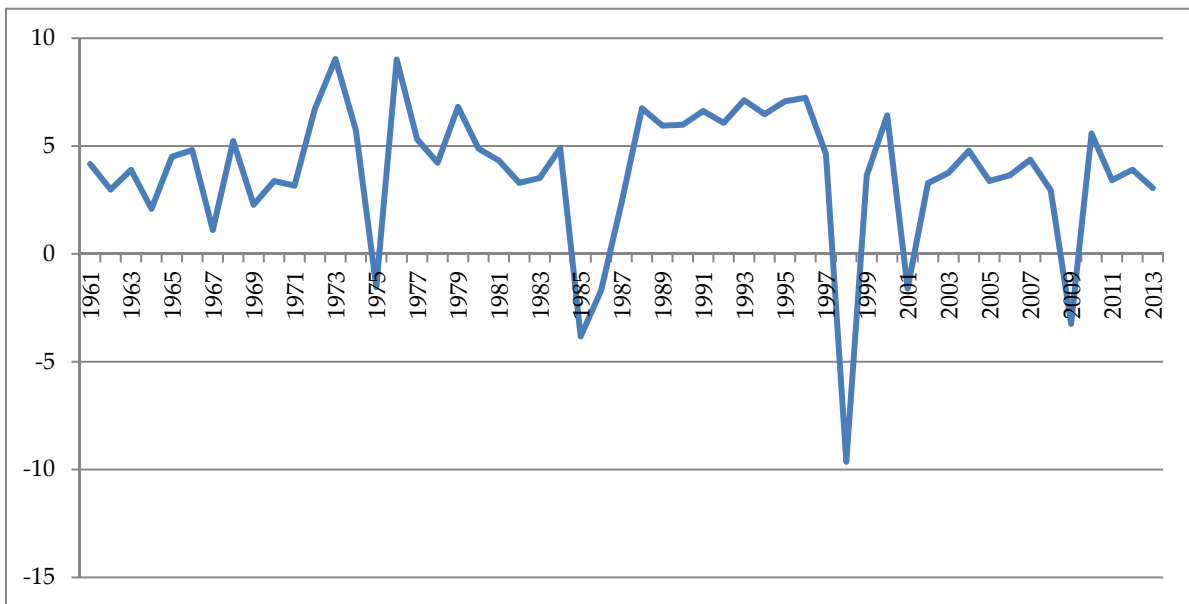
The biggest problem of the heavy industry program, however, was that it was both expensive and the social returns on the investment were low or negligible when one removes the large subsidies provided by high tariff protection. Proton automobiles as well as Perodua, Naza and Inakom are not internationally competitive 34 years after the heavy industry program was initiated. Furthermore, far from being a truly made in Malaysia automobile, many of the key more sophisticated components had to be imported from Japan and elsewhere. Proton has localized substantially but its sales among national producers have plunged. Perodua is the leading seller of national cars now but its components are largely supplied from abroad, including its model designs. By the twenty-first century the whole idea of a national automobile was obsolete since most automobile manufacturers around the world now get their parts from many different countries.

The Proton effort, however, at least did produce a large share of the cars on Malaysian roads beginning from 1985. Even that cannot be said about Perwaja Steel that went from one large loss to another despite government bailouts and high protection from imports. Could Malaysia have produced a large and successful steel company if the sole goal had been to produce steel in Malaysia? There were and are private steel mills in Malaysia run by experienced people which do make money much of the time all be it with the help of import restrictions. If these firms had been helped by the government to reach a scale that would make them internationally competitive, Malaysia might have been able to create a modern steel industry not unlike Korea's Pohang Iron and Steel that also started and was for a long time a state owned enterprise. But the builders of Pohang knew they had to become internationally competitive in a relatively short time, and the government helped them in getting started, but Pohang mostly got there on its own. Unlike Proton's subsidies and protection in the domestic market, POSCO's access to these benefits was stringently tied to performance (Amsden, 1989). Pohang, however, was not expected to serve major social goals.

Despite the drag on growth of the heavy industry program, Malaysia's economy grew rapidly in 1988-1996 with GDP per capita averaging nearly 7 percent per year. Foreign direct investment was at its highest levels ever as a share of GDP and partly as a result of exports as a share of GDP also rose substantially from 62 percent of GDP in 1987 to 91 percent in 1996. But then in 1997-1998 the economy crashed as Malaysia became embroiled in the financial crisis of those years (see Figure 7). The 1997-1998 financial crisis did not hit all countries in Asia equally hard (see Figure 8 for Southeast Asian economies). Malaysia was one of the four countries hardest hit (the others were Thailand, Indonesia, and South Korea) largely because the policies of the 1980s and 1990s had led to many highly leveraged companies that were particularly vulnerable to the crisis. Like the other Asian economies most affected, Malaysian banks and other companies had borrowed heavily abroad without hedging for the foreign exchange risk that hit hard when the ringgit fell sharply.

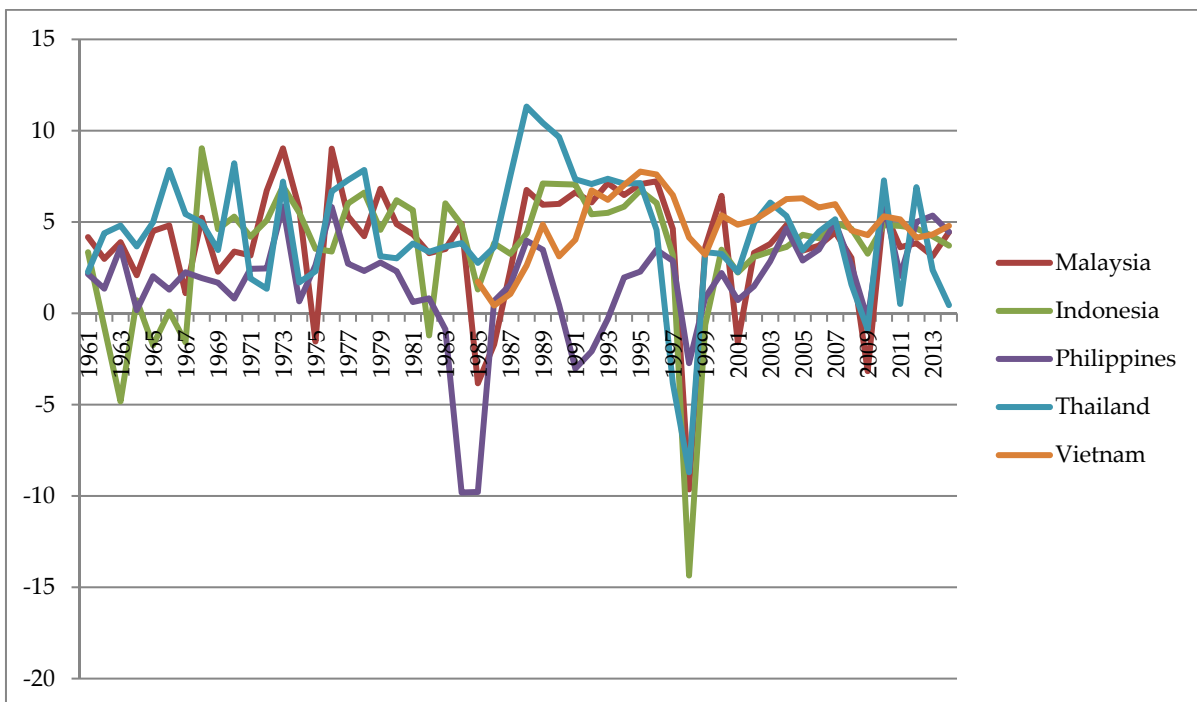
The dependence of the economy on foreign direct investment also played a role because foreign direct investment in Malaysia plunged during the crisis. Banks from Korea (since 1985), and Thailand had borrowed extensively from abroad (appreciating national currencies drew them to make money from arbitrage differences). Banks in Malaysia did not do so and that is why the country still had huge international reserves against current account payments and short term debt service commitments. At its height these foreign payment commitments reached 138 percent, 149 percent and 153 percent of the international reserves of Indonesia, Philippines and Thailand respectively when it reached only 55 percent of international reserves of Malaysia in 1996 (Rasiah, 1998: 367). As the ringgit fell, owing to both an unsustainable build up in current account deficits and the speculative contagion from the Baht, defaulters (NPLs) mounted. However, Malaysia was fortunate to have much of its debt domestically denominated which allowed the government to restructure the debt without foreign pressure. The booming US market also quickened recovery.

Figure 7: Malaysian GDP per capita growth rate



Source: World Bank, WDI online, January 2016.

Figure 8: ASEAN GDP Per Capita Growth Rates



Source: World Bank, WDI online, January 2016.

Since the 1997-1998 crisis, there have been two further downturns in the Malaysian economy, in 2001 and 2009. Both resulted from global recessions that did not originate from conditions within Malaysia. These two recessions largely account for the slower

average growth rate of GDP during the first decade of the twenty-first century. By the middle of that decade oil and palm oil prices, together with the prices of other natural resource products, rose rapidly and then, with the exception of the financial crisis years, stayed up through most of 2014. Manufactured exports in real terms grew briskly for several years after the 1997-1998 financial crisis at 6.1 percent a year (2003/1999) then slowed to 3.1 percent for the next eight years (2010/2003) and actually declined at 1.5 percent per year from the end of 2010 through 2013.¹³ Total exports in current US dollar prices did much better growing at 4.1 percent a year (2014/2010) but that was thanks largely to high oil and palm oil prices. Malaysian GDP growth in the second decade of the twenty-first century to date has depended on the growth rate in services that in turn has depended at least in part on the high natural resource prices, high prices that fell dramatically in 2015.

By the 1990s, the above described efforts of the government had transformed the ownership structure of the Malaysian economy and the structure of the 1990s has persisted into the twenty-first century. In agriculture, food products and small holder palm oil and rubber acreages are mainly in Bumiputera hands, either those working farms or land lords. Many of the largest plantations formally owned by foreigners have been taken over by the government. In the service sector a large portion of small shops are in Chinese-Malaysian hands as in the past. It is among the larger firms, the kind that are listed on the Kuala Lumpur Stock Exchange (KLSE), where the transformation in ownership has been most profound. The data on ownership in 1974 before the NEP had much impact and 1993 are presented in Table 4. By 1993 (and likely much the same today), foreign ownership had been reduced from 49.11 to 10.7 percent and Chinese-Malaysian private ownership from 27 to 13.9 percent. The government controlled 40.5 percent directly and Unit Trusts another 17.6 percent. The government was dominated by UMNO politically and by Bumiputera in the civil service. The major Bumiputera unit trusts were managed by PNB, a government company set up for that purpose.

¹³ These figures were derived from the export volume index and the share of manufacturing in total exports in World Bank, WDI online January 2016.

The leading firms of the Malaysian economy over the past two decades, therefore, have largely been firms dominated by the government either directly or indirectly. The major exceptions are the foreign owned firms that provide most of Malaysia's exports and Malaysian-Chinese owned firms that mainly provide goods and services for the domestic market particularly in such areas as housing and hotels. Together these latter two groups account for just over a quarter of the capital of the firms listed on the Kuala Lumpur stock exchange, and probably an even smaller share of GDP.

The question this ownership structure raises is whether it is an appropriate structure for an economy that needs to rely increasingly on innovation and global competitiveness if it is to sustain steady and fairly rapid growth toward high income status? Government controlled enterprises have not often been seen as either innovators or even firms capable of competing internationally in fields such as manufacturing or business services. Alternatively, can the remaining private sector firms that compete on the open market for business carry the innovation and global competitiveness load? To begin to answer these questions we need to look in greater depth into the performance of the manufacturing and modern service sectors. In the section that follows we will focus mainly on manufacturing. A study of the technological sophistication of the service sector is a research project for the future.

