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SOURCES OF GROWTH STUDIES IN MALAYSIA: METHODOLOGIES AND RESULTS

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METHODOLIGIES AND RESULTS

Abstract

This paper reviews selected sources of growth studies in Malaysia. We present the different methodologies adopted, results and policy implications. Several conclusions emerged. The growth of Malaysian economy was mainly governed by the input-driven rather than productivity-driven. Capital accumulation contributed almost half of output growth. The contribution of productivity growth, which was about 25 percent, was very low as compared to productivity-driven economy such as Korea and Taiwan, where productivity growth contributed almost half of their GDP growth. Empirical evidence shows that outward-oriented economy, existence of foreign firms and improvement in physical capital tend to give significant effect in enhancing productivity growth in Malaysia.

1. INTRODUCTION

The growth of an economy is governed by two distinct sources of growth that is input-driven and productivity-driven. The input-driven growth is achieved through the increase in factors of production which is inevitably subjected to diminishing returns and is not sustainable in the long run (Young,1992; Krugman,1994 and Kim and Lau,1994). The productivity-driven growth is the growth in output that cannot be explained by the growth in total inputs. It is normally attributed to the advance of knowledge or technological progress, efficient use of factors of production, improvement in organizational structure and human resources management, gains from specialization, learning-by-doing, skill acquisition through human capital investment and enhancement of information technology.

Thus the growth in productivity, which is also known as total factor productivity (TFP) growth, is the difference between actual growth of output and the growth of a composite of all factor inputs. It measures the overall efficiency with which products are produced and thus enable the economy to generate larger output from the same available resources. In other words,

TFP growth would bring the economy to a higher production frontier, with more efficient use of factor inputs. Hence it is an important source of sustainable long-term economic growth.

TFP growth has long been identified as one of the important sources of economic growth in the western countries (Solow, 1956, 1957; Abromovitz, 1956; Denison, 1967; Kim and Lau, 1994). In a study on sources of growth in nine western countries, Denison (1967) found that advanced knowledge, improved allocation of resources and economies of scale accounted for almost 60 to 90 percent of the growth in income per capita, with factor inputs (labor, capital and land) explaining a relatively small percentage of the overall economic growth. This implies that the growth of the western countries has been mainly driven by TFP growth rather than the growth in factor inputs. This finding is supported by another recent study conducted by Kim and Lau (1994). They found that almost 45 to 70 percent of the economic growth in five OECD countries was contributed by productivity growth.

This growth phenomenon is somewhat different from the growth pattern observed in the East Asia New Industrializing Countries. Studies indicated that the growth of these countries has been mainly input-driven through massive factor accumulation rather than productivity-driven (Young, 1992, 1995; Krugman, 1994; Kim and Lau, 1994). Young (1992), for example, found that over the period of 1966-1990 productivity growth in the aggregate non-agriculture economy ranges from as low as 0.2 percent in Singapore to a high of only 2.3 percent in Hong Kong, whereas in manufacturing productivity ranges from a low of -1.0 percent in Singapore to a high of only 3.0 percent in South Korea.

In the past, the growth of Malaysian economy was mainly governed by the input-driven particularly through investment, with capital accumulation contributing almost half of the potential output growth. Due to limited resources and capacity in capital accumulation and stiff

competition in attracting foreign investment, the government has decided to shift the economic growth strategy from input-driven to productivity-driven (Malaysia, 1996).

Most of past studies on the sources of growth in Malaysia were conducted either at the macro level for the Malaysian economy or focused specifically on manufacturing sector. Included in the first category were studies done by Ikemoto (1986), World Bank (1993), Gan and Robinson (1993), Kawai (1994), Zarina and Shariman (1994), Gan and Soon (1998) and Jenny (2001). Studies that attempted to measure sources of growth and TFP growth for the manufacturing sector are benefited from the work done by the World Bank (1989), Maisom and Arshad (1992), Maisom and Mohd. Ariff (1993), Maisom, Mohd. Ariff and Nor Aini (1994), Okamoto (1994), Tham (1997, 1998), Nik Hashim (1998), Rahmah (1999), Rahmah and Idris (2000) and Zulaifah and Maisom (2001).

In estimating TFP growth rates, all of the above studies produced various results and are not directly comparable due to differences in methodologies, data, time frame as well as sample coverage. However, these differences should not prevent us from arriving at a general conclusion on long term TFP growth performance in Malaysia. Thus, the objectives of this paper are to review the selected TFP growth studies in Malaysia, identify the pattern of TFP growth performance and analyse factors and policies that are responsible for the efficiency performance. This paper is divided into five parts. After the introduction in Part 1, Part 2 reviews the methodologies adopted in the selected TFP studies and compare their results in Part 3. Part 4 analyses factors and policies that influence TFP performance and our conclusion is presented in Part 5.

