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SOURCES OF INDUSTRIAL GROWTH USING THE FACTOR DECOMPOSITION APPROACH: MALAYSIA, 1978–87

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I. INTRODUCTION

DURING the past three decades, the Malaysian economy has sustained a remarkable rate of growth. Many factors have been identified as the cause of such growth, but important among them are factors such as a generous supply of natural resources, particularly ample reserves of oil, gas, and arable land, and the country's outward-oriented trade strategy. There has also been the external factor of a favorable world economy. But all these factors would not have automatically resulted in rapid growth without the sound management of the country's economic and financial institutions (World Bank 1989).

As in many developing Asian countries which adopted industrialization as their major goal of economic development, Malaysia embarked on industrialization soon after its independence in 1957. The aim was to redress the economy's problems caused by too much dependence on two primary export products (rubber and tin), an uneven distribution of income (Malaysia 1965), and unemployment (Osman Rani and Haflah 1990). Industrialization was also aimed at to solve the long-term problems of the nation's balance of payments (Kanapathy 1970). The initial support for industrialization came from the International Bank for Reconstruction and Development (IBRD) when its mission recommended the strategy for Malaya in 1955 (Kau 1979).

From the pre-independence days until the late 1960s, the formulation of development policy overwhelmingly followed the infant industry argument which justified the strategy for heavily protected import-substituting industrialization (Jomo 1990). Offering specific incentives to stimulate investment in the manufacturing sector, the Malaysian government introduced the Pioneer Industries Ordinance (PIO) in 1958 (Ariff 1991). By the late 1960s it became apparent that any further undue encouragement of import-substituting industries via protection would only mean nurturing greater inefficiency in Malaysia's industrial sectors. This would not be compatible with the long-term industrial development of the country (Tan 1990) because the import-substitution strategy had created distortions in domestic

product prices, low value-added, and poor linkages with the rest of the economy (Osman Rani and Haflah 1990). Moreover, unless there were more overseas market ventures, further industrial expansion in Malaysia was not viable because of the limited domestic market reflected by the country's relatively small population and low average-income level (Ariff and Abdul Aziz 1988). An export-oriented industrialization strategy seemed to be the logical solution. The strategy had been adopted in the early 1960s with great success by other Asian countries such as the Republic of Korea, Hong Kong, Singapore, and Taiwan, and Malaysia felt it should not miss out on this major source of growth (Fong 1989).

In an effort to enhance Malaysia's export-oriented industrialization strategy and to encourage expansion of manufactured exports, the government in 1968 implemented the Investment Incentives Act (IIA) to replace the PIO. In 1971 the manufacturing sector was designated as a strategic sector not only for achieving the goals of the New Economic Policy (NEP) but also for export-oriented industrialization. During the same year, the government enacted Free Trade Zone (FTZ) Act to assist multinational corporations in locating in Malaysia (Doraisami 1996). Furthermore, firms could apply to be designated as Licensed Manufacturing Warehouses (LMWs) which allowed them to effectively operate as firms located within FTZs (Kanapathy 1994).

The government introduced its First Industrial Master Plan (First-IMP) for the period 1986–95 with a strong emphasis on continuing the export-led industrialization strategy which focused on further diversification and deepening of the resource-based and non-resource-based industries (MIDA/UNIDO 1985). The Second-IMP covering the period 1996–2005 has been building upon the success of the First-IMP and addresses issues and challenges that have been identified to sustain and enhance the growth momentum of the manufacturing sector (MITI 1996).

Over the period 1957–96, Malaysia witnessed substantial structural change in its economy as measured by the sectoral share of production and employment. During this period the share of agriculture to GDP and employment has declined steadily from 39.3 per cent in 1957 to 13.6 per cent in 1995 and from 61.3 per cent to 18.0 per cent, respectively. On the other hand, the manufacturing sector's share has increased more than three times during the last three decades, while its share for employment has resen almost four times. Table I summarizes this change. Zakariah and Chan (1995) observed this reversal between agriculture and manufacturing that took place in the production structure between 1970 and 1994.

There are a few studies that examined structural changes in the economy using a common methodology. Important among them are Hoffmann and Tan (1975, 1980) covering the period 1959–68 and 1968–74, and Ariff (1975) covering the period 1963–74, which analyzed the structural change of the economy for Peninsular Malaysia. Kanapathy (1994) is the most recent and covered the whole Malaysian economy for the period 1978–85. These studies use a shift-share analysis;

TABLE I

GROSS DOMESTIC PRODUCT AND EMPLOYMENT BY SECTOR, 1957–2000

(%)