Table 4: Market Capitalization of the Top KLSE Companies by Ownership Category

Nationality/Ethnicity	Percent Share (1974)	Percent Share(1993)
Foreign Controlled Companies	49.11	10.7
Malaysian Controlled Companies		
Government A	6.3	40.5
Government C	17.7	
Chinese (private local)	27.0	13.9
Bumiputera (private local)		6.3
Indian (private local)		0.1
Institutions		10.4
Unit Trusts	--	17.6
Nominees	--	0.7
Total	100.00	100.00

Note: Foreign controlled companies in 1974 do not include Singapore controlled companies. If Singapore companies were included, the foreign share would be 61.1 percent of a larger total. Singapore companies are excluded because of the complications connected with the way Singapore and Malaysian companies were cross listed in the early years in both Singapore and Kuala Lumpur. Government A companies were those under government control in 1974. Government C companies were those under foreign control in 1974 but were taken over by the government in 1977; Private local ownership in 1974 was mostly Chinese Malaysian.

Sources: The data for 1974 come originally from Tan Tat Wai, 1982. The 1993 data were constructed by Ms. Veena Loh under the supervision of Dr, Tan Tat Wai; This table as presented was taken from Perkins and Woo, (2000). p. 234.

Growth and Structural Change in Manufacturing

Any discussion of rising technological sophistication and increasing efficiency in the Malaysian economy must focus on those sectors where major changes in those areas have been achieved at a rate that will, if continued, support Malaysia's rise to high income status. That emphasis does not necessarily eliminate a discussion of palm oil and rubber but the main focus looking backward has to be on manufacturing and particularly the manufacturing sectors that to date have carried Malaysia to upper middle income status, meaning the major manufacturing export sectors. Thus, we compare the experience of the manufacturing sector of Malaysia with that of the Northeast Asian and Southeast Asian countries' manufacturing sectors in this section.

Manufacturing

Since the East Asian economies grew rapidly on the back of manufacturing expansion, we examine in detail Malaysia's record here against the other economies. Over the period 1960-2014 South Korea (12.1 percent) and China (11.2 percent) experienced the highest average annual growth in real manufacturing value added (see Table 5). Indonesia (8.1 percent), Thailand (8.1 percent) and Singapore (6.9 percent) were the next fastest industrializers in

East Asia. Malaysia's (5.7 percent) manufacturing value added recorded higher average annual growth than the Philippines (4.1 percent) and Japan (2.1 percent). While Japan's deindustrialization (a declining share of manufacturing in GDP) is largely caused by the relocation of manufacturing abroad and technological deepening, the Philippines has experienced premature deindustrialization. Malaysia has also begun deindustrializing since 2000.

Table 5: Manufacturing Value Added, Annual Average Growth Rates, 1960-2014

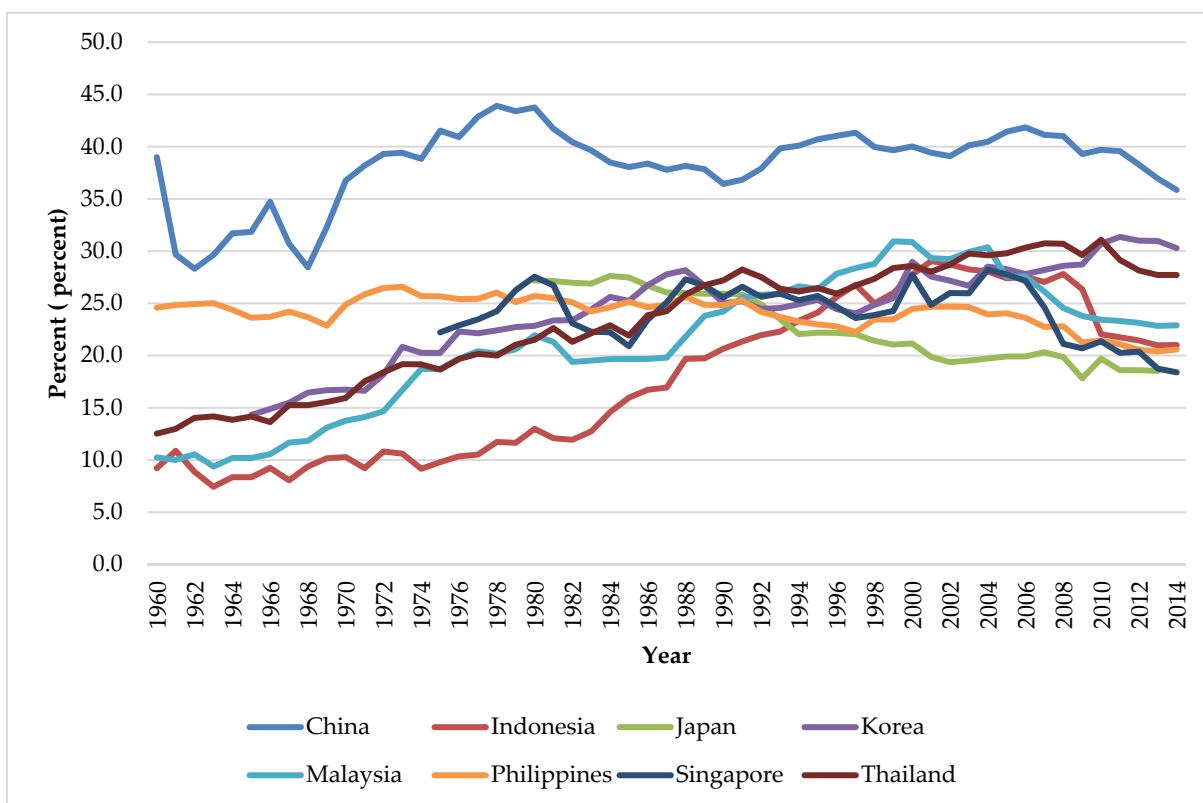
	1960-70	1970-80	1980-90	1990-2000	2000-14	1960-2014*
China	NA	NA	9.6	13.9	10.5	11.2
Indonesia	4.6	14.0	12.2	6.6	4.7	8.1
Japan	NA	NA	4.8	0.3	1.3	2.1
Korea	23.2	16.2	11.9	8.1	5.8	12.1
Malaysia	NA	11.6	9.8	9.9	4.0	5.7
Philippines	5.8	6.1	0.9	2.6	4.7	4.1
Singapore	NA	11.2	6.9	7.3	4.9	6.9
Thailand	11.6	10.1	9.9	6.8	4.1	8.1

Note: * For China and Japan over the period 1980-14; # - for Malaysia and Singapore over the period 1970-2014

Source: Computed from World Bank Institute (2015)

Rapid growth in value added drove the share of manufacturing in GDP in South Korea from 14.3 percent in 1965 to 31.4 percent in 2011 before it fell slightly to 30.3 percent in 2014 (Figure 9). The share of manufacturing has remained the highest in East Asia. The share of manufacturing in Malaysia rose from 10.3 percent in 1960 to 30.9 percent in 2000 but has since fallen in trend terms to 22.9 percent in 2014. Juxtaposing Figure 9 alongside Table 5, it can be seen that Malaysia's growth in manufacturing value added has started to slow down significantly from the year 2000.

Figure 9: Share of Manufacturing in GDP, East Asian Countries, 1960-2014



Source: Plotted from data drawn from World Bank Institute (2015).

All manufacturing industries taken broadly grew strongly over the period 1970-2010. Machinery and transport equipment enjoyed the highest annual average value added growth over the period 1970-2010 (Table 6). However, whereas textiles and clothing contracted by 3.7 percent per annum on average, machinery and transport equipment slowed down significantly to record only a 0.5 percent growth per annum on average in 2000-10. The contraction in the textile and clothing industry was expected as the comparative advantage from cheap labor has shifted from the pioneering ASEAN market economies of Indonesia, Singapore, Philippines and Thailand to China, the Indo-Chinese economies, Bangladesh and Myanmar. The slowdown in machinery and transport equipment, however, is worth analyzing because it is an industry comprising both high and medium technologies that reflect policy issues endemic to Malaysia.

Table 6: Annual Average Manufacturing Value Added Growth by Broad Industries, Malaysia, 1970-2010 (percent)

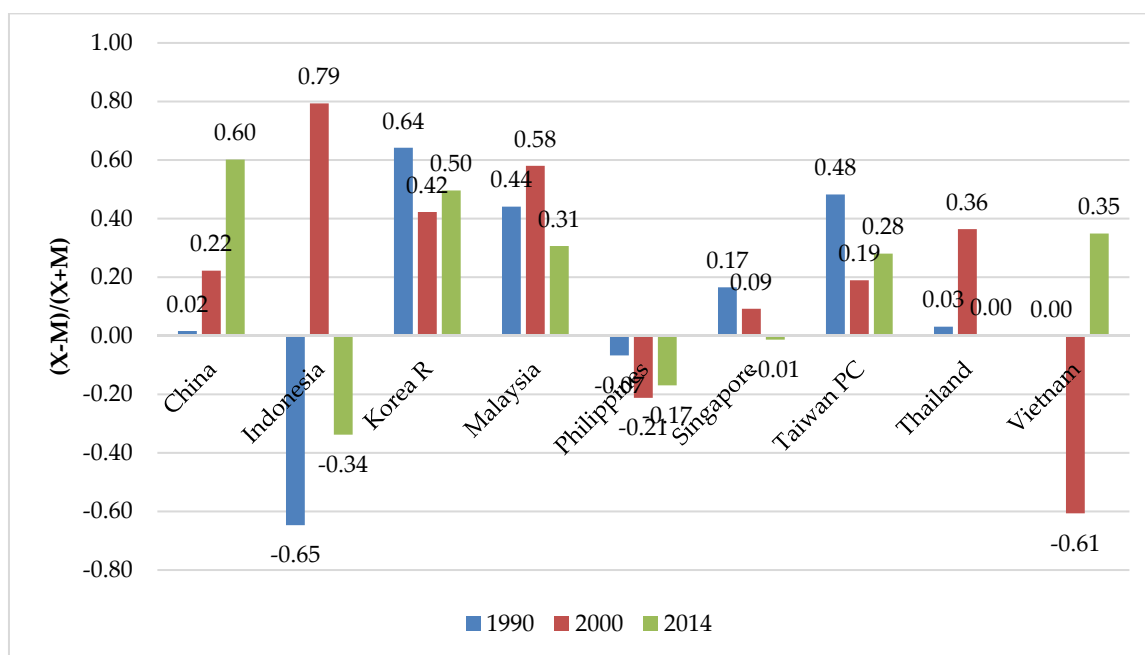
	1970-80	1980-90	1990-2000	2000-10	1970-2010
Chemicals	6.6	17.6	6.6	7.6	9.5
Food, beverages, and tobacco	10.8	3.5	4.6	7.9	6.6
Machinery and transport equipment	15.2	12.2	26.5	0.5	13.2
Textiles and clothing	19.8	9.0	4.9	-3.7	7.2
Others	11.6	10.6	6.1	4.7	8.2

Source: Computed from World Bank (2015)

Within the machinery and transport industry, examining the electronics industry is of particular importance because it has not only been the dominant export-oriented industry but is also a high technology industry that enjoys synergistic effects on other industries. Electronics exports in total national exports overtook primary commodities to become the lead export of the country since 1987 (Rasiah, 1995). Although its share in national exports has gradually fallen since 2000, it was still the leading export in 2015 at 35.6 percent of the nation's exports (MATRADE, 2016). Malaysia's exports of high tech ICs in 2014 was 7.2 percent of world exports, which exceeded that from Japan (6.4 percent) (WTO, 2016). In East Asia, its share was only lower than China (17.2 percent), Singapore (17.0 percent), Taiwan Province of China (13.8 percent) and South Korea (10.5 percent). To put that into perspective, where data are available, we first compare the trade balance coefficients recorded by some of the key sub-electronics industries of telecommunications equipment, office machinery, and integrated circuits and components. Trade balance coefficient here is calculated using the formula, $(X_i - M_i) / (X_i + M_i)$ where X, M and i refer to exports, imports and industry type respectively.

In the medium technology industry of telecommunications, Malaysia has performed fairly well as it has enjoyed a higher trade balance coefficient than the richer countries of Republic of Korea, Taiwan Province of China and Singapore (see Figure 10).¹⁴ Apart from the year 2000, Malaysia also ranked higher than the Philippines, Thailand and Indonesia. However, its performance ranked lower than China and Vietnam.