2. METHODOLOGIES FOR ESTIMATING SOURCES OF GROWTH IN MALAYSIA

The concept of TFP growth and its measurement was first developed by Solow (1956, 1957) in his conventional growth accounting framework. It is further elaborated by other scholars, such as Kendrick (1961), Denison (1967), Christensen, Cummings and Jorgenson (1980), Gollop and Jorgenson (1986), Maddison (1987), Jorgenson et. al. (1987) and Gillis et. al. (1996). In essence the framework decomposes the rate of growth of output into the contributions of the rate of growth of labor and capital inputs, plus a residuals term, typically referred to as the rate of growth of TFP. In fact, this residual-based methodology include not only the effect of technological change, but also other elements, such as improvement in managerial practices, qualitative improvement in human and capital resources, economies of scale, imperfect factor and product markets, X-inefficiency, poor measurement of capital and labor inputs and other omitted factors.

2.1 Overall Economy

In estimating sources of growth for the Malaysian economy, two methodologies that are commonly being used, are the growth accounting framework (Ikemoto, 1986; Kawai, 1994; Gan and Soon, 1998) and the econometric estimation of a production function (World Bank, 1993; Zarina and Shariman, 1994; Jenny, 2001).

2.1.1 The Growth Accounting Framework

The growth rate of GDP as define by Kawai (1994) is given by:

$$\frac{d\ln GDP}{dt} = V_L \frac{d\ln L}{dt} + V_K \frac{d\ln K}{dt} + \frac{d\ln TFP}{dt} \qquad (1)$$

where *GDP* is gross domestic product, L is labor, K is capital stock, V_L is labor share in value added, V_K is capital share in value added and t is time. With the assumption of constant returns to scale $V_L + V_K$ is equal to 1.

Following Ikemoto (1986), Kawai's value share of labor is the ratio of averages wages and salaries in the manufacturing sector to total value added. The first term on the right hand side of equation (1) shows the contribution of labor to the GDP growth rate, while the second and third terms show the contribution of capital and TFP respectively. Thus the growth rate of TFP is a residual which is obtained by subtracting the contribution of labor and capital from output growth:

$$\frac{d\ln TFP}{dt} = \frac{d\ln GDP}{dt} - V_L \frac{d\ln L}{dt} - V_K \frac{d\ln K}{dt} \tag{2}$$

2.1.2 The Econometric Estimation of Production Function

The World Bank (1993) utilized the production function approach to estimate TFP growth. Given the economy production function of the form:

$$Q=AF(K,E,L) \tag{1}$$

where A is TFP, K is capital services, E is human capital endowment, L is labor services in natural unit, the growth of output per worker (lower case letter indicate rates of change) is given by:

$$(q-l) = a + s_K(k-l) + s_E(e-l) \tag{2}$$

where s_K is elasticity of output with respect to physical capital and s_E is elasticity of output with respect to human capital. The TFP growth is thus the residual obtained by subtracting the contributions of human and physical capital accumulation from the growth of output per worker:

$$a = (q-l) - s_K(k-l) - s_E(e-l) \tag{3}$$

With the assumptions of competitive factor market and constant returns to scale, s_K and s_E are equal to the income shares of physical and human capital respectively. Under the condition of producer equilibrium, the income share of input is equal to the elasticity of output with respect to the corresponding input. Thus in most empirical studies, the estimated output elasticity coefficients are taken as income shares.

The difficulties of getting the income share data, forced the World Bank to estimate s_K and s_E directly from the economy production function by regressing annual log output growth on log capital growth, log human capital growth and log labor growth.

2.2 Manufacturing Sector

Two methodologies that are normally adopted in estimating sources of growth and TFP growth for the manufacturing sector are the Gollop and Jorgenson (1986) model and the Dollar and Sokoloff (1990) model. Gollop and Jorgenson's methodology was employed by the World Bank (1989); Maisom and Arshad (1992), Maisom and Mohd. Ariff (1993) Maisom, Mohd. Ariff and Nor Aini (1994), Okamoto (1994) and Tham (1997, 1998). Zulaifah and Maisom (2001) used Dollar and Sokoloff model, while Rahmah and Idris (2000) adopted the variant of Dollar and Sokoloff model.