Sectors	1957	1965	1970	1975	1980	1985	1990	1995	2000[a]
Agriculture									
% of GDP	39.3	34.4	29.0	27.7	22.9	20.8	18.7	13.6	10.5
% of Emp.	61.3	54.6	53.5	49.8	39.7	35.7	26.0	18.0	13.1
Mining									
% of GDP	6.4	5.2	13.7	4.6	10.1	10.4	9.7	7.4	5.7
% of Emp.	6.4	2.5	2.6	2.2	1.7	1.1	0.6	0.5	0.5
Manufacture									
% of GDP	11.1[b]	11.0	13.9	16.4	19.6	19.7	27.0	33.1	37.5
% of Emp.	6.4	8.4	8.7	11.1	15.7	15.1	19.9	25.9	28.9
Construction									
% of GDP		4.3	3.8	2.1	4.6	4.8	3.5	4.4	4.8
% of Emp.	3.2	3.5	2.7	4.0	5.6	6.9	6.3	8.3	9.3
Services									
% of GDP	43.2	45.1	36.2	49.2	40.1	43.6	42.3	44.2	45.7
% of Emp.	29.1	33.5	32.5	35.1	37.3	41.2	47.2	47.3	48.2

Source: Various five-year development plans of Malaysia; Malaysia, Ministry of Finance, *Economic Report*, various issues.

[a] Forecasted by Seventh Malaysia Plan.

[b] Includes construction sector share.

which adopted a methodology suggested by Lewis and Soligo (1965).[1] Abdul Aziz (1990) was the only one that examined the tables, looking at the changing structure of output, final demand, primary input, technology, and linkages by comparing the corresponding technical coefficients for the years 1960–66, 1971, 1978, and 1983. However, there is still no study examining the structural change of the Malaysian economy using a structural decomposition method of output growth as suggested by Chenery (1960).

The main objective of the present paper is, therefore, to examine the sources of industrial output growth of the Malaysian economy using the factor decomposition method. The method was first introduced by Chenery (1960) and was applied in many studies of structural change in developed and developing countries. Since there have been only three input-output tables, for the years 1978, 1983, and 1987, ever published by the Department of Statistics for the whole economy (previous tables were only for Peninsular Malaysia), the present study will cover the period

[1] Shift-share analysis has its own limitation; it fails to separate the domestic-demand expansion effect from the intermediate-demand expansion effect. One of the merits of the structural decomposition approach used in the present study is its ability to separate these effects.

TABLE II

SECTOR RECLASSIFICATION

Major Sectors	Sixty Subsectors
1. Agriculture	1. Agriculture, other
	2. Rubber planting
	3. Oil palm estates
	4. Livestock breeding etc.
	5. Forestry and logging
	6. Fishing
2. Mining	7. Mining and quarrying
3. Light industry	8. Meat, dairy production
	9. Preserved food
	10. Manufactured oils and fats
	11. Grain mills
	12. Bakeries, confectionery industry
	13. Other food production
	14. Manufactured animal feed
	15. Beverage industries
	16. Manufactured tobacco
	17. Textiles manufacturing
	18. Wearing apparel manuf.
	19. Sawmills
	20. Furniture and fixtures
	21. Paper prod. and printing
4. Heavy industry	22. Industrial chemicals
	23. Paints and lacquers
	24. Other chemical industries
	25. Petroleum, coal industry
	26. Rubber processing
	27. Rubber industries
	28. Plastic products
	29. China, glass, and clay industry
	30. Cement, lime, plaster industry
	31. Other nonmetal minerals
	32. Basic metals industries
	33. Other metals industries
	34. Nonelectrical machinery
	35. Electrical machinery
	36. Motor vehicle manufacturing
	37. Other transport equipment
	38. Other manufacturing
5. Services	39. Electricity and gas production
	40. Water works and supply
	41. Building, construction
	42. Wholesale and retail trade
	43. Hotels and restaurants
	44. Transportation
	45. Communications
	46. Financial institutions
	47. Insurance
	48. Real estate
	49. Business services
	50. Private education
	51. Private health services
	52. Recreation, culture
	53. Vehicle repairing
	54. Other repairing, cleaning
	55. Public administration, defense
	56. Government education
	57. Government health services
	58. Other government institutions
	59. Private nonprofit institutions
	60. Other private services

Source: Chenery et al. (1986), James and Fujita (1989), Akita (1991), and Malaysia, Department of Statistics, 1978, 1983, 1987.

allowed by the availability of data. As often encountered by any inter-temporal analysis that uses more than two input-output tables, the structural changes have to take account of changes that are caused by nominal and real variables. In order to reveal the real changes in the variables only, the 1983 and 1987 input-output tables were deflated to 1978 constant prices so that all the three tables became "truly" comparable. The present study has compiled and used producer price indices and import price indices for the sixty sectors of the economy.

To make the present study comparable with other studies that use the same methodology but for different countries, we have reclassified the economy by aggregating its sixty sectors into a five-sector economy. The reclassification scheme adopted here, shown in Table II, follows closely that of Chenery, Robinson, and Syrquin (1986), James and Fujita (1989), and Akita (1991).[2] The agriculture sector comprises six subsectors while the mining sector is taken directly from the input-output sector. The light industry sector comprises fourteen subsectors and the heavy industry sector contains seventeen subsectors. These two sectors, light and heavy industries, represent the manufacturing sector of the economy. The service sector comprises twenty-two subsectors.

