CHAPTER 4

CALCULATING THE TFP GROWTH OF MALAYSIA (1971-1999)

This chapter presents the findings of the study, the results of the estimation and the statistical test that mentioned in earlier chapters are tabulated in this chapter.

As mentioned earlier, total factor productivity growth (TFPG) is the residual of growth of output per labor after deducting the contribution from capital per labor.

TFPG = output/labor growth − α capital/labor growth

Since α are not available, it is estimated by using a simple production function, regress annual log of output per labor growth on log capital per labor growth.

4.1 Model (Estimating α)

ln [y(t)/y(t-1)] = constant + α ln[k(t)/k(t-1)] + error

where ln [y(t)/y(t-1)] = GDP per labor growth (%)

ln [k(t)/k(t-1)] = capital per labor growth (%)

Coefficient of capital per labor growth is expected to have positive sign, as capital per labor growth increased, GDP per labor growth will increase too.

4.2 Result

From the regression results (**Table A1**):

$$\ln [y(t)/y(t-1)] = 0.023947 + 0.544753 \ln[k(t)/k(t-1)]$$
$$t = 1.4780 \qquad t = 7.9765$$
$$s.e = 0.0162 \qquad s.e = 0.0683$$

$R^2 = 0.7021$
Adj $R^2 = 0.6910$

The overall fit of the regression is good and coefficient of the variable is of the expected sign.

The estimated capital per labor income share (α) is **0.544753**, consistent with our estimation that it has a positive impact on output per labor growth. The coefficient is always positive and statistically significant at 0.01 level (**Table A1**). This imply that a 1% increase in capital per labor produces a 0.544753% increase in output per labor growth. What is left is the growth of TFP.

However, after adjusted for the autocorrelation problem, the estimated capital per labor income share became **0.532876** (**Table A2**):

$$\ln [y(t)/y(t-1)] = 0.027174 + 0.532876 \ln[k(t)/k(t-1)]$$

$$t = 2.3879 \qquad t = 9.6149$$
$$s.e = 0.0114 \qquad s.e = 0.0554$$

$R^2 = 0.7689$

$\text{Adj } R^2 = 0.7496$

The fit of the regression is better and the coefficient has smaller value and significant.

4.3 Calculation of Total Factor Productivity Growth (TFPG)

Using the coefficient (α) of this model,

TFPG = output/labor growth – α capital/labor growth

The estimated annual TFP growth rates over the 1971 to 1999 period are shown in **Table 3**. Overall, the TFPG has not been encouraging over this period. The growth rate of real output per labor and capital per labor over 1971 to 1999 period were 8.0901% and 11.4786% respectively. Applying the coefficient of capital per labor share (0.544753), about 6.2530% growth per year due to increases in stocks of capital. What is left over is about 1.8371% growth in TFP (**Table 3**). This result agrees with those of the previous

Table 3
TFPG Estimates for Malaysia, 1971-1999

Year	GDP/L growth %	Cap/L growth %	TFPG a = 0.544753 %	TFPG* a = 0.532876 %
1971	-2.7391	6.3304	-6.1876	-6.1124
1972	0.9228	9.6245	-4.3202	-4.2059
1973	11.1605	6.0105	7.8863	7.9576
1974	-0.8457	14.7708	-8.8921	-8.7167
1975	0.5155	12.3449	-6.2094	-6.0628
1976	18.0023	3.9471	15.8521	15.899
1977	5.7425	10.4593	0.0448	0.169
1978	0.2155	3.4285	-1.6522	-1.6115
1979	13.766	19.2004	3.3065	3.5346
1980	6.2129	25.7708	-7.8258	-7.5197
1981	74.7402	119.2409	9.7834	11.1996
1982	1.4243	1.3287	0.7005	0.7163
1983	5.2626	4.4022	2.8645	2.9168
1984	3.5007	-8.359	8.0543	7.955
1985	-3.9416	-14.1393	3.7608	3.5929
1986	-9.3373	-16.422	-0.3914	-0.5864
1987	10.0963	-6.7146	13.7541	13.6743
1988	30.731	12.9998	23.6493	23.8037
1989	2.4521	29.6898	-13.7215	-13.3689
1990	-0.3292	21.5276	-12.0564	-11.8007
1991	64.94	95.0106	13.1827	14.3111
1992	1.1319	-3.401	2.9846	2.9442
1993	2.7345	8.5521	-1.9243	-1.8227
1994	1.7423	12.5192	-5.0776	-4.9289
1995	5.6803	15.2595	-2.6324	-2.4511
1996	-2.5531	-6.8677	1.1881	1.1065
1997	3.705	5.2034	0.8704	0.9322
1998	-10.7731	-32.4245	6.8902	6.5051
1999	0.4539	-16.4126	9.3947	9.1998
Average	**8.0901**	**11.4786**	**1.8371**	**1.9734**