Figure 10: Telecommunications Equipment Trade Balance, East Asia, 1990-2014

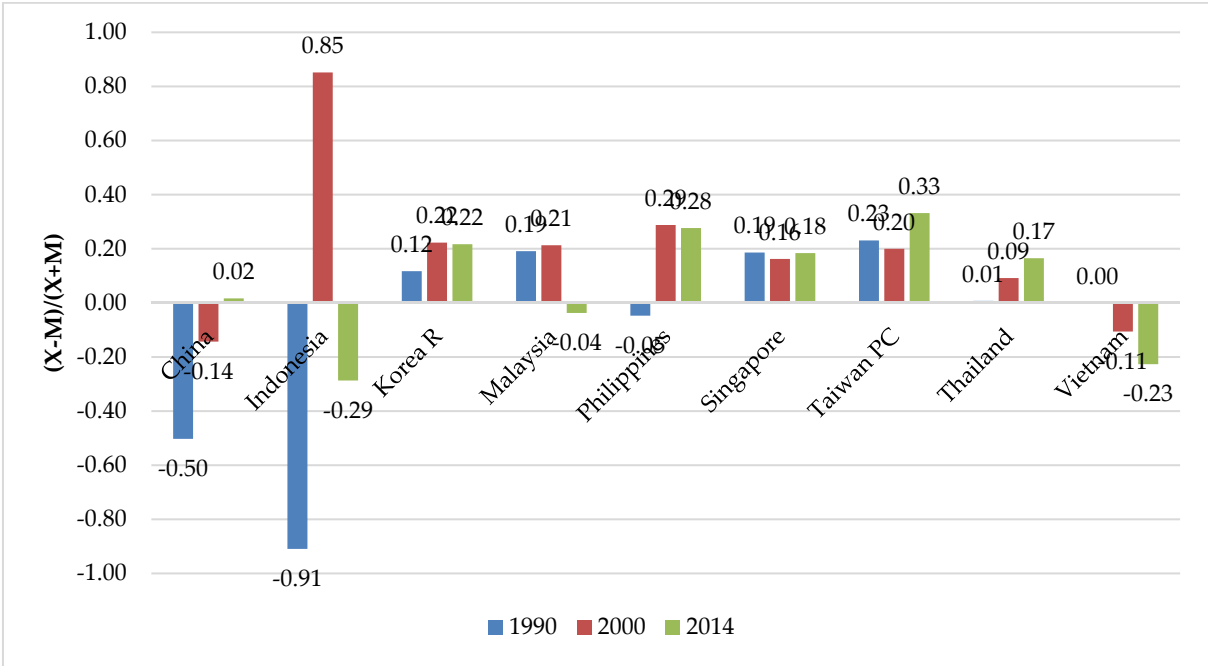


Source: WTO (2015)

¹⁴ Lall's (2004) classification of industries by low, medium and high is widely used by United Nations publications.

In the medium technology industry of office machinery, Malaysia's trade balance coefficient performed better than China, Indonesia (except for 2000) and Vietnam (see Figure 11). However, Malaysia's coefficient (-0.04) was lower than that of Taiwan PC (0.33), Philippines (0.28), Republic of Korea (0.22), and Thailand (0.17) in 2014.

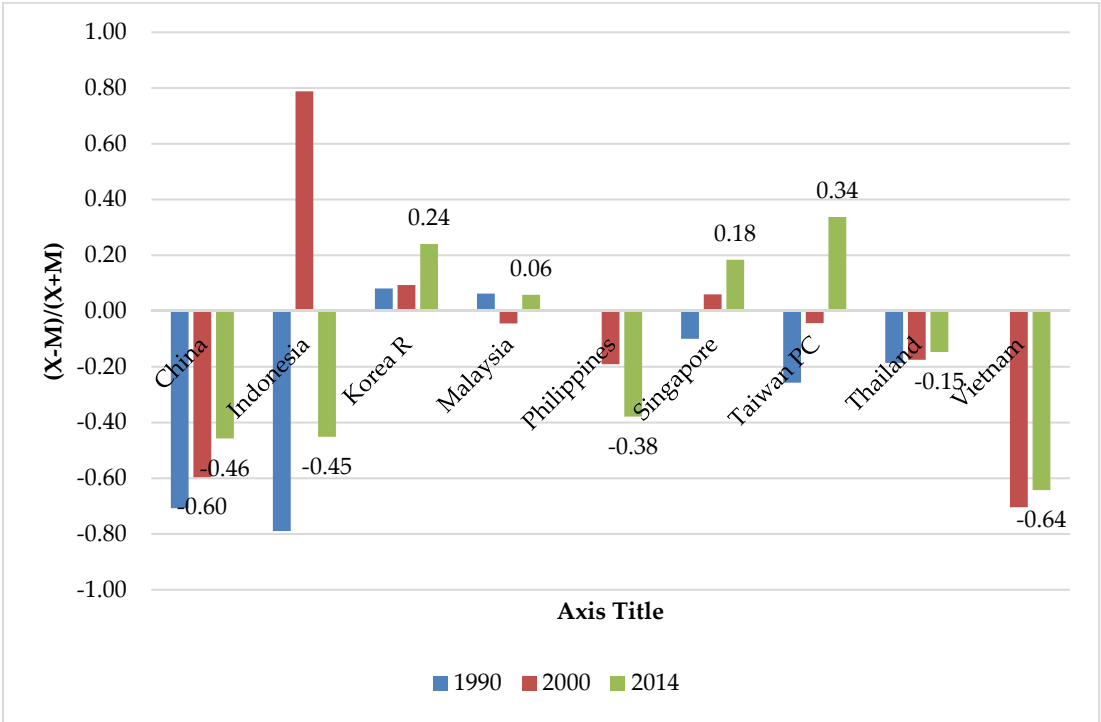
Figure 11: Office Equipment Trade Balance Coefficient, East Asia, 1990-2014



Source: WTO (2015)

In the high technology industry of integrated circuits and components, Malaysia has performed better than all East Asian emerging economies except for the Republic of Korea, Taiwan Province of China and Singapore. This evidence is in accordance with the TFP assessment presented earlier, i.e. Malaysia has not performed as well as the Republic of Korea, Singapore and Taiwan.

Figure 12: Integrated Circuits and Components Trade Balance Coefficient, East Asia, 1990-2014



Source: WTO (2015)

The distribution of integrated circuits firms in emerging East Asia in 2011 is shown in Table 7. China had the largest number of firms followed by Taiwan Province, Malaysia and the Republic of Korea. Where national firms outnumber foreign firms in Taiwan and Korea, it was the other way around in the remaining East Asian emerging economies.

Table 7: Distribution of Integrated Circuits Firms, East Asia, 2011

	National	Foreign	Total
China	65	83	148
Indonesia	0	5	5
South Korea	23	19	42
Malaysia	8	35	43
Philippines	7	22	29
Singapore	10	24	34
Taiwan	61	23	84
Thailand	6	15	21
Vietnam	2	6	8
Total	182	232	414

*Note: Chip Implant R&D; Chip Design; RDS – supportive R&D; WF – Wafer fabrication; AT – Assembly and test
Source: Gartner & Gartner*

To examine the technological capabilities of the East Asian emerging economies, we focus on the highest technology industry within electronics, i.e. the integrated circuits industry. We differentiate technological capabilities by sophistication within the value chain, namely, frontier R&D, chip design, wafer fabrication, and assembly and test operations. Taiwan and Korea had the largest number of firms with frontier R&D capabilities followed by China and Singapore (see Table 8).

Table 8: Integrated Circuits Firms by Stages of Activity, East Asia, 2011

	National					Foreign					Total
	RD	CD	RDS	WF	AT	RD	CD	RDS	WF	AT	
S Korea	4	2*	2#	6	9	0	7	6	2	4	38*#
Taiwan	5	3*	2	17	34	0	7	5	2	9	84*
China	1	3*	2#	25	34	0	11	8	6	58	148*#
Malaysia	0	0	0	2	6	0	4	1	5	25	43
Singapore	1	1	1	3	4	0	7	1	4	12	34
Vietnam	0	1	0	1	0	0	3	1	0	2	8
Indonesia	0	0	0	0	0	0	0	0	0	5	5
Philippines	0	0	0	0	7	0	1	0	0	21	29
Thailand	0	0	0	0	6	0	0	0	0	15	21

Note: * - includes integrated R&D and chip design operations; # - includes chip design and supportive R&D operations.
Source: Gartner & Gartner

Table 9 shows the number of integrated circuits' (ICs) patents filed by the East Asian economies in the United States over the period 1985-2011. The focus on R&D has produced a massive expansion in patents filed by firms and organizations located in South Korea and Taiwan. Also, national firms dominate patents filed in South Korea and Taiwan. These countries are then followed by Singapore and China. While foreign firms accounted for most of the patents filed from Singapore and China, national firms have also shown a

strong presence. Malaysia came in next but most patents were filed by foreign firms. Nevertheless, Malaysia holds a strong lead over Thailand, Philippines, Vietnam and Indonesia.

Table 9. Patents Filed in the US, IC Firms in East Asian Developing Economies, 1985-2011.

Period	1981-1985		1986-1990		1991-1995		1996-2000		2001-2005		2006-2011	
	N	F	N	F	N	F	N	F	N	F	N	F
China	0	0	0	0	0	3	0	27	11	52	177	436
Indonesia	0	0	0	0	0	0	0	0	0	0	0	0
Malaysia	0	0	0	0	0	1	0	5	4	39	3	270
Philippines	0	0	0	0	0	0	0	5	0	40	0	70
Singapore	0	0	0	1	0	14	0	36	4	216	290	545
South Korea	1	0	103	2	1526	1	5095	11	8049	139	25014	409
Taiwan	0	0	2	0	278	5	3063	124	4826	43	5223	107
Thailand	0	0	0	0	0	0	0	3	0	45	0	3
Vietnam	0	0	0	0	0	0	0	0	0	0	0	0

Note: * N – national; F – foreign.

Source: USPTO (2012).

Taken together, it is clear that Malaysia's leading manufacturing industry has performed better than that of the Indonesia, Philippines, Thailand and Vietnam. However, its performance is significantly short of South Korea and Taiwan. Indeed, in the IC industry it is not just that Taiwan's and Korea's firms are at the frontier competing with global firms (Mathews and Cho, 2000; Amsden, 1989; Amsden and Chu, 2003), in Samsung and Taiwan Semiconductor Manufacturing Corporation these countries have the leading global firms in memory and logic chips respectively. Singapore and China have also performed better than Malaysia but the distance is not great. While Korea and Taiwan have enjoyed a significant lead, Malaysia's lead over Indonesia, Philippines, Thailand and Vietnam suggests that its policies may be superior to the latter. If production history is an important determinant, then Malaysia has clearly outperformed the Philippines as IC Multinational Corporations began relocation operations in these countries at about the same time in the early 1970s. We examine this question in the next section.

Efforts to Build a Modern Innovation Capacity

As explained earlier, the government intervened to remove the ethnic-based identification of occupations beginning in the early 1970s and gave preferential allocation of places for Bumiputeras following the introduction of the New Economic Policy (NEP) in 1971. To restructure the economy ethnically, liberalization in manufacturing was promoted vigorously as one of the vehicles to attract FDI in order to stimulate job creation (Malaysia, 1971). Apart from tariffs on final consumption goods that came with the Pioneer Industry Ordinance of 1958, the government did not impose other conditions on manufacturing firms until 1975. Following the promulgation of the Industrial Coordination Act in 1975, however, the government began imposing NEP conditions, that included a goal of 30 percent Bumiputera equity of firms with paid up capital of RM100,000 and above (which was raised a number of times to reach RM1 million in 1986 and is now RM2.5 million). However, the government, as explain earlier, relaxed ownership conditions on firms exporting at least 80 percent of sales. Exchange rates were also liberalized in 1975 despite the government withdrawing the ringgit from fixed parity with the Singapore and Brunei dollars. Investment regulations were liberalized following the Investment Incentives Act of 1967, but its translation into massive inflows of FDI took off after the Free Trade Zones and Licensed Manufacturing warehouses were open from 1972 on. Tariff-free operations in security guaranteed locations that were also equipped with excellent basic infrastructure and tax holidays attracted massive inflows of export-oriented firms (Rasiah, 1989, 1993).