This paper is organized as follows. Section II begins with an overall analysis of changes in the industrial structure while the next section presents the factor decomposition method together with its analytic framework and sources of data. The empirical results and changing pattern of the sources of growth will be discussed in Section IV. Lastly, the conclusion and recommendations will be presented in Section V.

II. CHANGES IN THE INDUSTRIAL STRUCTURE DURING 1978–87

The Malaysian economy has undergone substantial structural change as it has responded to various government policy incentives and strategies, especially the industrialization strategies that were first formulated to encourage import substitution activities then shifted toward export promotion. The purpose of this section is to investigate changes in the industrial structure that have taken place during the 1978–87 period. We will first analyze the share of exports, imports, value-added, domestic demand, and intermediate demand for the major sectors (see Table III) of the economy during the period. In order to relate the present discussion to the economy's trade orientation, we will analyze changes in the economy's export and import ratios (the definitions of these ratios are given in Table III). The three input-output tables for 1978, 1983, and 1987 will be used exclusively as the basis of analysis. Table III shows domestic demand, intermediate demand, exports, imports, and value-added to gross output together with the export and import ratios of the five major sectors during these years.

[2] The capital-labor ratio has been calculated for all sectors in Malaysia using the Census of Manufacturing Industries (1990) to classify them according to the five major categories of industries. Industries are classified as capital intensive if their capital-labor ratios are above that of the manufacturing average; otherwise they are classified as labor intensive. However, by assuming that light industries are labor intensive and heavy industries are capital intensive, this classification does not coincide with that of Chenery, Robinson, and Syrquin (1986), James and Fujita (1989), and Akita (1991). This may be due to different factor intensity between Malaysia and other countries. The present study, therefore, adopted that used by the above studies which are considered a more universal pattern of factor intensity in production.

TABLE III

DOMESTIC DEMAND, INTERMEDIATE DEMAND, VALUE-ADDED, EXPORTS, IMPORTS, EXPORT RATIO, AND IMPORT RATIO BY INDUSTRIAL GROUP IN CURRENT PRICES

(%)

Sector	Domestic Demand	Interme-diate Demand	Value-Added	Exports	Imports	Export Ratio	Import Ratio
1978							
Agriculture	9.9	19.0	19.6	8.4	5.3	17.03	7.49
Mining	–0.1	8.8	9.9	14.4	2.2	57.72	11.54
Light industry	15.0	16.7	10.7	24.4	18.1	38.24	28.04
Heavy industry	10.5	21.2	11.0	41.7	44.1	66.47	56.78
Services	64.7	34.4	48.7	11.0	30.2	6.94	11.33
Total	100	100	100	100	100	27.75	19.39
1983							
Agriculture	7.2	15.2	15.5	7.5	3.7	17.93	7.51
Mining	1.0	7.5	11.8	17.4	2.5	60.61	14.36
Light industry	10.4	18.8	8.3	23.5	13.1	37.76	28.27
Heavy industry	12.4	22.0	11.9	37.3	42.1	58.99	54.82
Services	69.1	36.6	52.5	14.3	38.4	8.24	15.28
Total	100	100	100	100	100	27.09	21.70
1987							
Agriculture	6.8	17.5	16.8	9.3	4.6	26.13	8.52
Mining	1.3	7.4	11.1	11.3	1.5	54.68	7.97
Light industry	11.7	18.9	8.5	21.9	17.7	44.42	35.66
Heavy industry	10.3	19.3	12.4	42.7	46.0	79.68	69.30
Services	70.0	37.0	51.1	14.8	30.1	11.30	12.14
Total	100	100	100	100	100	34.43	21.89

Source: Malaysia, Department of Statistics, 1978, 1983, and 1987.
Note: Export ratio = Export / Total domestic output. Import ratio = Import / Total domestic demand.

A. *Domestic Demand, Intermediate Demand, Exports, Imports, and Value-Added*

Agriculture was modest in terms of its contribution to the economy's total exports and imports but quite significant in its contribution to GDP during the 1978–83 period. Table III shows that the average share of the sector to total exports and imports remained low (less than 10 per cent) while to GDP it was relatively higher (in the range of 15–20 per cent). This implies that a large proportion of agricultural output was consumed domestically either through inter-industrial or final uses. Overall analysis shows that all the three indicators followed a declining trend with the lowest level recorded in 1983. Only the forestry subsector showed strong export performance.

The export share of the mining sector was 14.4% in 1978, which increased to 17.4%, and then decreased to 11.3% in 1983 and 1987, respectively. Its import share for the same period was 2.2%, 2.5%, and 1.5%, respectively while its contribution in value-added was 9.9%, 11.8%, and 11.1%.

The export share of light industry fell from 24.4% in 1978 to 21.9% in 1987. Among the major products under this category were oils and fats, sawmills, textiles, and wearing apparel. The industry's import and value-added shares also fell, respectively, from 18.1% to 17.7% and 10.7% to 8.5%.