* after adjusted for autocorrelation problem

studies, that is the rapid transformation of the Malaysia economy in recent years is due mainly to input growth.

Using the same method, TFPG for 1971-1985, 1986-1999, 1980s and 1990s are also calculated (Table 5)

4.4 Trends in Overall TFPG

There was a significant improvement of TFPG in the 1980s (Table 5). The TFP grew faster during 1980s, at an average of 3.7111% per year. The TFPG then slowdown to 1.4309% in 1990s. During 1971-1985, it registered a growth of 0.2194%. A different picture ha emerged for the period 1986-1999. An average annual TFPG of 2.9505% was recorded. They in turn average to 1.8371% and 1.9734% respectively over 1971 to 1999 period, before and after adjusted for autocorrelation problem.

In terms of contribution to GDP per labor growth, that of TFPG has decreased from 30.63% in 1980s to 21.44% in 1990s (Figure 2). The greatest and smallest share of TFPG has recorded in 1986-1999 (41%) and 1971-1985 (2%), respectively.

The regression results are consistent with the economy development in Malaysia and a review of it will reflect the path of Malaysia achievement over the years.

Table 4
Regression Results

| Dependent Variable	GDP per Labor Growth, 1971-1999					
Sample Period	1971-1985	1986-1999	1980-1989	1990-1999	1971-1999	1971-1999 *
Observation	15	14	10	10	29	29
Capital/Labor Growth						
coefficient	0.60948	0.500906	0.56855	0.529715	0.544753	0.532876
t stst	6.8708	4.6082	4.7681	5.4818	7.9765	9.6149
standard error	0.0887	0.1087	0.1192	0.0966	0.0683	0.0554
R square	0.7841	0.6389	0.7397	0.7898	0.7021	0.7689
Adj R square	0.7675	0.6088	0.7072	0.7635	0.691	0.7496

☐ statistically significant at 0.01 level

Table 5
Contributions of Sources of Growth : Malaysia (1971-1999)

Time Period	Contributions of Sources of Growth				TFPG in
	GDP/L %	Cap/L %	Cap/L share	TFP %	GDP/L growth %
1971-85	8.9293	14.2907	0.60948	0.2194	2.4571
1986-99	7.191	8.4657	0.500906	2.9505	41.0305
1980-89	12.1141	14.7797	0.56855	3.7111	30.6345
1990-99	6.6733	9.8967	0.529715	1.4309	21.44
1971-99	8.0901	11.4786	0.544753	1.8371	22.708
1971-99 *	8.0901	11.4786	0.532876	1.9734	24.3928