Learning by doing was the prime mode of technological upgrading in the 1970s as no effort was made to introduce innovation rents *a la* Schumpeter (1934, 1943). Neither were grants targeted at R&D and incubation nor were they targeted at training and standards acquisition as was pursued in Taiwan through the industrial technical research institutes (ITRIs) of Taiwan. Hence, export-oriented industrialization in Malaysia in the 1970s was dominated by low wage and low value added processing, testing and assembling operations (Rasiah, 1995). At the same time a dual economy in which the principal customs area (the primary, secondary and tertiary sectors) was subjected to restrictions imposed by the NEP while the export-oriented sector was exempted from it (Jomo and Edwards, 1993).

The emphasis on foreign direct investment, however, as noted earlier, fell in the first half of the 1980s when the government assumed nationalistic efforts to bulwark national capital in heavy industries. Impressed by the successes of Japan, and South Korea, the government launched the Look East Policy in 1981 to spearhead national-ownership based heavy industrialization. Since the examples used were Japan and Korea, one could claim that the influence came from Abramovitz (1956) and Gershenkron (1962) but specifically Johnson (1982) and Amsden (1989), but the direct influence of Japanese associates of Prime Minister Mahathir. Protection and state ownership targeted at eventually leaving control to *Bumiputeras* became the rallying cry of the government to industrialize. High commodity prices in the late 1970s enabled such a policy, which included massive highway and bridge construction across the Western corridor of Peninsular Malaysia. While restrictions were not imposed on export-oriented foreign capital, incentives to these firms were gradually terminated. Import-substitution policies resembled the type advocated by structural economists. However, these industries failed miserably because they not only lacked the introduction of Schumpeterian innovation rents that Amsden (1989) had argued were critical in South Korea's catch up, they also lacked the use of the stick to ensure discipline and performance. Although the carmaker Proton is still functioning it does not have a significant presence in the national economy.

All the heavy industries were derailed by a combination of sharply falling commodity prices and the appointment of top managers without the requisite tacit knowledge. Supporting the preferred national capital with subsidized credit was similar to what South Korea did. However, unlike South Korea which forced the chaebols to export their way out of the 1975-76 balance of payments and debt crisis, Malaysia imposed no performance standards on these firms. The situation got worse in 1984-1985 when a cyclical trough occurred in the main export product of the electronics industry due to overproduction and the Yen began to soar following the Plaza Accord in 1985. On the one hand, unemployment rose back from 4 percent in 1980 to 8 percent in 1985 while debt service in Yen rose. Rather than following the Korean strategy of imposing export quotas the Malaysian government

devalued the ringgit, and reissued generous tax holidays to attract FDI. Calls to introduce technological deepening were deferred (Rasiah, 1999).

External developments changed the economic environment dramatically from the second half of the 1980s. Following the Plaza Accord of 1985, the Yen, Won, NT dollar and Singapore dollar began to appreciate. In addition to a devaluation of the Ringgit in 1986 and the withdrawal of the generalized system of preferences from the Asian newly industrialized countries in February 1988 attracted an avalanche of FDI from Japan, South Korea, Taiwan, and Singapore to the whole of developing Southeast Asia's market economies, including Malaysia (Rasiah, 1995). Hence, the share of FDI in gross domestic investment in Malaysia rose from 10.7 percent in 1980-90 to 24.6 percent in 1991-93 (UNCTAD 1996). Taiwan Province of China and the Republic of Korea emerged as major new investors from the second half of the 1980s as a consequence. The electronics industry whose foreign ownership share reached 91 percent in 1993, became Malaysia's leading export-earner from 1987 accounting for 67.5 percent of manufactured exports in 1995 (see Rasiah 1995).

Exports were also stimulated through the use of export refinancing schemes, export abatement allowances and double deduction tax exemptions (Malaysia, 1988). Several industries began to experience export surges primarily due to rising global demand and FDI redeployment. While the export-oriented foreign led manufacturing sector grew rapidly making Malaysia's economy successful as the annual average GDP growth rate exceeded 8 percent over the period 1988-96, the inward-oriented IS sector in contrast performed dismally. Despite enjoying huge rents from protection, heavy industries in Malaysia did not enjoy massive profits because of escalating costs of imports and royalties until the early 1990s. The captive domestic market, which grew substantially through growth in employment from export manufacturing and resource-based industries, helped generate demand for domestic ventures in the country. Hence, Proton and later Perodua, Kedah Cement, Perak Hanjoong, UEM, Renong, Sime Darby and PNB reaped enormous rents. A significant share of the rents were mere transfers from domestic consumers whose

options were sharply restricted by duties and opaque selection procedures.¹⁵ The domestic economy grew so much that even national textile and garment firms, such as South Island garment, began to move in a major way into real estate sector speculation and property development (Rasiah, 1995). With the exception of a few obvious failures such as Perwaja (Jomo, 1990), the microeconomic losses in consumer welfare were not evident during the boom of 1987-95 as strong domestic demand masked such transfers in deadweight losses. Hence, a number of inward-oriented national ventures benefited from demand created from FDI-led export manufacturing growth.

Hence, with the exception of resource-based processed palm oil and oleo-chemicals, most nationally owned manufacturing industries did not experience strong growth in value added. Some inward-oriented manufacturing industries became successful from second round import-substitution. Domestic rents helped create the scale needed for learning in clinker and cement production, and highway construction. Hence, YTL Corporation acquired Perak Hanjoong (a Korean firm) to become a successful cement manufacturer, while United Engineers Malaysia (UEM) acquired the knowledge to build modern highways that enabled its successful forays abroad, including India, China, United States and Japan (Juan, 2008). Where export markets and import competition was stiff as in steel and car manufacturing the firms have either failed or are merely surviving through the help of state-created rents.

Through the Industrial Master Plan of 1986, the Malaysian government for the first time initiated support for technological upgrading in manufacturing. However, although implementation of such procedures were defined in 1988 to include the provision of double deduction taxation incentives (DDTI) on training and R&D activities, there was little implementation of these incentives until 1991 (Rasiah, 1999). It is only after the launching of the Action Plan for Industrial Technology Development (APITD) in 1991 that serious policy efforts were initiated to promote technology development. The APITD provided

¹⁵ Malaysia had in place not only high duties on imported cars until 2004, it has continued to restrict automobile imports through the mandatory requirement of application permits (APs). Hence, the profits enjoyed by national car producers were largely a consequence of buyers being discouraged from purchasing imported cars because of prohibitive prices resulting from tariffs and APs (Rasiah, 1999).

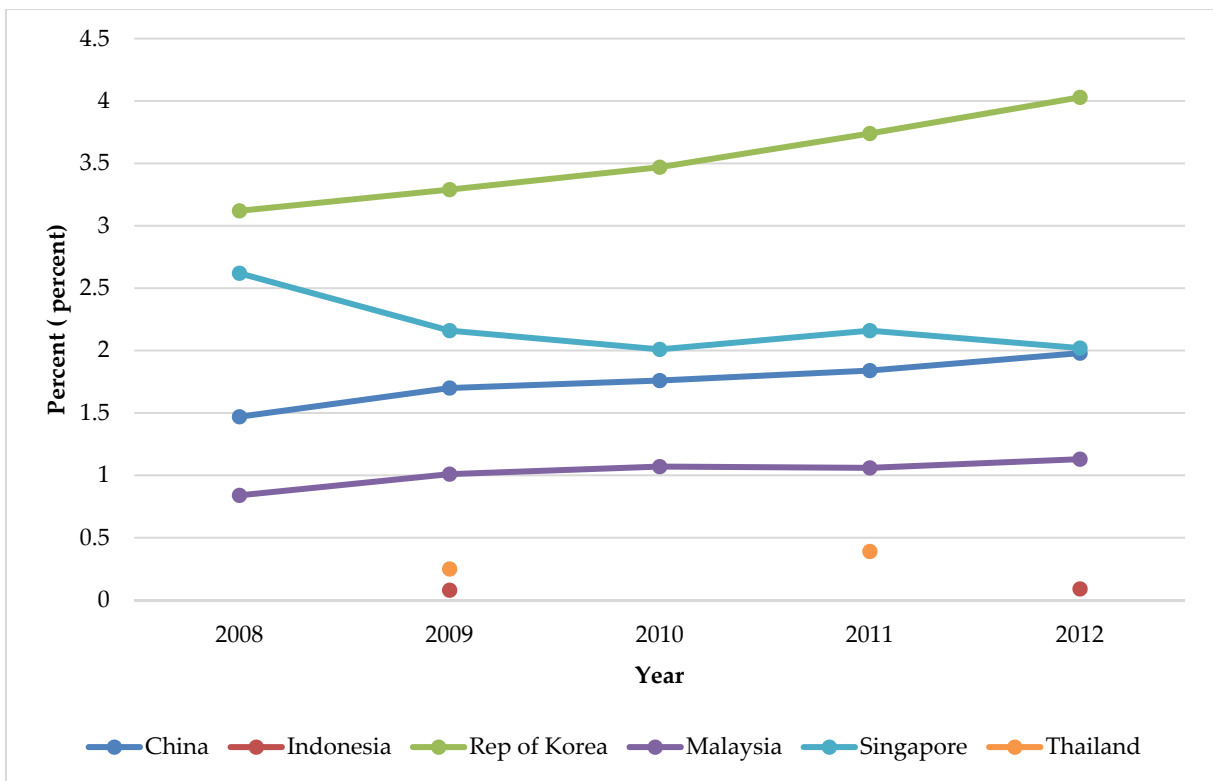
the technological blueprint for the Way Forward of 1991. The Meso organizations of Human Resource Development Council (HRDC), Malaysian Technology Development Corporation (MTDC), Multimedia Development Corporation (MDec), Multimedia Super Corridor (MSC), and Malaysia Industry, Government High Technology (MIGHT) were launched over the period 1993-95. These organizations were targeted to solve collective action problems to strengthen human resources, provide venture capital funding for innovation, promote multimedia product and service development, offer specialized high tech infrastructure, and encourage strategic high technology collaboration respectively. They were also targeted to coordinate and support incubation in science and technology parks that were created since the 1990s. The Malaysian Institute of Microelectronics Systems (MIMOS) was also corporatized in 1993. However, while these organizations were launched after a careful review of policies in Korea, Singapore and Taiwan, the political economy environment prevented the achievement of the success achieved by these countries.

In Korea and Taiwan, these meso organizations were led by proven managers who not only studied related courses in the best universities in the United States but had also gained tacit knowledge managing high technology development in lead firms, such as Texas Instruments and International Business Machines. This is a key catch up route discussed by Gershenkron (1962), Rasiah and Lin (2005) and Saxenian (2006). In Malaysia similar experts were bypassed. R&D Grants were offered in Korea, Taiwan and Singapore but while the former emphasized strongly *ex ante* vetting, monitoring and *ex post* appraisal to ensure rent dissipation was minimal such evaluations were loosely carried out. Both Singapore (since 1986) and Malaysia (since 2005) offered R&D grants to foreign firms. However, Singapore's leveraging strategy ensured that there was human capital and technological development in the country, Malaysia has lacked similar efforts (see below). Whereas Korea, Taiwan and Singapore managed to develop a team of expert assessors by gradually cutting down mistakes so as to be able to understand industry-based developments, similar developments did not take place in Malaysia (Amsden, 1989; Wong, 2002; Tsai and Cheng, 2006; Rasiah, 2011). Also, while the leading Taiwanese high technology firms were spun out from science parks through the coordination by experts

who gained tacit and experiential knowledge from abroad, Malaysian incubators did not enjoy such direction and discipline. Hence, without the use of experts carrying tacit (Polanyi, 1966) and experiential (Penrose, 1959) knowledge the management of Malaysian meso organizations lacked the drive and experience to screen, strategize and support potential innovators.