The largest contribution to exports in all three years came from the heavy industry sector which contributed about 41.7%, 37.3%, and 42.7% respectively. Similarly its share of imports was the highest contributing about 44.1%, 42.1%, and 46.0%. The major structural shift within the industry, and perhaps in the economy as a whole, was the emergence of electrical machinery as the leading export, its share increasing sharply from 8.8% in 1978 to 19.8% in 1987. Currently it is still the leading contributor to the whole economy's exports. In the same manner, imports by the electrical machinery subsector increased to about 23.0% in 1987. The heavy industry sectoral share of value-added increased from 11.0% in 1978 to 12.4% in 1987.

The export share of the service sector increased from 11.0% in 1978 to 14.8% in 1987, while its share of imports in 1978, 1983, and 1987 was of about 30.2%, 38.4%, and 30.1%, respectively. The contribution of this sector to value-added was substantial, accounted for about 48.7%, 52.5%, and 51.1% in the same respective years. The wholesale and retail trade sector appears to be the major contributor to the service industry value-added, providing about 11.4%, 11.5%, and 10.2% in the respective years.

The service sector was found to be the dominant contributor to the economy's domestic and intermediate demand. Moreover, the construction subsector appears to be the major contributor among all the subsectors to domestic demand, followed by the public administration and wholesale and retail trade sectors. On the other hand, the highest contributor subsectors in terms of intermediate demand were those of wholesale and retail trade, and oils and fats (light industry subsector).

In summary, the heavy industry sector was the leading sector in terms of the highest contribution to both total exports and imports of the economy in all three years of 1978, 1983, and 1989, while the service sector was the highest contributor to the whole economy's value added, domestic demand, and intermediate demand. Major export contributors were oils and fats, sawmills, textiles, and electrical machinery products while the major import contributor was electrical machinery. Wholesale and retail trades were most important in contributing to the economy's value-added and intermediate demand. Moreover, the construction subsector appeared to be the highest contributor to the domestic demand.

B. *Export and Import Ratios*

The definition of export and import ratios is found in the footnote of Table III. Generally, the economy was found to be more integrated into international trade in the later period. Both its ratios of exports and imports rose from 27.8% to 34.4% and 19.4% to 21.9% in 1978 and 1987, respectively. The agricultural sector's export ratio increased from 17.0% in 1978 to 26.1% in 1987, indicating that this sector's production became more export-oriented. Its import ratio also increased, though not as significantly as its export ratio, from 7.4% in 1978 to 8.5% in 1987. The forestry subsector was the leading contributor to the agricultural export and import ratios. For mining both the export and import ratios fell from 57.7% to 54.7% and 11.5% to 7.97% in the same years, respectively. It should be pointed out that the mining export ratio in 1983 was the highest among all the major sectors.

The export ratio for the light industry was 38.2%, decreasing to 37.8% and then increasing to 44.4% in 1978, 1983, and 1987, respectively while its corresponding import ratio increased from 28.0%, to 28.3% then 35.7%. Sawmills, oils and fats and preserved foods, wearing apparel, and the textile subsectors were the major contributors to improving the light industry sector's export ratio, while animal feed, other foods, paper printing, wearing apparel, and textiles were the major contributing subsectors to the increased import ratio of the light industry sector. On the other hand, the heavy industry sector export ratio was the highest among the major sectors in 1978 and 1987, while in 1983 it was the second highest, indicating that its production was the most export-oriented. The export ratios of this sector were 66.5%, 59.0%, and 79.7%, respectively, in 1978, 1983, and 1987. Electrical machinery (the highest contributor), processed rubber, other manufactured products, paints, and basic metal products were the main contributing subsectors to the high export ratio in the heavy industry sector. However, this sector's import ratio was also high accounting for about 56.8%, 54.8% and 69.3% in the same years. Electrical machinery, paints, and other manufacturing products subsectors were the major contributors to the heavy industry sector's import ratio.

The export and import ratios of the service sector in 1978 were 6.9% and 11.3%, respectively; these increased to 8.2% and 15.3% in 1983. These figures show that products of this sector were the least export-oriented. The service sector's export ratio in 1987 was 11.3% while its import ratio was 12.1%, maintaining its low export orientation.

In sum, the export ratio continuously increased for the major sectors of agriculture, light industry, heavy industry, and services while for the mining sector it increased in 1983 but decreased in 1987. On the other hand, the import ratio fell in 1987 for the mining and service sectors but not for the agriculture, light industry, and heavy industry sectors. It should be noted the electrical machinery industry has the highest export and import ratios among all the industries in the country.