2.2.1 Gollop and Jorgenson Model

Following Gollop and Jorgenson model, Maisom and Mohd. Ariff (1993) estimated TFP growth for the Malaysian resource based industries. Given the production function:

$$Q = F(K, L, t) \tag{4}$$

where Q is gross output, K is capital, L is labor and t is time:

$$\frac{d\ln Q}{dt} = \frac{d\ln Q}{d\ln K}\cdot\frac{d\ln K}{dt} + \frac{d\ln Q}{d\ln L}\cdot\frac{d\ln L}{dt} + \frac{dQ}{dt} \tag{5}$$

With profit maximization, the value share of each input is equal to the elasticity of output with respect to each input:

$$S_K = \frac{P_K K}{P_Q Q} = \frac{d\ln Q}{d\ln K} \tag{6}$$

$$S_L = \frac{P_L L}{P_Q Q} = \frac{d\ln Q}{d\ln L} \tag{7}$$

where P_K is the price of capital, P_L is the price of labor and P_Q is the price of output. Substituting equation (6) and (7) into equation (5):

$$\frac{d\ln Q}{dt} = S_K\frac{d\ln K}{dt} + S_L\frac{d\ln L}{dt} + S_t \tag{8}$$

where S_t is the residual or TFP growth.

For changes between discrete points in time, this can be approximated by:

$$\ln Q_t - \ln Q_{t-1} = \bar{S_K}\left[\ln K_t - \ln K_{t-1}\right] + \bar{S_L}\left[\ln L_t - \ln L_{t-1}\right] + S_t \tag{9}$$

where weights are given by average shares of capital and labor inputs in the value of output:

$$\bar{S_K} = \tfrac{1}{2}\left[S_{Kt} + S_{Kt-1}\right]$$

$$\bar{S_L} = \tfrac{1}{2}\left[S_{Lt} + S_{Lt-1}\right]$$

Thus, from equation (9), TFP growth is given by:

$$S_t = \left[\ln Q_t - \ln Q_{t-1}\right] - \bar{S_K}\left[\ln K_t - \ln K_{t-1}\right] - \bar{S_L}\left[\ln L_t - \ln L_{t-1}\right] \tag{10}$$

2.2.2 Dollar and Sokoloff Model

Based on the growth accounting model, Dollar and Sokoloff (1990) introduced alternative methodology to estimate TPF growth. In essence, their model decomposes labor productivity growth into the contribution of capital deepening plus a residual, which is TFP growth:

$$\left(\hat{\frac{Q}{L}}\right) = \alpha\left(\hat{\frac{K}{L}}\right) + \hat{TFP} \tag{11}$$

where $\hat{\frac{Q}{L}}$ is the growth of labor productivity, $\hat{\frac{K}{L}}$ is the growth of capital-labor ratio, α is the coefficient of capital-labor ratio and $\alpha\left(\hat{\frac{K}{L}}\right)$ is capital deepening. The first term on the right-hand side of equation (11) is the rate of growth of labor productivity attributable to the increase in the rate of capital utilization. The TFP growth is the residual between the actual growth in labor productivity and the amount of the advance due to capital deepening, that is:

$$\hat{TFP} = \left(\hat{\frac{Q}{L}}\right) - \alpha\left(\hat{\frac{K}{L}}\right) \tag{12}$$

3. RESULTS OF SOURCES OF GROWTH ESTIMATES IN MALAYSIA

3.1 Overall Economy

Table 1 shows estimates on sources of growth for Malaysian economy obtained by Ikemoto (1986), Gan and Soon (1998) and the Economic Planning Unit (Malaysia, 2001). Malaysia experienced high rates of growth of around 7 to 8 percent, except during 1984-1989 and 1996-2000, when the economy suffered from severed recession in 1985 and 1998. Bearing in mind the differences in methodologies adopted, these studies revealed that the growth of Malaysian

economy is primarily input-driven. Ikemoto (1986), in his comparison study on sources of economic growth for 10 Asian countries (Japan, Singapore, Hong Kong, Taiwan, Malaysia, Republic of Korea, Philippines, Thailand, Indonesia and India), found that GDP growth in Malaysia during 1970-1980 was heavily dependent on growth of capital input. Capital contributed about 45 percent to GDP growth as compare to only 22 percent from TFP growth. This result was in contrast to the case of productivity-driven economies such as Taiwan and Korea where productivity growth contributed about half of their GDP growth.