* after adjusted for autocorrelation problem

Figure 2 Contribution of TFP and Input Accumulation to Output Per Labor Growth
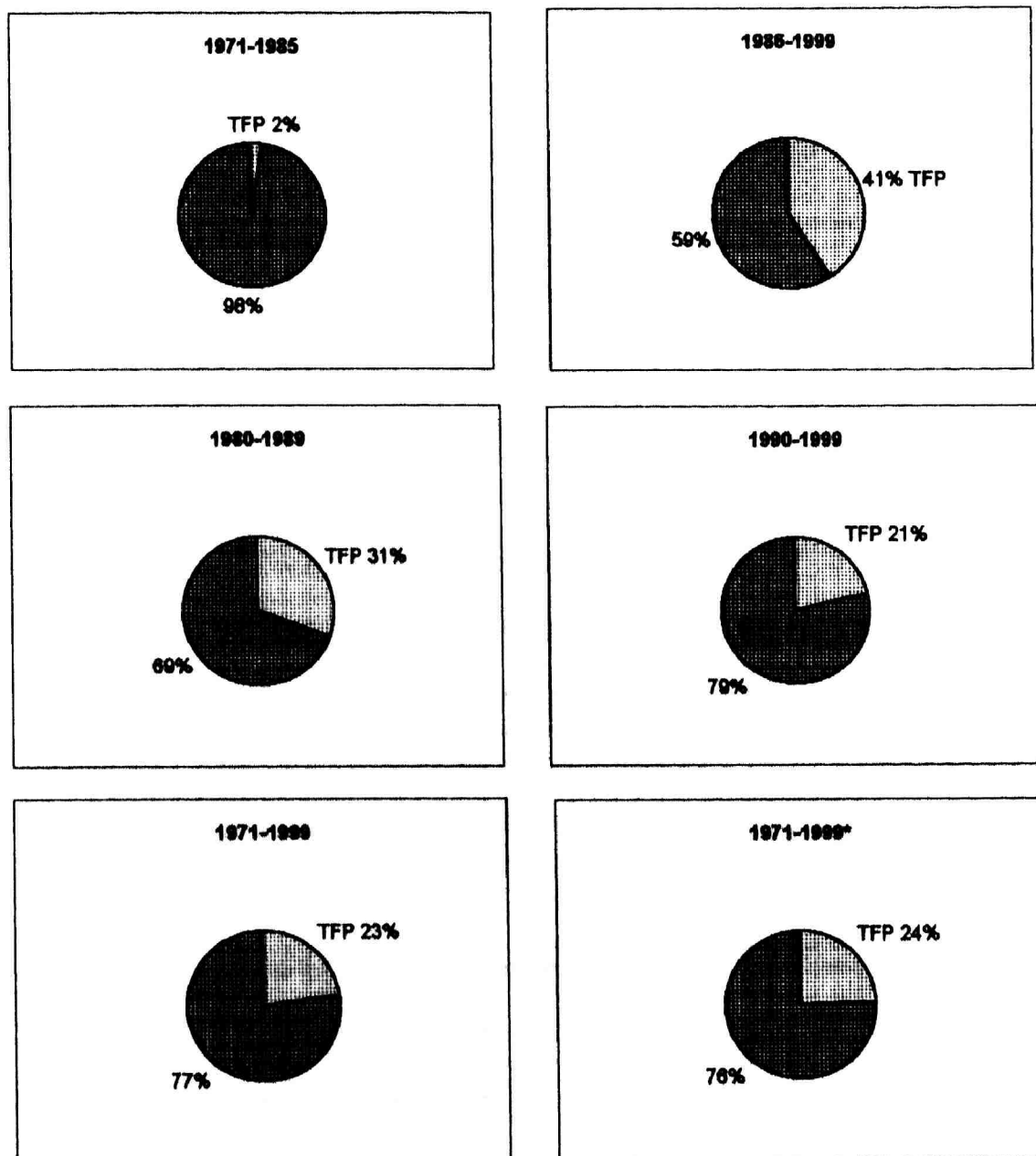
* after adjusted for autocorrelation problem

4.5 TFPG Vs Economic Development in Malaysia, 1970-1999

1970s: Public sector-led growth

During the first twenty years after independence, Malaysia continued the essentially free market trade and industrial policies of the colonial government, although it intervened extensively to promote rural development and provide social and physical infrastructure. Began with a period of import substitution in 1960s, with a strong bias against export, Malaysia moved to establish an export-oriented regime in 1970s.

The objectives of the limited import substitution were to reduce import of consumer goods and increase the processing of natural resources to create industrial employment opportunities. But the government's investment incentives and tariff protection for domestic industry created an unintended bias towards capital-intensive production techniques, resulting in low employment generation (Jomo & Edwards, 1993). A shift in strategy to more labor-intensive export-oriented industrialization was codified in the 1968 Investment Incentives Act, the 1971 Free Trade Zones Act and related labor law reforms, which sought to attract export-oriented foreign investments. A wide variety of instruments were used, including export credit, export targets, tax incentives and duty-free imports for exporters and their suppliers.