III. METHOD FOR THE STRUCTURAL DECOMPOSITION OF OUTPUT

Pioneered by Leontief (1941) the analysis of structural change using an input-output framework has evolved into a firmly established field of economic study. The technique, despite its modest data requirements, provides a workable general equilibrium model that gives powerful insights into the linkages between the various sectors of the economy. Normally, studies of the structural change of an economy are concerned with changes in the level and composition of net output and employment, and the allocation of labor by industries. The method of structural decomposition of output growth as adopted in the present study analyzes major shifts within the economy by means of comparative static examination of the key parameters. Forssell (1988) listed three reasons why the method is useful in providing a framework for examining structural change in an economy. According to him, the different factors conducive to structural change in an economy may be decomposed by analyzing changes in the input-output coefficients which provide the links that transmit changes among industries through technological changes. Thus, the method provides an important central tool for dynamic analysis of structural change. The method also enables the structural change to be examined from different perspectives by using the same framework.

The present study uses the factor decomposition method that was originally proposed by Chenery (1960) to identify the sources of structural change and industrial growth in the Malaysian economy for the period between 1978 and 1987. The period is further subdivided into 1978–83 and 1983–87 subperiods. Although in its general framework our model is similar to that applied by Akita (1991) and Lee and Schluter (1993), it differs in its use of deflators. The present study uses a sectoral producer price and import price indices to deflate the relevant tables while Akita's study used a scalar GDP deflator only.

A. *Analytical Framework*

The approaches of Akita (1991) and Lee and Schulter (1993) begin with an accounting identity of demand and supply, allowing it to explain differential changes in disaggregated sectoral production as a non-proportional expansion. It does so through the following four causal factors:

1. Domestic-demand expansion, or the total effect on the output from each sector of expansion of domestic demand in all sectors.
2. Intermediate-demand expansion, or the total effect on the output from each sector of changing input-output coefficients throughout the economy.
3. Export expansion, or the total effect on the output from each sector of increasing exports in all sectors.

4. Import substitution, or the total effect on the output from each sector of increasing the proportion of domestic demand in all sectors that is supplied from domestic production instead of foreign sources.

In an open Leontief system, the basic material balance between supply and demand can be written as:

$$\boldsymbol{X} = \boldsymbol{D} + \boldsymbol{W} + \boldsymbol{E} - \boldsymbol{M}. \tag{1}$$

where $\boldsymbol{X}$, $\boldsymbol{D}$, $\boldsymbol{W}$, $\boldsymbol{E}$, and $\boldsymbol{M}$ are respectively vectors of gross output, domestic final demand, intermediate demand, export demand, and import.

Noting that the intermediate demand of i-th sector can be determined by multiplying the input-output coefficients by total sectoral output as $\boldsymbol{W} = \boldsymbol{AX}$ (where $\boldsymbol{A}$ is the matrix of input-output coefficients), while the import ratio can be computed as import to total domestic supply as $m_i = M_i/D_i + W_i$ (Chenery 1979), Equation (1) can be rewritten as:

$$\begin{aligned} \boldsymbol{X} &= \boldsymbol{D} + \boldsymbol{AX} + \boldsymbol{E} - \boldsymbol{m}(\boldsymbol{D} + \boldsymbol{AX}) \\ &= (\boldsymbol{I} - \boldsymbol{m})\boldsymbol{D} + (\boldsymbol{I} - \boldsymbol{m})\boldsymbol{AX} + \boldsymbol{E}. \end{aligned} \tag{2}$$

By putting $\boldsymbol{\mu} = \boldsymbol{I} - \boldsymbol{m}$ (where $\boldsymbol{\mu}$ represented the diagonal[3] matrix of domestic supply),

$$\boldsymbol{X} = (\boldsymbol{I} - \boldsymbol{\mu A})^{-1}\,(\boldsymbol{\mu D} + \boldsymbol{E}). \tag{3}$$

By taking "Δ decomposition measure" (utilized by Kubo and Robinson 1979),

$$\begin{aligned} \Delta X &= X_1 - X_0 \\ &= R(\mu_1 D_1 + E_1) - X_0 \quad [\text{from equation (3)};\ \because R = (I - \mu_1 A_1)^{-1}] \\ &= R\mu_1(D_1 - D_0) + R\mu_1 D_0 + R(E_1 - E_0) + R\,E_0 - X_0 \\ &= R\mu_1 \Delta D + R\Delta E + R\mu_1 D_0 + R\,E_0 - X_0. \end{aligned}$$

The last two terms of the above expression can be expanded as follows:

$$\begin{aligned} & R\mu_1 D_0 + R\,E_0 - X_0 \\ &\quad = R\mu_1 D_0 + R\,E_0 - R\,R^{-1} X_0 \\ &\quad = R\mu_1 D_0 + R\,E_0 - R(I - \mu_1 A_1)X_0 \\ &\quad = R\mu_1 D_0 + R\,E_0 - R\,X_0 + R\mu_1 A_1 X_0 \\ &\quad = R\mu_1(A_1 - A_0)X_0 + R\mu_1 A_0 X_0 + R\mu_1 D_0 - R(X_0 - E_0) \\ &\quad = R\mu_1 \Delta A\, X_0 + R\mu_1(A_0 X_0 + D_0) - R(X_0 - E_0) \\ &\quad = R\mu_1 \Delta A\, X_0 + R\mu_1(A_0 X_0 + D_0) - R\mu_0(A_0 X_0 + D_0) \\ &\qquad (\because X_0 - E_0 = \mu_0 Y_0;\ Y_0 = A_0 X_0 + D_0) \end{aligned}$$