Note also that despite high rate of economic growth of 7.2 percent during 1979-1983, TFP growth was extremely low at 0.5 percent per year and contributed only 6.9 percent to output growth. Distortions in resource allocation due to excessive public sector involvement and regulation, unsustainable current account deficit and over-valuation of the exchange rate were factors identified by Gan and Soon (1998) that adversely affected productivity growth during this period. Estimates by the Economic Planning Unit showed that productivity performance is expected to achieve its highest level of 2.8 percent and contributed about 37.2 percent to output growth during 2001-2005. The question which can be raised is how we evaluate the expected contribution of TFP to the growth process of Malaysia? To answer this question we use Chenery and Syrquin's typology (1986) of the relative contributions of TFP growth to total output growth at different stages of development (Table 2).

According to Chenery and Syrquin's typology, the shift from primary producing to industrializing economy requires high rates of capital accumulation and rising productivity. Annual TFP growth increases from an average of 0.44 percent (contributing 12 percent to growth) in the primary stage to 2.92 percent (contributing 44 percent to growth) in the later stage of industrialization. Consequently, the contributions of physical inputs decrease from 87.0 percent in the primary stage to 54.0 percent in the later stage of industrialization. As the economy develops, TFP contributes 50 percent to output growth

with physical inputs contributing the other half. Thus, with the contribution of TFP to GDP growth of around 37 percent, based on Chenery and Syrquin's typology, Malaysia is in the middle stage of industrialization.

TABLE 1

Sources of Economic Growth (percent)

Country / Author	Annual Rate of Growth				Percentage Contribution to Growth			
	GDP	Capital	Labor	TFP	GDP	Capital	Labor	TFP
Malaysia								
Ikemoto (1986)								
1970-1975	7.1	3.3	2.4	1.4	100.0	46.9	33.1	20.0
1975-1980	8.6	4.1	2.6	1.8	100.0	48.1	30.4	21.5
1970-1980	7.8	3.6	2.6	1.7	100.0	45.3	33.0	21.7
Gan and Soon (1998)								
1974-1978	7.0	2.6	2.4	2.0	100.0	37.1	34.3	28.6
1979-1983	7.2	4.5	2.2	0.5	100.0	62.5	30.5	6.9
1984-1989	5.2	2.0	1.7	1.6	100.0	38.5	32.7	30.8
1990-1995	8.8	4.6	2.1	2.2	100.0	52.3	23.8	23.9
1974-1995	7.1	3.4	2.1	1.6	100.0	47.9	29.6	22.5
Economic Planning Unit (Malaysia,2001)								
1990-1995	9.5	4.7	2.3	2.5	100.0	50.2	23.9	25.9
1996-2000	4.7	2.3	1.2	1.2	100.0	50.2	25.0	24.8
2001-2005	7.5	3.1	1.6	2.8	100.0	41.3	21.5	37.2
Taiwan								
Ikemoto (1986)								
1970-1975	8.8	2.7	1.9	4.3	100.0	30.7	21.2	48.1
1975-1980	10.2	3.3	1.7	5.2	100.0	32.2	16.7	51.1
1970-1980	9.5	2.9	1.9	4.8	100.0	30.3	19.7	50.0
Korea								
Ikemoto (1986)								
1970-1975	9.5	2.5	2.4	4.6	100.0	26.2	25.1	48.7
1975-1980	7.6	3.7	1.9	2.0	100.0	48.6	24.7	26.6
1970-1980	8.5	2.7	2.3	3.5	100.0	31.5	27.3	41.2

Source: compiled by authors

TABLE 2

Chenery and Syrquin's Typology on Sources of Growth

	Annual Rate of Growth (percent)			Percentage Contribution to Growth		
	Capital	Labor	TFP	Capital	Labor	TFP
Stage 1:	3.90	2.56	0.44	49	38	12
Primary Production	5.03	3.06	0.72	49	34	16
Stage 11:	5.84	2.85	1.40	47	27	25
Industrialization	6.29	2.30	2.28	43	21	36
	6.52	1.81	2.92	39	15	44
Stage 111:	6.11	1.40	3.11	35	15	50
Developed	5.50	1.47	2.80	32	18	50

Source: adapted from Gan and Soon (1998)

3.2 Manufacturing Sector

This section discusses results of several selected earlier studies on TFP growth in the Malaysian manufacturing industries.

(a) Maisom and Mohd. Ariff (1993) estimated TFP growth for 43 five-digit resources based industries for the period 1968-1988. Their estimates showed generally low TFP growth rates for Malaysian resources based industries compared to Turkish, Korean and Japanese productivity growth during 1960's and 1970's. They also observed higher productivity growth in consumer-oriented labor-intensive industries (vegetable oils and fats industries and clothing), whereas industries with excess capacities (rice mills, sawmills, ice factories and fertilizer) experienced lower productivity growth. Industries with lower effective protection rates (paper products and wood products) were found to experience higher productivity growth as compared to those which were heavily protected (sawmills, rice mills and sugar refineries). The export-oriented industries (clothing, vegetable oils and fats, palm oil and cocoa) experienced higher TFP growth relative to the import-substitution industries (rice mills, fertilizers and tobacco). This is due to the

fact that to compete internationally, they have to reduce their costs by operating efficiently and thus achieving a relatively higher productivity level.