Recognizing that Malaysian manufacturing firms were failing to upgrade to move up the value chain, the government began increasing expenditure on R&D so that Gross Expenditure in R&D (GERD) as a share of GDP rose in trend terms over the period 2008-2012 (UNESCO, 2015). Grants were not only offered to selected firms but also to universities and public laboratories. However, as can be seen in Figure 13, Malaysia's GERD still fell significantly below that of Korea, Singapore and China although it was higher than that of Indonesia and Thailand.

Figure 13: Gross Expenditure in R&D/GDP, Selected Economies, 2008-2012



Source: UNESCO (2015)

However, the trend increase in Malaysia's GERD/GDP since 2008 is little reflected in technological upgrading within manufacturing. Wong and Goh (2010) and Krishnan, Santha and Rasiah (2016) used regression results to show that investments into R&D in Malaysia positively impacted on increased scientific publications, but showed no relationship with patent filing in the United States and GDP growth. In contrast, Wong and Goh's (2010) regressions on Korea and Taiwan showed a positive and strong relationship between R&D investment and patent filing in the United States and GDP growth. Central to this anomaly is the lack of effective human capital development policies. We examine this issue in the next section.

Challenges to the Education System and the Brain Drain

Underlying Malaysia's limited innovation capacity, as pointed out, has been the lack of sufficient training and experience of the personnel available to industry and other research and development efforts. Efforts to greatly improve physical infrastructure, institutional efficiency, and mass education (particularly in the fields of science and technology) were very successful in Korea, Taiwan and Singapore, there is evidence to suggest that Malaysia's performance on these three dimensions were considerably less impressive, and that is particularly the case in the area of education. Malaysia has made much progress in expanding access to education but much less progress in upgrading the quality of education. We will examine in this section the quality of the Malaysian education system by looking at two components: high school and universities.

The State of High School Education

For the assessment of the high school component, we use the PISA (Programme for International Student Assessment) scores collected by the OECD every three years, beginning in 2000.¹⁶ PISA tests the scholastic performance of 15-year old students around the world in Mathematics, Reading, and Science. Malaysian participated in the 2009, 2012 and 2015 assessments, but the 2015 Pisa scores of Malaysia were excluded from the final tabulation because they were judged to be insufficiently reliable.

¹⁶ The data cited are from: <http://www.oecd.org/pisa/>

The 2009 PISA scores for Malaysia did not appear in the regular official PISA report of 2009 published in 2010 by the OECD, they appeared instead in a supplement volume, "PISA 2009 Plus Results: Performance of 15-year olds in reading, mathematics and science for 10 additional participants," published in 2011 by the Australian Council for Educational Research (ACER). Ten countries (including Malaysia and the United Arab Emirates) were added to the original sample of 65 countries in the regular official 2009 PISA report. Since the United Arab Emirates included Dubai as a member, we dropped Dubai from the expanded 2009 sample set we constructed, bringing the consolidated 2009 sample size to 74 countries.

The regular official 2012 PISA report included Malaysia in its sample of 65 countries. This 2012 PISA sample had two countries not in our consolidated 2009 sample: Cyprus and Vietnam. The 2012 PISA sample was smaller than our *Consolidated 2009 PISA sample* because it excluded Azerbaijan, Georgia, Kyrgyzstan, Malta, Mauritius, Moldova, Panama, Trinidad-Tobago, Miranda-Venezuela, Himachal Pradesh-India, and Tamil Nadu-India. To increase the consistency in comparing the ranking in the 65-country size of the 2012 sample with the ranking in the 74-country 2009 sample, we constructed a *67-country Reference 2009 Pisa sample* by dropping seven countries (Georgia, Malta, Mauritius, Moldova, Miranda-Venezuela, Himachal Pradesh-India, and Tamil Nadu-India) from the *74-country Consolidated 2009 Pisa sample*.

We created a comparator group of 6 countries to provide a benchmark to assess the quality of Malaysian education and the change in quality over 2009-2012. These six countries were picked on the basis of two reference points.

First, we chose 2012 as the reference year because we want to assess the performance of Malaysian high schools in the ASEAN context. And the 2012 Pisa Report contains more ASEAN members (Indonesia, Malaysia, Singapore, Thailand and Vietnam) than 2009 Pisa Report (where Vietnam was absent).

Second, we chose Mathematics as the reference subject area. This is because PISA (2013, pp. 6) stated that, more so than Reading and Science, “Proficiency in mathematics is a strong predictor of positive outcomes for young adults, influencing their ability to participate in post-secondary education and their expected future earnings.” In the 2012 sample of 65 countries, Malaysia ranked No. 52 in Mathematics in 2012, Chile was No. 51 and Mexico was No. 53 – and we put similar-ranked Chile and Mexico into our comparator group (which already includes Indonesia, Singapore, Thailand and Vietnam).

Table 10 shows that, for every country, the international ranking of its students’ performance in each of the three areas (Mathematics, Reading and Science) are generally quite close. In 2012, the respective ranks for Thailand were 50, 48 and 49, and for Indonesia were 64, 62 and 64. This feature of similar international rank for a country across the three disciplines was also seen in the two Latin American countries: 51, 48 and 47 for Chile, and 53, 51 and 53 for Mexico – a maximum difference of 4 across disciplines. Table 10 also shows that the international rank of a country was relatively stable in the 2009-2012. Thailand’s respective rank for the three subjects (Mathematics, Reading and Science) in 2009 was 51, 51 and 50; Indonesia’s was 63, 59 and 62; Chile was 48, 43 and 43; and Mexico was 50, 49, and 52 – a maximum difference of 5 across time for any discipline. Of course, this general stability in ranking over time might be the artifact of the short 3-year period.

For Malaysia in 2012, its respective rank for the three subjects was 52, 59 and 53 – a difference of 7 between Reading and Math-Science, which suggests that the reading ability of Malaysian students is unusually low for this level of mastery of Math-Science. What is more worrying is that the general performance of Malaysian students fell in the 2009-2012 period compared with the other six countries in Table 10. The two-place improvement in Mathematics (from 55 in 2009 to 53 in 2012) was very much offset by the 6-place drop in Reading and 1-place drop in Science.

When we look at the mean PISA score in each subject across time, we see two classes of outcome in Table 10: definite significant improvement versus mixed performance. Singapore and Thailand showed definite improvement with increases in score in all three

subjects, ranging from 8 to 20 points. For Mathematics, Chile, Malaysia, and Indonesia showed improvement but Mexico's score declined. For Reading and Science, retrogression characterized Chile, Malaysia, Mexico and Indonesia.

TABLE 10: Scholastic Performance of 15-Year Old Students in Selected Countries

			<u>International Rank</u>			<u>Mean Score</u>		
	Income (GDP per capita, PPP)		<u>Mathe-</u>	<u>Reading</u>	<u>Science</u>	<u>Mathe-</u>	<u>Reading</u>	<u>Science</u>
	Constant 2011 International \$		<u>matics</u>			<u>matics</u>		
<u>2012 PISA score (official sample of 65 countries)</u>								
Singapore	75,777.4		2	3	3	573	542	551
Vietnam	4,910.3		17	20	21	511	508	528
Thailand	14,584.7		50	48	49	427	441	444
Chile	21,142.0		51	48	47	423	441	445
Malaysia	22,706.6		52	59	53	421	398	420
Mexico	16,158.3		53	51	55	413	424	415
Indonesia	9,282.7		64	62	64	375	396	382
<u>2009 PISA score (our constructed reference sample of 67 countries)</u>								
Singapore	63,610.8		2	5	4	562	526	542
Vietnam	4,260.0		NA	NA	NA	NA	NA	NA
Thailand	12,663.0		51	51	50	419	421	425
Chile	18,505.6		48	43	43	421	449	447
Malaysia	20,051.8		55	53	51	404	414	422
Mexico	14,843.4		50	49	52	419	425	416

Malaysia displayed the most volatile changes: a 17-point rise in Mathematics score but a 16-point decline in Reading. Because there was a general improvement in mastery of Mathematics across the comparator group of countries, the 17-point rise for Malaysia translated only to a 2-place improvement in rank. The 16-point decline in Reading, on the other hand, caused a 6-place drop in rank. Overall, Table 10 shows that it is easier to argue that the quality of high school education in Malaysia has decreased rather than increased in the international context. It was at best unchanged.

We are able to look further into the nature of the large decline in Malaysia's PISA score on Reading in 2009-2012 because the 2009 Pisa Report contains the breakdown of the Reading score according to the five components of Reading Skill: (1) Access and Retrieve, (2) Integrate and Interpret, (3) Reflect and Evaluate, (4) Comprehension of Continuous Texts,

and (5) Comprehension of Non-Continuous Texts. Table 11 presents the data for 6 of the 7 countries in our comparison group (Vietnam was not in the 2009 Report). The Overall Reading Score for Malaysia in 2009 (414) was substantially lower than Singapore (526), Thailand (421), Chile (449) and Mexico (425) but substantially higher than Indonesia (402).

Singapore, Chile and Mexico dominated Malaysia in every component of the Reading Test. Thailand did not dominate Malaysia only because its score for “Integrate and Interpret” was 1 point below that of Malaysia. It is noteworthy that Malaysia could not dominate Indonesia in Reading because its score for “Reflect and Evaluate” was 2 points lower than Indonesia’s score (409). Table 11 confirms that Malaysian high school students had a particularly difficult time in mastering Reading Skills.

The most unexpected aspect in Table 10 is that although the income level of Malaysia (22,706.6¹⁷) in 2012 is higher than those in Vietnam (4,910.3), Thailand (14,584.7), and Chile (21,142.0), the scholastic performance of Malaysian high school students was dominated in all three fields by the performance of students in these three countries. Although Mexico’s income (16,158.3) is only 71 percent of Malaysia’s, its Reading score in 2012 (424) was substantially higher than Malaysia’s (398).

Since the academic achievements of Malaysian high school students in 2012 were worse than in the lower-income countries of Vietnam, Thailand and Chile, could this outcome be due to education being inadequately supported by the Malaysian government budget? The education budgets of the seven countries are expressed as a percent of total government expenditure in Table 12 and as a percent of GDP in Table 13. By expressing the education budget as a percent of the total government budget, we are able to assess the priority that the government gives to education. The 20.3 percent of budget that the Malaysian government allocates to education shows that the Malaysian government is as strongly committed to supporting education as Singapore (20.5 percent), Vietnam (20.1 percent), Thailand (20.5 percent), and Mexico (20.4 percent).

¹⁷ Measured as GNP per capita in PPP constant 2011 international dollars.

Table 11: Comparative View of Mastery of Different Reading Skills in 2009

	Overall Reading score	<u>Score on the components of the Reading test</u>					
		<i>Access and retrieve</i>	<i>Integrate and interpret</i>	<i>Reflect and evaluate</i>	<i>Continuous texts</i>	<i>Non-continuous texts</i>	
	(a)	(b)	(c)	(d)	(e)	(f)	
OECD average	493	495	493	494	494	493	
Singapore	526	526	525	529	522	539	
Thailand	421	431	416	420	423	423	
Chile	449	444	452	452	453	444	
Malaysia	414	408	417	407	414	410	
Mexico	425	433	418	432	426	424	
Indonesia	402	399	397	409	405	399	

The normalization of the education budget by GDP in Table 13 shows the amount of resources that a country is investing in education relative to its income. The figure of 5.85 percent of GDP for Malaysia is at least one percentage higher than Singapore (3.25 percent), Thailand (4.12 percent), Chile (3.84 percent), Mexico (4.83 percent), and Indonesia (3.04 percent). The only country that almost matched Malaysia's high level of expenditure on education is high-performance Vietnam (5.83 percent).

It appears that the high investment by Malaysia on education has been either inefficiently implemented or rendered ineffective by something in the system.