[3] It should be highlighted that, in addition to the above approach adopted by all other studies, the present study has tried to use the import transaction matrix of Malaysia's input-output table in the model. The results, however, are not consistent with other studies. This may be attributed to the off-diagonal figures that produce negative values on most coefficients in the Leontief inverse matrix.

$$= R\mu_1 \Delta A X_0 + R\Delta\mu(A_0 X_0 + D_0).$$
$$\therefore \Delta X = R\mu_1 \Delta D + R\Delta E + R\mu_1 \Delta A X_0 + R\Delta\mu(A_0 X_0 + D_0). \quad (4)$$

From equation (4), the decomposed ΔX can be expressed as follows:

$$\begin{aligned}\Delta X = {} & R\mu_1 \Delta D \text{ (represented the change in domestic demand)} \\ & + R\Delta E \text{ (represented the change in export demand)} \\ & + R\mu_1 \Delta A X_0 \text{ (represented the change in intermediate demand)} \\ & + R\Delta\mu(A_0 X_0 + D_0) \text{ (represented the change in import substitution).}\end{aligned}$$

The decomposition equation can be defined using initial year structural coefficients and terminal year volume weights[4] as follows:

$$\begin{aligned}\Delta X &= X_1 - X_0 \\ &= R[(E_1 - E_0) + \mu_1(D_1 - D_0) + \mu_1(A_1 - A_0)X_0 \\ &\quad + (\mu_1 - \mu_0)\ (A_0 X_0 + D_0)],\end{aligned}$$

where subscripts 0 and 1 designate the initial year and the terminal year, respectively.

B. *Sources of Data*

Basically, the present study uses secondary data from Malaysia's input-output tables published by the Department of Statistics. The following three tables represent all such tables ever published by the department, including the latest one.

1. *Input-Output Table, 1978* (Malaysia, Department of Statistics 1982).
2. *Input-Output Table, 1983* (Malaysia, Department of Statistics 1988a).
3. *Input-Output Table, 1987* (Malaysia, Department of Statistics 1994).

In order to reveal the real changes in the variables, the nominal 1983 and 1987 input-output tables have been transformed into their 1978 constant prices, making all the tables comparable. We use the producer price indices and import price indices provided by the Department of Statistics at two digits (Malaysia, Department of Statistics 1988b), which are expressed in the Standard International Trade Classification (SITC) to deflate the above tables. Painstaking efforst have been taken to match the indices with those based on the SITC and National Account Classification. Finally, indices for thirty-eight sectors were developed. By simply matching indices coded by the SITC, we manage to construct deflators for twenty-six sectors. Deflators for the other twelve sectors were constructed by taking a simple average of more than one index coded by the SITC. Seven out of these twelve sectors were matched by taking a simple average of two indices while three sectors were done by taking a simple average of three indices. Deflators for the remaining two sectors

[4] The decomposition equation can also be defined by using terminal-year structural coefficients and base-year volume weight. This is similar to the Passche and Laspeyres price indices. Few studies like Akita (1991) simply average both of the two alternatives.

were matched by a simple average of five indices. Deflators for the twenty-two services subsectors[5] were adopted from the Gross Domestic Product (GDP) deflator. Appendix Table I shows the matching procedure adopted by the study, while Appendix Table II shows sectoral producer and import price indices.

IV. RESULTS AND DISCUSSION

This section presents the results of decomposing the output growth of each sector output in terms of its four sources of growth: export expansion, import substitution, domestic-demand, and intermediate-demand expansion. The results are expressed in real thousand Malaysian ringgits (RM), in percentages to total sectoral output growth, and to total output growth of the whole economy. A source of growth is considered as a dominant source if its contribution to sectoral output growth is the largest among the four sources. If in a particular sector, export expansion is found to be dominant, the sector can then be labeled as an export-oriented sector. Similarly, a sector can be called an import-substituting sector when the import-substitution source appears to be the main contributor to its output growth. If domestic-demand expansion appears to be the major contributor to sectoral output growth, the sector can be regarded as a domestic-demand-driven sector. Similarly, if intermediate-demand expansion appears to be the major contributor to sectoral output growth, the sector can be labeled as an intermediate-demand-driven sector. Intermediate-demand expansion is usually regarded as a positive sign of technological change, therefore our analysis of this output effect will also discuss this aspect of the effect. The aim of this section is to present the results of Malaysian output growth based on the model described in the previous section.