(b) Maisom, Mohd. Ariff and Nor Aini (1994) undertook study on productivity levels in the Malaysian industries over the period of 1974-1989. They found that productivity levels have increased and Malaysian industries were more productive compared to Turkish industries in the 1960's and early 1970's and comparable to Korean industries in the early period. When classifying industries according to heavy, medium, light and resource-based, they observed highest TFP growth was among the medium industries. Among the light industries, the footwear industry was found to exhibit a decline in productivity. TFP growth was also declining in the tobacco resource-based industries. Investment goods industries experienced the highest level of TFP growth and the fastest growing compared to the intermediate goods industries. Light industries were found to be the slowest growing industries.

(c) Tham (1997) using the four-input model to estimate sources of growth in the manufacturing sector found that TFP grew at only 0.3 percent for the period of 1986-1991. The low TFP growth for the overall manufacturing sector was due to negative TFP growth obtained for 12 out of the 28 industries computed. She also found that the major source of output growth in the manufacturing sector was input-driven, particularly from capital which contributed 22.4 percent of the growth as compared to the TFP growth of only 2.2 percent. In her another study, Tham (1998) also obtained a very low TFP growth for the manufacturing sector at 0.1 percent for the period of 1986-1993.

(d) Rahmah and Idris (2000) undertook studies on sources of labor productivity growth in large scale industries (LSI) for the period of 1982-1994. They found that many LSI have gained labor productivity growth through efficiency or TFP growth. In some sub-industries such as chemicals,

non-metallic mineral products and transport equipment the contribution of TFP growth was more than 100 percent and the contribution of capital deepening and labor were either very low or negative. As a whole, their results showed that the LSI have benefited from the efficiency gain in raising labor productivity. In contrast to this finding, Rahmah (1999) in her earlier study on sources of growth in small and medium industries (SMI) found that the contribution of TFP growth were still small especially in the more labor intensive enterprises. These results are not surprising since it is well recognized that as compared to SMI, LSI enjoy benefits from technological advancement, better human resource and organizational managements which will lead to higher efficiency gains.

(e) Zulaifah and Maisom (2001) looked into the sources of labor productivity growth in the manufacturing sector for the period of 1985-1995. They found that for the manufacturing sector as a whole TFP growth was the most important source of labor productivity growth contributing about 58.7 percent and followed by capital deepening which accounted for the remaining 41.3 percent. In almost all industries, TFP growth constitutes a more important source of labor productivity growth compared to capital deepening.

Table 3 presents a summary of annual TFP growth estimates for the manufacturing sector as a whole. The results are not consistent with each other. For example, though using the same methodology and covering the same time period, Maisom, Mohd. Ariff & Nor Aini (1994) obtained higher TFP growth estimate of 9.1 percent as compare to 3.8 percent obtained by the World Bank (1989). These differences can be attributed to differences in inputs. The World Bank adopted a three-input model comprising of capital, labor and intermediate goods. Output is measured by the gross value of output while capital is reflected by the value of fixed assets (the stock concept), and labor is represented by wages and salaries. Maisom, Mohd. Ariff & Nor

Aini, on the other hand, employed a two-input model. Value added is taken as output, while real cost of capital assets (the flow concept) measures capital input and the number of full-time and part-time workers representing labor input. This differences, thus lead to different estimates of TFP growth.

Despite differences in methodologies and sample coverage, comparison of these results provides some insights on longer perspective of TFP growth performance. Neglecting Maisom, Mohd. Ariff & Nor Aini results, prior to 1980, the overall manufacturing industries experienced positive TFP growth with an average of 3.8 percent per annum. Until the middle of 1980's, the efficiency performance of the manufacturing sector deteriorated and recorded negative growth rate. However, from 1986 the productivity performance showed an improvement. The TFP grew from less than 1 percent per year during 1986-1993 to more than 4 percent per year in mid 1990's.