Table 12: Education budget as percentage of total government expenditure

	Singapore	Vietnam	Thailand	Chile	Malaysia	Mexico	Indonesia
2000	14.2		28.4	16.4	21.4	19.8	
2001	18.1		24.2		24.3	20.8	11.6
2002	17.7		16.2	17.4	25.9	21.0	14.4
2003	22.7		20.9	17.6	24.5	22.4	16.3
2004	26.4		21.5	17.0	21.0	22.2	14.2
2005	23.9		20.5	16.1		22.2	15.1
2006	23.1		22.0	16.2	16.7	20.7	
2007	22.5		18.5	16.6	16.1	20.2	14.9
2008	22.8	18.1	18.2	17.5	14.0	18.8	13.7
2009	17.5		18.2	17.2	18.5	18.5	19.3
2010	16.6	20.9	16.2	17.5	18.4	19.4	16.7
2011	20.6		22.6	17.5	21.0	19.0	18.1
2012	20.9	21.4	21.4	19.3			18.1
2013	19.9		18.9	19.1	21.5		17.6
2014							17.5
<i>average</i>	20.5	20.1	20.5	17.3	20.3	20.4	16.0

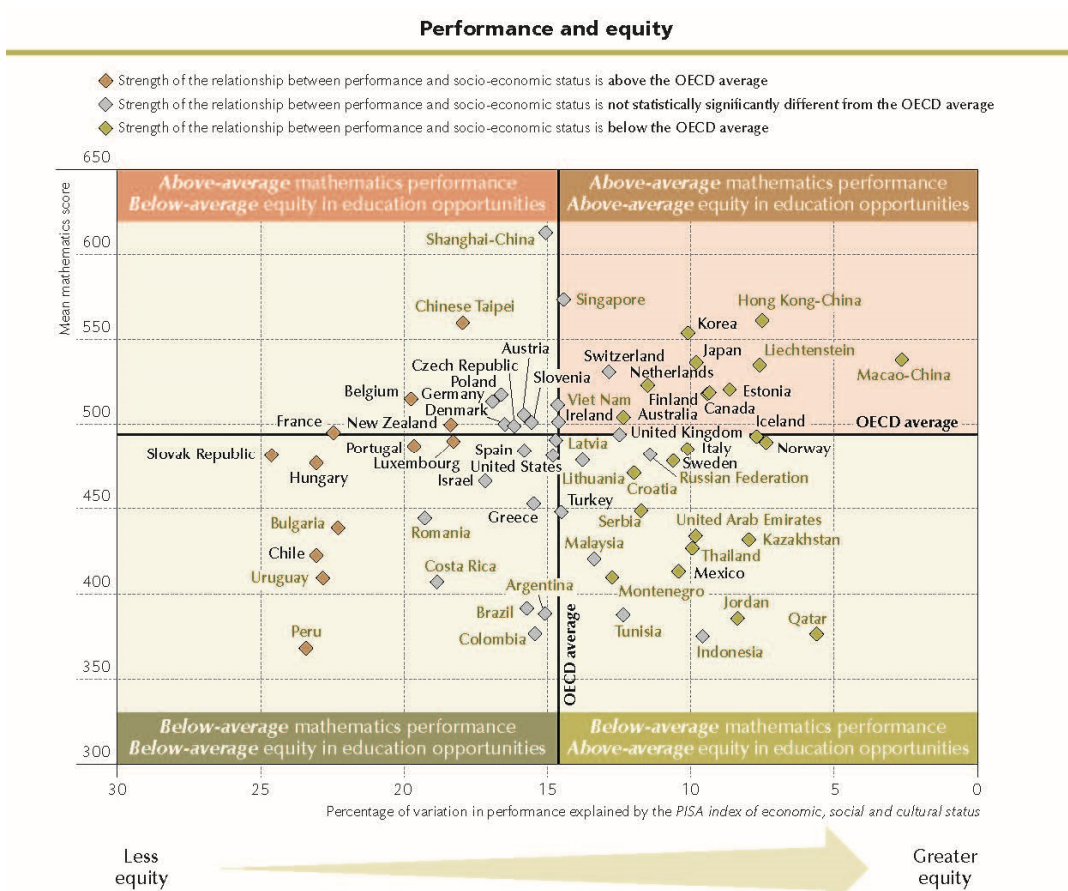
Table 13: Education budget as percentage of GDP

	Singapore	Vietnam	Thailand	Chile	Malaysia	Mexico	Indonesia
1997			4.56	3.09	4.62		1.07
1998			4.63	3.43		3.53	
1999			4.83	3.84	5.69	3.66	
2000	3.32		5.25	3.71	5.97	4.13	
2001	3.55		4.82		7.48	4.43	2.46
2002	3.90		3.86	4.01	7.66	4.64	2.65
2003	4.01		3.73	3.85	7.50	5.19	3.22
2004	3.68		4.03	3.49	5.92	4.80	2.75
2005	3.22		3.94	3.23		4.91	2.87
2006	2.87		4.05	3.02	4.49	4.75	
2007	2.96		3.60	3.22	4.37	4.73	3.04
2008	2.78	4.89	3.51	3.79	3.96	4.86	2.90
2009	3.03		3.86	4.24	5.97	5.23	3.53
2010	3.11	6.29	3.51	4.18	4.97	5.20	2.81
2011	3.07		4.81	4.07	5.76	5.15	3.19
2012	3.12	6.30	4.54	4.57			3.41
2013	2.91		4.13	4.56	6.09		3.37
2014							3.30
<i>average</i>	3.25	5.83	4.12	3.84	5.85	4.83	3.04

Figure 14 shows the cross-country relationship between the Mathematics score and the pay of the teacher (measured as a percent of per capita income) in 2012. It is found that a statistically significant positive relationship exists for countries with per capita income of US\$20,000. For countries with per capita income of less than US\$20,000, this relationship is negative but not statistically significant. Malaysia has a Mathematics score slightly lower than that of Chile, but Malaysian teachers were paid 210 percent of average income compared to 140 percent for Chilean teachers. Thailand's Mathematics score was substantially above Malaysia's but its teachers were paid only 125 percent of average income. The policy message from Figure 14 is that Malaysia had greatly overpaid its ineffective high school teachers.

It also appears that the high expenditure on education in Malaysia has greatly increased the quantity of educational opportunities but it has not increased the quality of the educational experience. Figure 15 reports the categorization of countries into a graph where the Y-axis is performance in Mathematics and the X-axis is accessibility to education. Malaysia is in the southeast quadrant which is characterized by "below-average mathematics performance and above-average equity in education opportunities." Indonesia, Mexico and Thailand are also in this southeast quadrant. Like Malaysia, these three countries have greatly increased access to high-school education but the quality of their high schools is lagging.

Figure 15: Education in Malaysia is High Accessible but Quality is Low



The State of Tertiary Education

The universities were important instruments in the 1971 New Economic Policy (NEP) program to re-engineer the socio-economic structure of Malaysia such that the share of Malay participation in higher-paying professional occupations, and Malay ownership of corporate capital would rise significantly to be more in line with the proportion of Malays in the population. Racial quotas were imposed to increase the number of Bumiputera students and Bumiputera faculty members. The desire to raise quickly the proportion of Bumiputeras in the universities resulted in a heavy emphasis on the fulfillment of the targeted quantities at the expense of maintaining (not to mention, raising) quality.

According to Mukherjee and Wong (2011): “In UM [Universiti Malaya] and in government, the policy impact spiraled upward so that Bumiputera staff members, overtime, secured

almost all senior management, administrative, and academic positions.”¹⁸At the same time, the language of instruction at tertiary institutions was switched to Malay from English -- except for the Bumiputera-only Mara University of Technology, UiTM, which (in principle) taught only in English. Mukherjee and Wong had this to say about the consequences of this change to the Malay language:

“The Malays benefited from the rapid change in language medium, particularly those from the rural areas. However, the short-term outcome of this policy, apart from improved grades among the Malay students, was the inability or unwillingness of many to deal with English. Opportunities were lost to function in English, which is currently the global language of research, publication, scientific discourse, and electronic communication and a tool for increasing mobility. Students regurgitated lecture notes, reluctant to refer to English-language texts, journals, and sources of reference ... Unless political measures support the widespread use of English, the engagement of young Malaysians in global knowledge creation will continue to be limited.”

The government also began building a large publicly-financed tertiary education system reserved for Bumiputeras, the MARA University of Technology (UiTM) system. MARA College was founded in 1965 to provide technical training to Bumiputeras (mainly for factory employment) by expanding an existing training center. MARA College became the MARA Institute of Technology (ITM) in 1967 when it embarked on a great expansion. ITM was granted university status in 1996, and it was renamed the MARA University of Technology (UiTM) in 1999.

UiTM has grown into a sprawling university system, making it the largest university in Malaysia. In 2015, UiTM consisted of the Anchor Campus in Shah Alam, 13 state campuses (e.g. UiTM Penang, UiTM Pahang), and 31 satellite campuses. The UiTM system enrolled

¹⁸ Hena Mukherjee and Poh Kam Wong, (2011).

168,865 students in 2015, employed 17,000 staff members, and offered over 500 academic programs. UiTM has two components in its division of labor: System 1 is the Anchor University, which consists of the Main Campus and satellite campuses in Shah Alam; and System 2 is the State University that comprises the rest of the system. The rough difference is that System 1 is research and post-graduate-based, and System 2 is teaching and learning-based.

The reservation of large proportions of student bodies at Malaysian public universities to Bumiputeras caused two responses by members of the non-Bumiputera community: (1) a massive outflow of non-Bumiputera students to foreign universities (especially to Taiwan, Australia, and the United Kingdom); and (2) the growth of private education institutions. There had always been private colleges (e.g. Taylor College) providing training for professional exams like accountancy and law. Two private colleges, INTI and HELP, emerged in 1985 offering courses to connect local students to overseas university degrees (“twinning programs”). HELP started with a South Australian degree program, and INTI with an American degree program. They were adopting what MARA College had been doing - credit transfer courses at MARA before sending the students overseas. Both INTI and HELP started with about 30 students.¹⁹

There were two main reasons why both INTI and HELP started in 1985. First, Malaysia suffered a large negative growth of nearly 9 percent in 1985, and the middle-class found it difficult to fund the overseas education of their children. Second, the United Kingdom and Australia – the two major destinations for middle class Malaysians – started charging international students higher fees to cover actual costs.

The restrictions on the establishment of private universities were further eased after the October 1990 elections, which saw the loss of 21 parliamentary seats by the ruling coalition, Barisan Nasional. The expansion of the private universities boosted the access of the non-Bumiputera community to university education, allowing the government to address an

¹⁹ Indeed, HELP started at the car park of the old government office block in Damansara. Selangor Properties Berhad owned that office block, which explains why for the longest of time Selangor Properties was a large shareholder of HELP

important complaint of the non-Bumiputera community without the government spending a cent and having to allocate more spaces in the public universities to the non-Bumiputera community. A less resentful (perhaps, even, grateful) non-Bumiputera community was one reason why Barisan Nasional gained 35 seats in the April 1995 elections.

The number of public universities increased from 1 in 1967 to 20 in 2007, and the number of private tertiary institutions rose from zero to 33 in the same period. The number of students enrolled in domestic tertiary institutions went from 4,560 to 873,238; and the number of Malaysian students studying abroad was 54,915 in 2007. The outcome was that the ratio of the population in the 18-24 age group attending tertiary education institutions (home and abroad) was 26.7 percent in 2007, which is very much above the 4 percent attendance rate in 1967.

However, this almost 30 percent university attendance rate in Malaysia is too low. The university attendance rate of the 18-24 group is about 80 percent in South Korea and about 60 percent in the United States. The access to tertiary education in Malaysia is still too limited to permit knowledge-based growth to be the new norm. In short, Malaysia still has a quantity problem.

The other bad news is that Malaysia must also greatly improve the quality of its tertiary education if knowledge-based growth is to ever occur. The NEP mechanisms have weakened the incentives for universities to upgrade themselves. One way to identify the impact of the social engineering mission on the quality of Malaysian universities is to compare the academic quality of Malaysian universities with those of foreign universities. The choice of University Malaya (UM) and National University of Singapore (NUS) for comparison is particularly appropriate because they were branches of the University of Malaya until 1962 when they were transformed into separate independent universities, Universiti Malaya and University of Singapore.