Our overall analysis of output growth compares the two subperiods to check the extent of structural shift, if any, by means of determining the major sources of growth (as outlined in the model) and the sectors contributing to growth. A comparison of the two subperiods shows that there was a switch in the role of domestic-demand expansion and export expansion as the major contributing source. Domestic-demand expansion[6] had been the major contributing source during the first subperiod, contributing about 58.8% followed by export expansion and intermediate-demand expansion which were about 37.7% and 9.1%, respectively. In the second subperiod, export expansion surpassed domestic-demand expansion[7] as the

[5] It is very difficult to find service sector price deflators (Lee and Schulter 1993). This is why the present study has applied the GDP deflator to all twenty-two subsectors of the service sector.

[6] During this period the Malaysian economy grew very fast and consequently was able to stimulate domestic demand expansion. The economy's sectors were able to take advantage of the rapid increase in domestic demand expansion.

[7] The presence of a large number of multinationals producing for the export market likely was the main reason for export expansion becoming the dominant source of output growth during the period.

dominant contributing source of output growth, contributing to about 117.2% while domestic-demand expansion was about 11.9% and intermediate-demand expansion 2.9%. In both subperiods import substitution did not seem to contribute at all to output growth.

Taking the whole 1978–87 period, export expansion appears to have been the major contributing source of output growth, contributing to about 65%, followed by domestic-demand expansion and intermediate-demand expansion of about 41.3% and 9.1%, respectively. Generally, the results of our analysis show that as output grew during the overall period, it was driven by an overwhelming increase in export expansion, and the contribution of both domestic-demand expansion and technological change became less significant.

During the first subperiod, the greater part of output growth was contributed by the service and manufacturing (light and heavy industries) sectors which together contributed to about 90.8% of the economy's output growth, while the agricultural sector contributed less than 10%. The second subperiod saw a clear shift in sectoral contribution to output growth with the service sector declining in importance while the rest of the sectors of the economy took up the share lost by the service sector. A notable increased in sectoral contribution was found in the agriculture[8] and mining sectors whose shares more than double. Table IV summarizes the contribution of each source of industrial growth as a percentage of sectoral output growth and as total output growth of the economy[9] (for detailed results of the sixty sectors, see Appendix Tables III, IV, and V)

A. *First subperiod 1978–83*

Domestic-demand expansion had a relatively strong effect on the economy's output growth, particularly in the mining and service sectors; whereas other sectors were dominated by the effects of export expansion. The mining sector was not a significant contributor although its output growth was clearly driven by domestic-demand expansion (because the sector contributed only 1 per cent to the overall output growth of the economy). The service sector, as a major contributor to overall output growth, provides a good example of where domestic-demand expansion had the greatest influence. Within the service sector, some subsectors were not driven by domestic but by export expansion (this was especially true of the transportation and communications subsectors) and by intermediate-demand expansion (in the business services subsectors).

As mentioned earlier, agriculture and light and heavy industries were driven ex-

[8] Although the agricultural sector share in total real GDP dropped moderately, the sector recorded growth due to higher export volume and higher prices (MIER 1989).

[9] It should be highlighted that this discussion of our results is subject to the sector classification we have adopted in Table II. If we were to adopt a different sector classification, perhaps it would require a different interpretation.

TABLE IV

SOURCES OF INDUSTRIAL GROWTH IN THE MALAYSIAN ECONOMY IN THE SUBPERIODS 1978–83, 1983–87, AND OVERALL PERIOD 1978–87

(%)

Sector	Export Expansion	Domestic Demand	Interme-diate Demand	Import Substitution	Total
1978–83					
Agriculture	41.4	30.8	33.4	–5.6	100
	(3.4)	(2.5)	(2.5)	(–0.5)	(8.2)
Mining	70.8	185.9	–182.9	26.2	100
	(0.7)	(1.9)	(–1.8)	(0.3)	(1.0)
Light industry	59.4	12.4	30.1	– 1.9	100
	(13.9)	(2.9)	(7.0)	(–0.4)	(23.4)
Heavy industry	56.5	34.3	–1.6	10.8	100
	(9.8)	(6.0)	(–0.3)	(1.9)	(17.4)
Services	19.6	91.0	2.8	–13.4	100
	(9.8)	(45.5)	(1.4)	(–6.7)	(50.0)
Total	37.7	58.8	9.1	–5.5	100
1983–87					
Agriculture	94.9	–7.8	9.5	3.4	100
	(15.3)	(–1.3)	(1.5)	(0.5)	(16.1)
Mining	34.6	22.2	10.2	33.0	100
	(1.6)	(1.0)	(0.5)	(1.5)	(4.5)
Light industry	147.9	9.2	–3.8	–53.3	100
	(29.7)	(1.9)	(–0.8)	(–10.7)	(20.1)
Heavy industry	202.8	0.0	6.9	–109.8	100
	(47.9)	(0.0)	(1.6)	(–25.9)	(23.6)
Services	63.5	28.9	0.1	7.4	100
	(22.7)	(10.3)	(0.0)	(2.6)	(35.7)
Total	117.2	11.9	2.9	–32.0	100
1978–87					
Agriculture	66.0	8.9	25.6	–0.6	100
	(7.4)	(1.0)	(2.9)	(–0.1)	(11.2)
Mining	43.3	62.9	–31.3	25.1	100
	(0.9)	(1.3)	(–0.7)	(0.5)	(2.1)
Light industry	80.1	10.7	23.9	–14.7	100
	(18.3)	(2.4)	(5.5)	(–3.4)	(22.9)
Heavy industry	120.7	18.8	4.2	– 43.7	100
	(23.4)	(3.6)	(0.8)	(–8.5)	(19.4)
Services	33.8	74	1.5	–9.3	100
	(15.0)	(32.9)	(0.7)	(–4.1)	(44.4)
Total	65.0	41.3	9.1	–15.5	100