4. POLICIES THAT INFLUENCE TFP PERFORMANCE

An estimate of TFP growth in the previous section shows that TFP recorded negative growth in the first half of 1980's which may be due to the poor performance of the heavy industries. Early 1980's was the period of transition from export-oriented industrialization towards heavy industries, such as chemicals, iron and steel, petroleum, cement and transport equipment. Maisom, Mohd. Ariff and Nor Aini (1994) found that the productivity performance of the heavy industries during 1973-1989 were not encouraging as compared to the medium and light industries. Similarly, the World Bank (1989) found that during 1975-1984, despite substantial investment resources, the capital intensive industries have performed poorly with excess capacity, low rates of labor absorption and declining

productivity. The average TFP growths for crude oil refineries and iron and steel during 1981-1984, for example, were found to be -11.4 percent and -21.0 percent respectively.

TABLE 3

Previous Estimates on TFPG in the Malaysian Manufacturing Industries, 1975-1995

Period of Study	Annual TFPG	Author	Level of Aggregation and Model
1975-1979	3.8 percent	World Bank (1989)	27 three-digit industries Gollop & Jorgenson: 3-input model
1975-1979	9.1 percent	Maisom, Mohd. Ariff & Nor Aini (1994)	23 three-digit industries Gollop & Jorgenson: 2-input model
1980-1983	6.4 percent	Maisom, Mohd. Ariff & Nor Aini (1994)	
1981-1984	-1.9 percent	World Bank (1989)	
1984-1986	4.1 percent	Maisom, Mohd. Ariff & Nor Aini (1994)	
1986-1989	0.9 percent	Tham (1998)	28 three-digit industries Gollop & Jorgenson: 3-input model
1987-1989	13.5 percent	Maisom, Mohd. Ariff & Nor Aini (1994)	
1986-1990	0.3 percent	Okamoto (1994)	27 three-digit industries Gollop & Jorgenson: 3-input model
1986-1991	0.3 percent	Tham (1997)	28 three-digit industries Gollop & Jorgenson: 4-input model
1986-1993	0.1 percent	Tham (1998)	
1990-1993	-0.8 percent	Tham (1998)	
1985-1995	4.3 percent	Zulaifah & Maisom (2001)	29 three-digit industries Dollar & Sokoloff: 2-input model

Source: compiled by authors

1980's also witnessed heavy involvement of public sector in the capital intensive projects through the establishment of various public enterprises (Rugayah, 1991). However, many of these public enterprises were not performing well (Ismail and Osman Rani, 1991 and Ismail and Meyanathan), operating inefficiently, causing wastage of investment resources, imposing greater fiscal burden and slowing down the economic growth (Salih and Yusof, 1989) thereby contributing to the deterioration of the total factor productivity performance.

To overcome the problems associated with the public enterprises and to minimize the size of public sector, the government announced the privatization policy in 1983. Besides encouraging private sector to play active role in economic development, the government also gave greater emphasized towards improvements in research and development (R&D), human resources development, and liberalization of trade and capital operations. Since most of the policy changes took place after the recession of 1985, it is not surprising to find improvement in efficiency performance in later years, thus reflecting the success of government economic policies in managing the economy.

4.1 Research and Development (R&D)

Technological progress has been seen as a crucial element in enhancing the total productivity and growth of a country. Technological improvement can be acquired either through the transfer of technology from abroad or the development of indigenous technology. Transfer of technology involves four components- techno-ware, human resources, information and organizational structures (Anuwar, 1992). Thus, the transfer of technology requires not only mere importation of plant, machinery and equipment, but also considerable investment in research and development of the other components of technology. The development of own indigenous technology would also require vigorous R&D efforts.

Realizing the importance of R&D in generating better efficiency, improving total factor productivity, and increasing competitiveness of all sectors in the economy, the government in early 1986 started to give greater emphasize on the development of Science and Technology (S&T) by launching the Fifth Malaysia Plan (1986-1990) and the Industrial Master Plan (1986-1995).

The commitment of government to build and develop indigenous technology and improve S&T capabilities is shown in Table 4. There was tremendous increase in the allocation for S&T infrastructure and development. The allocation for R&D was increased by 50 percent from 1981-1985 to 1986-1990 and by 60 percent between 1986-1990 and 1991-1995. Besides the commitment to build and develop indigenous technology, the transfer of technology from abroad becomes increasingly important. Malaysia has sought foreign technology through a variety of mechanisms, such as technical assistance and know-how, joint ventures, trade marks, patents and turnkey. The transfer of technology is mostly focused on the technical assistance and know-how. The composition of imported technology also reflected the movement towards investment in high value added and capital intensive industries, such as transport equipment and industrial chemicals (Malaysia, 1996).