More importantly, the Malaysian and Singapore governments assigned very different missions to their respective universities. social engineering versus economic construction.

As mentioned earlier, after 1969, the Malaysian government reorganized the universities to help in the task of accelerating the emergence of a large Malay middle-class and large Malay businesses (by graduating large numbers of Malay professionals and of potential Malay entrepreneurs) and of accelerating the use of the Malay language in high-level education. The Singapore government, on the other hand, doubled down on entrenching meritocracy in its universities, on supporting cutting edge research by their faculty, and on reducing the costs of transmission of the latest know-how from abroad (in which the strengthening of the fluency of the population in English was viewed as a top education priority).

It was to be expected that these very different priorities resulted in very different outcomes. Table 15 reports the QS ratings of the academic quality in Universiti Malaya (UM) and National University of Singapore (NUS) in the 2005-2016 period. The international rank of the overall academic quality of NUS went from 22 in 2005 to 30 in 2009 and then to 12 in 2016, while that of UM went from 169 to 180 and then to 133 – a difference between NUS and UM of over 100 places in every period. In short, there is a huge difference between the academic prowess of NUS and UM.

The gaps in the international rank of NUS and UM in some key research areas were even wider than the gap in overall rank. In Bio-Medicine, NUS suffered a substantial decline in its rank from 15 in 2005 to 27 in 2014 but then staged a recovery to 20 in 2017. The movement in UM's rank in Bio-Medicine was qualitatively similar but quantitatively much more dramatic, from 82 in 2005 to 325 in 2014 and then to 164 in 2017. The important point to note in this case is that the difference in rank between NUS and UM in Bio-medicine had widened by over 100 places in the 2005-2017 period. The difference in rank in these three years were 67, 298 and 144 respectively, confirming the huge difference in academic prowess between the two former branches of the same university.

Table 15: QS Rankings of Universities

QS Ranking of Universities							
	<u>2005</u>	<u>2007</u>	<u>2009</u>	<u>2014</u>	<u>2016</u>	<u>2017</u>	
<i>National University of Singapore</i>							
Overall	22	33	30	22	12		
<i>Biomedicine</i>	15	12	20	27	17	20	
<i>Science</i>	34	25	27	11	9	12	
<i>Technology</i>	9	10	14	7	4	7	
<i>Social Sciences</i>	13	20	20	9	7	8	
<i>Arts & Humanities</i>	56	21	23	17	13	21	
<i>Universiti Malaya</i>							
Overall	169	246	180	151	133		
<i>Biomedicine</i>	82	107	132	325	249	164	
<i>Science</i>		124	244	367*	217	164	
<i>Technology</i>		166	201	213	54	35	
<i>Social Sciences</i>	83	119	167	167	69	71	
<i>Arts & Humanities</i>	45	233	178	159*	127	85	
<i>2007-2009 data are from Mukherjee and Wong (2011)</i>							
<i>2014-2017 data are from QS website accessed 4 April 2017</i>							
<i>* = these are 2015 ranks because 2014 ranks are not available for Universiti Malaya</i>							
<i>in Science and Arts & Humanities</i>							
<i>The fields listed are from Mukherjee and Wong (2001), but the fields listed</i>							
<i>in QS (4 April 2017) are different. We assume that the following equivalence</i>							
<i>between the former and the latter:</i>							
<i>-- Biomedicine = Life Sciences & Medicine</i>							
<i>-- Science = Natural Science</i>							
<i>-- Technology = Engineering & Technology</i>							
<i>-- Social Sciences = Social Sciences & Management</i>							

The second notable point in Table 15 is about the decline in rank in the area Bio-Medicine in the 2005-2017 period was an exception for NUS. In the other four broad subject areas of Science, Technology, Social Sciences, and Arts & Humanities, the rank of NUS went up by 22 places, 2 places, 5 places, and 35 places respectively – mirroring the rise in the overall ranking of NUS. In short, the twin policies of a merit-based reward system and constant generous government budget allocations have enabled NUS to become an academic powerhouse.

Table 16 reports the number of publications of UM and NUS in different fields, and the professional impact of their research. The good news is that, for both universities, the quantity of publications generally went up over time (the exception being UM in the

Economics field), and that the number of citations per publication also generally went up (the exception being UM in the Business and Management field). The dissatisfactory feature revealed in Table 16 is that the improvements of NUS greatly dominated the improvements of UM in every field. The number of publications in the Engineering field rose from 9 in 1981-83 to 146 in 2001-03 for UM but this progress was dwarfed by that of NUS, rising from 111 to 2,823. Over the same period, the average number of citations per publication in the Engineering field rose from 1 to 3.8 for UM and from 1.5 to 5.7 for NUS.

The first policy-relevant message from Table 15 and Table 16 is unambiguous. While it will always be a matter for debate about whether the absolute academic quality of UM had fallen or not, it is undeniable that UM is not anywhere near a top global research university and that NUS has now come a world-class research university. UM experienced large declines in ranks in 2005-2017 in two of the three subject areas for which data are available, while NUS reported substantial gains in its ranks in four of the five subject areas (e.g. science, and arts and humanities). Malaysia’s hope for transition to knowledge-based growth and innovation-led industries will be hard to realize until a large number of its universities are close to being cutting-edge in most subject areas.

Table 16: Publications & Citations of Universiti Malaya (UM) and National University of Singapore (NUS)

	<u>Engineering fields</u>		<u>Medicine fields</u>		<u>Economics fields</u>		<u>Business & Management fields</u>	
	UM	NUS	UM	NUS	UM	NUS	UM	NUS
<u>Number of papers</u>								
1981–83	9	111	132	186	11	51	2	8
1991–93	40	586	192	747	5	32	0	45
2001–03	146	2,823	324	1,808	6	123	6	148
<u>Average citation rate per publication</u>								
1981–83	1	1.45	2.85	3.16	0.09	0.35	6.5	0.13
1991–93	1.4	2.54	4.43	6.24	0.4	2.47		3.69
2001–03	3.83	5.66	5.08	11.33	3.17	3.89	0.17	8.41
Source: Mukherjee and Wong (2011)								

The second policy-relevant message from Table 15 is that Malaysian universities can improve dramatically when the correct incentives are introduced and effective implementation is undertaken. After Prime Minister Mohamad Mahathir declared in 1991 that Malaysia would attain developed country status in 2020 (the 2020 Vision statement), it was increasingly recognized over time and by a growing proportion of the elite that the Malaysian universities were not up to the task of training enough Malaysians to master new technologies from abroad, not to mention, to, more easily, create new technologies locally.

Abdullah Badawi, who became Prime Minister in 2003, has come to be known as the “Father of Human Capital Development” for his serious efforts to upgrade the Malaysian universities. He took the Department of Higher Education out of the Ministry of Education to create the Ministry of Higher Education, gave large budgetary allocations to the public universities, ceded some operational autonomy back to them, and demanded, in return, that the public universities improve their academic productivity. In November 2008, Badawi appointed Ghauth Jasmon (who was well-known for his insistent advocacy for higher academic standards) the Vice-Chancellor of Universiti Malaya. Ghauth Jasmon launched the High-Impact Research Program that both increased pressure on UM staff to do more and better research, and recruited many productive scholars from abroad. The much higher rank of UM in disciplines across-the-board in 2017 was doubtlessly helped by the High-Impact Research Program. Table 15 reports that Bio-Medicine ranked 164 in 2017 compared to 325 in 2014; Science ranked 164 compared to 367 in 2015, Technology ranked 35 compared to 213 in 2014, Social Sciences ranked 71 compared to 167 in 2009, and Arts & Humanities ranked 85 compared to 233 in 2007.

In 2015, the government sought to recommit itself to the task of restructuring the Malaysian tertiary education by issuing the Malaysia Education Blueprint 2015-2025 (Higher Education) which promulgated 10 shifts in the organization of higher education. For example, there would be greater emphasis on STEM (science, technology, engineering, and mathematics), proficiency in English, the commercialization of ideas, university-industry research partnerships, use of Massive Open Online Courses and blended learning,

collaboration between public and private universities, life-long learning and transition from the current centralized governance of public universities by the Ministry of Higher Education to earned autonomy of the public universities.²⁰ The Ministry of Higher Education (MOHE) is the driver in the fulfillment of this ambitious agenda.

This is not the first time that a well-articulated plan with a well-marked delivery schedule for tertiary education reform has been formulated for Malaysia. The Institute for Strategic and International Studies in Malaysia (ISIS Malaysia) prepared a very sound plan in 2002 for the Ministry of Finance to transform the input-driven growth strategy of Malaysia into a knowledge-driven growth strategy (where transformation of the universities was the most important component)²¹. Then, in 2007, the World Bank prepared a very sensible, highly practical plan for the Economic Planning Unit to reform Malaysian universities.²² However, very little has been heard about the extent to which the 2002 ISIS plan and the 2007 World Bank plan were implemented.

In our comparison of the 2007 World Bank plan and the more recent 2015 blueprint, the substance and message of the two reports are about the same. The primary difference is that the 2015 blueprint is visually much more attractive. We know that this time could be different in that there would be greater and better implementation of the blueprint, and we do loyally hope that this time would indeed be different from the outcomes of the 2002 and 2007 action agendas.

Recently there has been a recent glitch in the upgrading of the public universities. Because the government faced difficult budget situations in 2016 and 2017, the budgets of most of the public universities were cut significantly in these years, and the results have been some cutbacks in staff and research budgets. We hope that the announced institutional reforms have been sufficiently implemented such that they would offset the negative academic consequences from the budget cuts.

²⁰ Ministry of Education Malaysia, 2015.

²¹ Institute of Strategic and International Studies, 2002.

²² World Bank. (2007).

Brain Drain from Malaysia

“Malaysia faces an exodus of talent. Not only is our education system failing to deliver the required talent, we have not been able to retain local talent of all races nor attract foreign ones due to poor prospects and a lack of high-skilled jobs.”
(National Economic Advisory Council, 2010. pp. 60)

In 2011, the World Bank issued a worrisome report on brain drain from Malaysia.²³ Figure 16 from World Bank (2011) summarizes the World Bank’s analysis of the brain drain problem. The Malaysian diaspora was estimated to be about one million people in 2010, compared to about 750 thousand in 2000. When we define “brain drain” as the outward-migration of people with tertiary-level education, the brain drain from Malaysia was 335 thousand in 2010, up from 217 thousand in 2000. The proportion of the diaspora that represented brain drain was therefore 29 percent in 2000 and 33 percent in 2012, which means that 43 percent of the outward migration was brain drain. Thus, the trend in outward migration is that it is becoming more and more the preserve of the skilled.

The number of skilled Malaysians living abroad has tripled in the last two decades with 2 out of every 10 Malaysians with tertiary education opting to leave for either OECD countries or Singapore. This is four times the world average. Malaysia’s brain drain is worsened by inadequate compensating inflows. 60 per cent of immigration into Malaysia has only primary education or less, and the number of skilled expatriates has declined by 25 per cent since 2004. Given the lower skill base — as proxied by educational attainment — the impact of a person leaving should also be higher in Malaysia than elsewhere, keeping all else constant. According to the World Bank (2011) report, the top three drivers for brain drain were career prospects, social injustice and compensation. “Social injustice” refers to the non-inclusiveness nature of many Malaysian government policies (e.g. exclusive scholarship programs for Bumiputeras), causing much discontent in the non-Bumiputera community, whose members make up the bulk of the diaspora (88 percent in 2010). Philip Schellekens, the lead author of the World Bank report, has concluded that

²³ World Bank, [Malaysia Economic Monitor: Brain Drain](#), April 2011. Philip Schellekens is the Lead Author.

brain drain “is likely to intensify, further eroding the country’s already narrow skills base in the absence of mitigating actions.”²⁴

As to the question of what is to be done, we would like to quote at length the frank recommendations of Philip Schellekens²⁵:

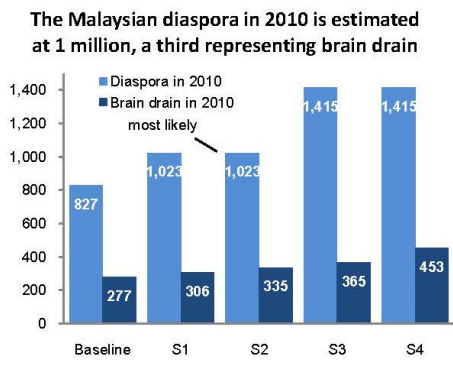
“[There is the fundamental] need to update Malaysia’s inclusiveness strategies so as to realign them with the objective of becoming a high-income economy.