However, Malaysia's 1969 ethnic conflicts triggered a reexamination of development policy. The New Economy Policy (NEP) launched in 1971 had many dimensions intended to promote growth with equity. In order to fulfill the NEP goals, the government became a more direct and active participant in the economic development of the nation.

1970-1985: Proactive Government Policy

The proactive government policy begun in the mid-1960s, led to the promulgation of the NEP in 1971. The global recession in the early 1980s resulted in further expansion of the government's role through the implementation of countercyclical policies. At the same time, the launch of heavy industry in 1980 further deepened the government's involvement in industrial development. This led to an escalation in public expenditure, resulted in the large capital per labor growth (Table 5 – 14.2907%) but little TFP growth (0.2194%). This has compelled the government to review its role in the economic development (Lee Saw Hoon & Abdul Wahab Muhamad, 1996).

Since 1985: Private sector-led growth

The 1985-1986 recession prompted the government to encourage the private sector to play a more active role in economic development, and several policy changes were implemented to encourage private sector-led growth (Lee Saw Hoon & Abdul Wahab Muhamad, 1996).

To facilitate the growth of the private sector, Malaysia introduced formal public-private sector cooperation in mid 1980s. It embodied the concept in the slogan "Malaysia Inc', an attempt to emulate Japan Inc, particularly the close relationship between Japanese ministries (Ministry of International Trade and Industry, MITI) and big business. With the government's privatization policy, the private sector was able to participate in economic activities, particularly in developing infrastructure, which were once the domain of the public sector. The increasing role of the private sector as the engine of growth became prominent since the middle of the 1980s in contrast to the

1970s and early 1980s. The improvements in productivity following the recession testify to the successful liberalization measures implemented by the government and from the collaboration between the public and private sectors. As a result, capital investment recorded double-digit growth and job opportunities increased (APO Productivity Journal, 1996).

The formulation of the Industrial Master Plan (IMP) in 1985 provided the blueprint for an accelerated industrial development. The strategies adopted in this plan rapidly transformed the industrial sector into one with a broader base and greater sophistication. In addition, heavy industries in the non-resource-based industries such as petrochemicals, automobiles, iron and steel were established, while the traditional electronics and electrical machinery, apparel and garment industries continued with their rapid expansion. At the same time, resource-based industries such as olechemicals, food processing and wood-based industries also experienced rapid growth. The economy is entering into yet another phase of industrialization that places new emphasis and demands on more capital-intensive, high technology and knowledge-based industries.

In late 1980s, a combination of terms of trade shocks and fiscal imbalances prompted the government to move in 1986 away from state led industrialization. Promotion of private investment across a broad range of sectors was combined with macroeconomic adjustment and continued efforts to increase manufactured exports. For example, the Promotion of Investment Act (1986) provided tax and other incentives for private investment. Tax incentives for exporters were increased and imports were liberalized.

Although industrialization has been part of the economic plans of Malaysia, further impetus to the growth of Malaysia came from the liberalization. The successful liberalization measures implemented by the government include measures to attract more foreign direct investment (FDI), create more highly skilled job opportunities, broaden the industrial base and maintain low inflation. All these contributed to productivity gains in all sector of the economy. Thus, it is believed that adjustment and liberalization had led to a major increase of TFP in 1980s. Good economic policies and a favorable economic structure accelerated TFPG change due to organizational change and product quality upgrading.

1990s: Technology-led growth

The National Development Policy (NDP), which took over the NEP in 1990, continues with the objective of growth with equity, placing a strong emphasis on the role of the private sector in attaining the long-term goal of a fully developed nation by the year 2020. In its endeavor to become an industrialized nation by 2020, the government stresses the need for a high technology-driven strategy.

The most likely explanation for the decline in the contribution of TFP in 1990s is the transition of the economy to high technology activities, which involved a high level of capital accumulation at the initial stage. The impact of the new capital investment on TFPG can be realized only after a lag of a few years, taking into account the gestation period and the learning curve.

While this is significantly higher than the figure reported in World Bank (1993) for Malaysia (1.0755) using different data set (Table 2), it remains a small portion (less than 30%) of the total GDP per worker growth of the country over 1971-1999 period, with capital per worker accumulation accounted for most of the GDP per worker growth (Figure 2). So, it is unable to conclude that Malaysia did particularly well in improving its TFP in recent years.