TABLE 4

Malaysia: Development Allocation for R&D and Technological Transfer by Type of Agreement, 1981-1995

Programme	1981-1985	1986-1990	1991-1995
Allocation (RM million)			
Direct R & D	413.8	629.0 (52.0 %)	1,000.0 (59.0 %)
S&T Infrastructure & Development	126.7	807.7 (537.5 %)	1,749.0 (116.5 %)
Types of Agreement			
Technical Assistance & Know-how	278	331	418
Joint Venture	76	72	31
Management	45	39	12
Trademarks & Patents	46	194	179
Service	19	21	27
Turnkey & Engineering	19	4	9
Others	118	76	21
Total	601	737	697

Note: Figures in brackets refer to percentage increase.
Source: Malaysia (1986, 1991 & 1996).

4.2 Human Resources Development

Economists have long stressed the important of human resources development in influencing productivity and growth of a country (Nelson and Phelps, 1966; Denison, 1967; Walters and Rubinson, 1983; Barro, 1991 and Haskel and Martin, 1993). Productivity-driven growth economy requires highly skilled, trainable and knowledgeable workers, as well as administrative and managerial expertise. Adequate supply of competence and skilled manpower is essential for the country not only to utilize new technology, but also to adapt to imported technology. According to Nelson and Phelps (1966), a country with larger human capital stock would be able to absorb new products and technology discovered elsewhere. Hence, a follower country with more human resource would grow faster because of the ability to catch up rapidly to the technological leader. Similar conclusion was made by Barro (1991) who found that the growth rate of a country is positively related to the starting amount of human capital and poor countries tend to catch up with richer countries if the poor countries have high human capital per person.

Realizing the importance of human capital in enhancing productivity, the government has taken various measures to improve educational and training facilities, which includes among others, offered courses in specialized trades to provide workers with skill required for the use and adaptation of modern and high technology production methods and processes. As a result, the number of trainees completing their training programme in the field of engineering, buildings trades and skill upgrading increased by 42.1 percent between 1981-1985 and 1986-1990 and by 96.2 percent between 1986-1990 and 1991-1995 (Table 5). This gives a positive influence on the pattern of the TFP growth in early 1990's.

Despite efforts to encourage enrollment of students in S&T, the output of graduates from public tertiary institutions continued to be dominated by arts graduates as compared to science and technical graduates, with the ratio of 60:40 during 1991-1995 (Malaysia, 1991). This suggests the weaknesses of Malaysian education system in producing adequate supply of S&T manpower. The ineffectiveness of our education system is revealed in a study by Jenny (2001) and Rahmah (2003) who found that human capital did not play major role in enhancing productivity growth. Rahmah (2003), on the other hand, found that improvement in physical capital, through the utilization of more advanced technology, would give significant effect in increasing productivity growth.

TABLE 5

Malaysia: Output of Degree Courses from Public Institution and Skilled and Semi-Skilled Manpower from Public Training Institution, 1981-1995

Course	1981-1985	1986-1990	1991-1995
Course			
Arts	14,802 (55.2%)	27,780 (52.6%)	49,018 (61.9%)
Science	9,317 (34.7%)	17,507 (33.1%)	19,642 (24.8%)
Technical	2,719 (10.1%)	7,540 (14.3%)	10,508 (13.3%)
Total	26,838 (100%)	52,827 (100%)	79,168 (100%)
Skilled and Semi-Skilled Manpower			
Mechanical Engineering	24,778	28,240	71,300
Electrical Engineering	13,543	21,110	46,610
Civil Engineering	8,621	13,440	13,030
Buildings Trades	8,162	12,850	16,750
Skill-Upgrading	1,437	4,730	10,000
Total	56,541	80,370 (42.1%)[1]	157,690 (96.2%)[1]

Note: 1 refers to percentage increase.
Source: Malaysia (1986, 1991 & 1996)

4.3 Outward-Oriented Trade Policy

Malaysia has adopted an inward-oriented trade policy during her second round of import substitution policy in the early 1980's, concentrating on the substitution of intermediate and capital goods industries. To encourage the development of these industries, the government adopted the import-restriction trade policy by raising the degree of protection. Trade restriction has resulted in an increased in both nominal and effective rates of protection for the majority of intermediate and capital goods industries during 1982-1985, especially in nonmetallic mineral products, fabricated metal products and transport equipment, (Okamoto, 1994).

However, these heavily protected industries were not performing well as expected (Malaysia, 1989). Protection makes them complacent within the domestic market and lack of interest to improve productivity in order to be internationally competitive. Existing empirical literatures on the relationship between trade policies and productivity change do indicate that trade restrictiveness tend to have a negative impact on TFP growth (Krueger and Tuncer, 1982; Nishimizu and Robinson, 1984). Industries which are heavily protected will experience lower productivity growth as compare to those with lower effective rates of protection. (Edwards, 1991; Maisom and Mohd. Ariff, 1993). The adoption of import-substitution policy will trapped the country into the vicious cycle characterized by inflation, stagnant exports, imports and investment and slow productivity growth (Kawai, 1994). Hence, it is not surprising to find very poor TFP performance for the manufacturing sector as a whole in the early of 1980's.