The need to update Malaysia’s inclusiveness strategies reflects both new realities and new challenges. The new reality is that poverty is no longer the key issue when thinking about inclusive growth. Poverty still exists—and pockets of poverty remain deep and concentrated — but inequality is now in the spotlight and is presenting a tremendous challenge. The other new reality is that inequality is no longer what it was four decades ago. Nowadays over 90 percent of the level of inequality is explained by differences within ethnic groups rather than differences between these groups. Individual socio-economic characteristics, such as activity status, sector of employment, urban versus rural stratum, and educational attainment are now the capital explanatory factors, no longer ethnicity.”

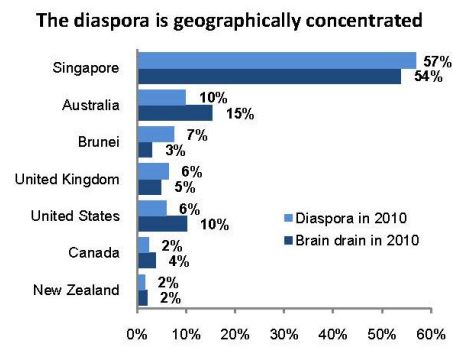
²⁴ Lee Wei Lian, (2011).

²⁵ Philip Schellekens, (2010).

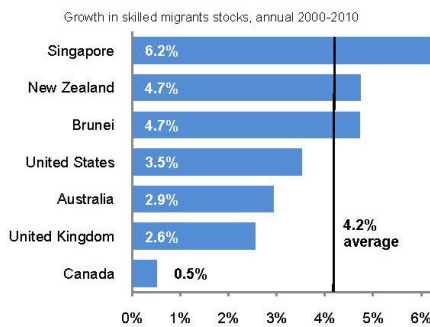
Figure 16: The Brain Drain Challenge in Pictures



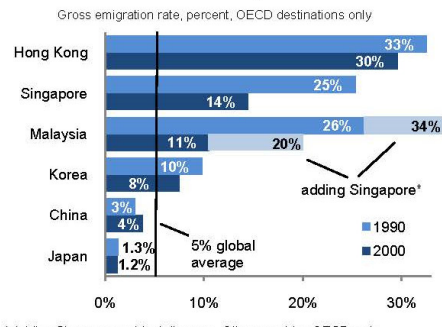
Note: S1-4 are scenarios accounting for uncertainty on nonresidents in Sgp.



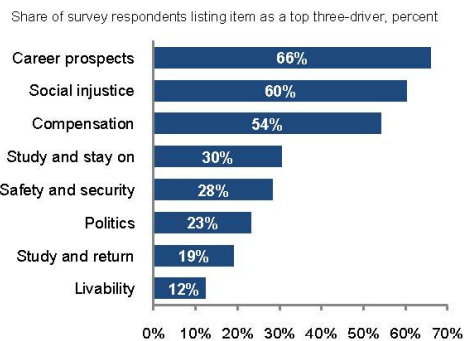
The pace of brain drain is elevated



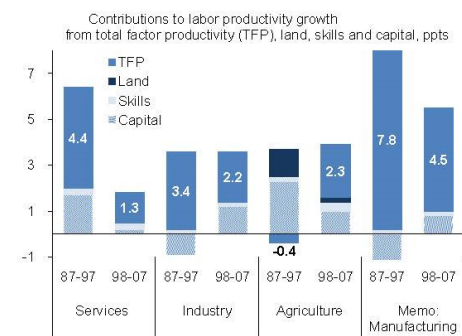
Relative to narrow skill base, brain drain is intense



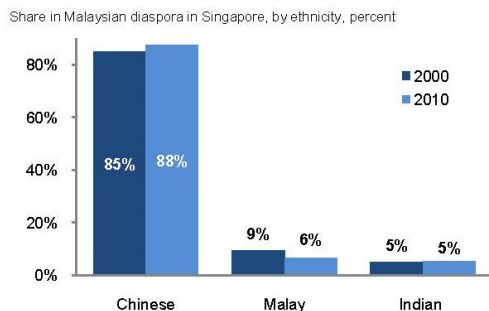
Brain drain is a symptom driven by productivity and inclusiveness concerns



Boosting productivity will require up-skilling through education and innovation policies



Reducing the ethnic skew in the diaspora will require updating inclusiveness policies



Targeted policies to tap into global talent and engage with the diaspora would complement



Source: World Bank (2011)

Will Malaysia Make it to High Income Status and When?

In the six decades since independence in 1957, Malaysia created and sustained policies that both supported economic growth and a major restructuring of society. As explained in this essay, the restructuring was designed first as a measure to eliminate the identification of occupation with race and second as a measure to reduce poverty in general but among Bumiputera specifically. The policies that made this growth and transformation possible relied on market forces, macroeconomic stability, and major government investments in infrastructure and education. After 1971, the favored position of Bumiputera with respect to access to government appointment was reinforced by policies designed to pressure the private sector to hire more Bumiputera and to give Bumiputera a larger share in the ownership and management of the economy. Of particular importance, public education at the university level was reoriented to give the major share of student places to Bumiputera and to support a steadily increasing role for Bumiputera in the faculties and management of public universities.

By any reasonable measure, as this essay has demonstrated, these policies succeeded in achieving their major goals. GDP since 1960 has averaged a growth rate of 6.3 percent per year, while GDP per capita averaged 3.8 percent per year. This growth alone has eliminated much of the poverty that existed in the country at the time of independence. For the poorest Bumiputera, the impact of growth on poverty has been reinforced by a wide range of government efforts to promote Bumiputera education, employment, and income. By the twenty-first century, each of the major ethnic groups in the nation were well represented in professions, in business, and in most areas of employment. The major exception was government employment where Bumiputera dominated. Ownership was also widely shared with Bumiputera dominating in economic activities where the government role was central and Chinese-Malaysians dominating in the private sector (35 of the 50 wealthiest Malaysians, for example, were Chinese-Malaysians).

While the policies put in place at independence and substantially revised after 1971 have largely accomplished their objectives to date, there is ample reason to suggest that these same policies carried forward into future decades are likely to be much less successful and

may even lead Malaysia into the much feared “middle income trap”. It should be noted that Malaysia in 2017 is not yet caught in the “middle income trap”. GDP growth and growth per capita, for example, have held up at 4.8 and 3.0 percent respectively since 2000. While this is a slowdown from the past, as pointed out earlier in this essay, it is likely that the slowdown to date mainly reflects the fact that Malaysia has achieved a level of per capita income (US\$25,000 in 2011 PPP prices) when all countries that have gone on to high income status have slowed down.

The problem going forward is, first and foremost, that at this level of income, sustaining economic growth increasingly depends on the ability of a country to innovate at the frontiers of knowledge. As our discussion above argued, in the electronics industry Malaysia does have some capacity to innovate at a level that has kept Malaysian products in this sector internationally competitive as the country has moved up the technology ladder. Malaysia’s innovative capacity in this sector is superior to that in other Southeast Asian countries, such as Thailand, Indonesia and the Philippines, but even in this sector Malaysian innovating capacity falls far behind that of the economies of Northeast Asia.

Furthermore, most of this innovation, and most of Malaysia’s electronics exports, emanate from foreign owned and managed firms. Malaysia has from independence on been an attractive destination for foreign direct investment due to its comparative stability, its excellent infrastructure, and the fact that much of the population speaks English. Foreign direct investment, however, is not large as a share of GDP and it is involved in only a limited range of industries. Furthermore, foreign investors can readily redirect their investment elsewhere if they see a more supportive environment elsewhere.

Malaysia thus needs a domestic innovating capacity that is based in Malaysian companies and carried out by Malaysian workers and entrepreneurs. Malaysian governments both at present and in the past have recognized this need and have made large investments in infrastructure such as cyberports designed to support such a capacity. Infrastructure is useful, however, only if one also has the human resources that can lead to a broad based, in depth, innovation effort. Because this kind of a human resource base is inadequate,

Malaysia's innovation infrastructure has fallen far short of its promise and of the country's needs.

There is no secret as to why Malaysia has to date failed to create the human resource base required for an innovating society and economy. The post 1971 New Economic Policies, while once necessary in order to include all of the country's people in development and thus ensure their support for development, have outlived their usefulness. Where once they created stability and broad support for the government, they now are increasingly a source of instability. Their impact on the education system has had an even more direct and negative impact on the ability of the country to become an innovation leader on the frontier of a range of industries and services.

This essay is not arguing to eliminate all of the policies that emanated first from the crisis of 1969. Policies designed to give special support to those in poverty should continue. It would be better if these policies were applied to all citizens who are poor and lack educational and other opportunities to raise themselves out of poverty, but the majority of such people are Bumiputera and whether these programs are expanded to non-Bumiputera is a secondary issue. Some already have been.

The real problem with the post 1969 ethnic policies lies with those that primarily benefit the Bumiputera elites. These elites that are already highly educated and have high incomes continue to receive favored access to a wide range of government favors ranging from finance to government contracts and much else. While many of these favored positions are legal according to Malaysian law, they are often widely perceived by many (including many well educated Bumiputera) as corrupt. The alienation of so many of the younger educated elites in all ethnic groups has driven those determined to hold on to their elite privileges to move in an increasingly conservative direction toward policies that are antithetical to continued rapid growth and a rise to high income status.

The most direct impact of these policies is on the education sector particularly at the university level. The problem partly is that the university quotas for entering students are,

in comparison with most such policies around the world, on the extreme end of favoring one ethnic group over the others. The bigger problem is that similar values have pervaded the selection of university management and faculty. All great universities around the world hire faculty and university leaders strictly on the basis of merit—not on political or ethnic criteria or even on nationality in the very best universities. While there are many very able Malaysian faculty members and deans in the public universities, the quality of Malaysian university education falls far below what one would expect in a country with Malaysia's high per capita income. Private universities in Malaysia can, to some degree, ameliorate the problem caused by the low quotas for non-Bumiputera in the public universities. But it will be a long time before even the best private universities can become a viable substitute capable of producing the technology and leadership elites that can take Malaysian industry and services to a world class level. The public universities are much better placed and supported to play this role, but not with current policies.

The continued pursuit of such a strong ethnic agenda has caused one other problem that inhibits growth to high income status. In countries such as China and Korea, governments have made major efforts and have offered a wide variety of incentives, and particularly strong elements of nationalism to get their most skilled and highly trained people to return home and stay home. Northeast Asia's success in moving rapidly up the technology ladder has resulted from the hundreds of thousands of people trained in the best institutions abroad, many also with work experience in places such as Silicon Valley, have given up good positions abroad to return home. Malaysia has done the opposite for the large share of its population that is not Bumiputera. Large numbers of non-Bumiputera trained abroad never come home and many of the ablest trained at home leave, notably to Singapore.

Malaysia in 2017 is at a crossroads where the reform policies instituted after 1969 are increasingly being questioned by the more educated and modernized parts of the population and by the challenges of remaining competitive internationally. There is no crisis at the moment at least in the economic sphere, however, and possibly the economic system designed over four decades ago can continue to muddle through with steadily rising incomes for most. As this essay has attempted to demonstrate, however, muddling

through with existing policies is likely to work less and less well both in the economic sphere and in the political sphere. Malaysia could eventually face a choice between doubling down on the existing system and traditional values, a step that will almost certainly lead to the kinds of stagnation that one finds in so many other middle income countries, or moving decisively toward a merit based modernizing agenda and membership in the club of high income countries.

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