The poor economic performance of the import-substituting industries and the onset of economic recession in 1985 have led the government to shift to the export-oriented trade and also implementing import liberalization policy. The most rapid efficiency gains is said to occur when barriers to competition, such as tariffs, quotas and other protective devices, are absent (World Bank, 1989). As a result, between 1985 and 1987, both nominal and effective rates of protection declined for the majority of industries, especially beverage, tobacco, footwear, rubber products, pottery, nonmetallic mineral products fabricated metal products and transport equipment (Okamoto, 1994). The coexistence of export-promotion policy and import liberalization policy is also known as trade neutrality (Thomas, Nash, et al., 1991). This neutral export-orientation trade policy would enable the Malaysia to enjoy the benefit of a virtuous cycle through increases in export, imports and investment and a rise in productivity (Kawai, 1994), thereby improving the TFP growth. In fact, available empirical evidence shows that greater openness of the Malaysian economy through trade enhanced the productivity growth (Gan and Soon, 1998; Jenny, 2001; and Rahmah, 2003).

4.4 Foreign Direct Investment (FDI) Liberalization Policy

Declined in prices of primary commodities, accumulated public debt and limited domestic investment due to the economic worldwide recession in the mid 1980's forced the government to adopt a more liberalized FDI policy. Several changes were made to FDI in 1986 including the introduction of new fiscal incentives and the acceptance of 100 percent foreign ownership of capital to companies which export more than 50 percent (previously 80 percent) of their products. Changes in FDI regulations have successfully attracted large

inflow of FDI, especially the export-oriented foreign companies, into the manufacturing sector and improved the production efficiency.

Two mechanisms has been identified by Okamoto (1994) through which FDI liberalization policy tend to have favorable effect on the level of TFP in the Malaysian manufacturing sector. First, foreign companies entering Malaysia are more productive in comparison with local companies. Since most of them are an export-oriented companies and to compete successfully in the international market, they must be more superior in terms of production technology and management know-how and thus more productive than the locals firms. Second, the entry of foreign companies may create spillover-effects which will improve the productivity performance of the companies. Stiff competition from foreign companies will encourage the local companies to improve their production and management technology and take advantage from direct and indirect transfer of technology from foreign companies. Furthermore, the creation of new business opportunities to the local companies due to the entry of foreign companies would raise capacity utilization of the locals and improve their productivity performance. In fact, available empirical evidence showed that the existence of foreign-owned companies gave a positive impact on TFP growth in Malaysia (Jenny, 2001).

The discussions above reveal that most of the drastic policy changes were introduced in 1986. Hence, it is not surprising to find the TFP growth in the manufacturing sector improved from -1.9 percent during 1981-1984 to 0.3 percent during 1986-1990, and further to 4.3 percent during 1985-1995.

5. CONCLUSION

In summary, the studies reviewed show that the growth of Malaysian economy and its manufacturing sector is primarily input-driven. Recent estimate of contribution of TFP to Malaysian economic growth ranges between 25 to 37 percent. This is relatively low compared to the expected contribution based on Chenery and Syrquin's typology to be regarded Malaysia as a developed country which requires half of the economic growth originating from total productivity growth. Various factors contribute to the enhancement of TFP growth. These include improvements in human resource, management, organization technique and trade policies and upgrading R&D. Greater openness of the economy through trade, existence of foreign-owned firms and improvement in physical capital tend to give significant effect in enhancing productivity growth in Malaysia.

On the methodology side, the model adopted varies from one researcher to another, the most popular being the Gollop and Jorgenson model. The measures of inputs and output also differ. Gross value of output and value added are two common measures taken to represent output, while the input components highlighted the differences inherent in the models. To measure labor input, World Bank (1989), for example considered wages and salaries to be superior to the number of workers, since wages and salaries take into account changes in age, sex, hours worked and educational composition. Maisom, Mohd. Ariff and Nor Aini (1994), on the other hand, preferred to adopt the number of workers as an alternative proxy. The transformation of inputs to a single output, that is the production function, is normally assumed to be of Cobb-Douglas type with constant return to scale. Researches have shown that not all industries exhibit this phenomenon. The frontier of TFP study thus provides a challenge and remains to be explored.

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