Note: Figures in parentheses indicate contribution as percentage of total output growth.

ternally by export expansion, particularly in the subsectors of textiles, sawmills, and oils and fats. There were six subsectors in the light industry sector that were driven internally through domestic-demand expansion. These were paper production and printing, furniture and fixtures, beverages, other foods, bakery products, and meat and dairy products. The period saw the effects of technological change on output growth occurring in the agriculture and light industry sectors.

Agricultural sector. This sector was export-oriented, contributing about 41.4% to total sectoral output. This was followed by intermediate-demand expansion of about 33.4% and domestic-demand expansion of 30.8%. The sector contributed about 8.2% to the total output growth of the economy.

Within the broad agricultural sector, the oil palm and forestry subsectors were found to be export-driven, agriculture and livestock were domestically driven, while rubber was found to be driven by the expansion of intermediate demand and technological change. Through the Rubber Research Institute of Malaysia, Malaysia is leading the world in rubber research. The fishery subsector was the only subsector within the major agriculture sector in which there was a negative output growth due probably to a decrease in domestic demand.

Mining sector. Driven domestically during this period, domestic-demand expansion contributed considerably, about 185.9%, to this sector's output growth. The sector, however, contributed only about 1% to total output growth of the economy.

Light industry sector. Like the agriculture sector, the light industry sector was found to be export-oriented during the first subperiod. Export expansion represented 59.4%, while intermediate-demand expansion accounted for about 30.1% of the light-industry sectoral output growth. The sector was the second highest contributor to total output growth, contributing about 23.4%. Within the sector there were six domestic-driven subsectors, namely, paper production and printing, furniture and fixtures, beverages, other foods, bakery products, and meat and dairy products; and three export-driven subsectors, namely, textiles, sawmills, and oils and fats. The tobacco and wearing apparel subsectors were driven by import-substituting activities. Intermediate-demand expansion was found to be the major source of growth in one subsector, that of grain milling. Elsadiq (1998) found that the growth of output in Malaysia food sector has had a positive correlation with the growth of total factor productivity (TFP). Our study also reveals that output growth was negative in the preserved food and animal feed subsector, perhaps due to a decrease in domestic demand in the former and in import substitution in the latter. This study also reveals that a reduction in export- and domestic-demand expansion in the wearing apparel subsector could be the main reason for the negative growth in this sector's output. Zakariah (1998) found that the country is now shifting its emphasis from the production and trade of clothing (wearing apparel) to that of primary textiles because of the changing of the world textile trade which is disadvantaging the country's exports.

Heavy industry sector. This sector was found to be export-oriented in the subperiod. Export expansion contributed 56.5% to its output growth while the industry itself contributed 17.4% to the overall output growth of the economy. The study found that five subsectors, namely, electrical machinery, industrial chemicals, other chemical products, basic metal products, and other manufacturing subsectors were clearly export-oriented. The petroleum and motor vehicles subsectors were driven by import substitution. There were nine domestic-driven subsectors, namely, cement, paints, rubber products, plastic products, china and glass, other nonmetal mineral products, other metals industries, nonelectrical machinery, and other manufactured transport equipment. A reduction in exports could possibly have caused the negative output growth in the processed rubber and basic metals subsectors.

Service sector. This sector was found to be domestically driven as domestic-demand expansion contributed about 91% to the sector's output growth. The service sector contributed about 50% to the overall output growth of the economy. Most of the sector's subsectors were domestically driven as about fifteen of them experienced substantial domestic-demand expansion. There were, however, two export-oriented subsectors, namely, transportation and communications and one driven by intermediate-demand expansion, that being the business services subsector. Our study shows that there was negative output growth in four subsectors, due probably to a reduction in the intermediate demand in the electricity and gas and the vehicle repair subsectors, as well as to a reduction in domestic-demand expansion in other repair services and private nonprofit services.

B. *Second Subperiod, 1983–87*

Unlike the first subperiod, the second subperiod witnessed the economy's output growth dominated by the effects of export expansion and which contributed about 117.2% to the overall growth of the economy. Domestic-demand expansion, on the other hand, contributed only marginally, about 11.9%. The second subperiod saw the effects of technological change on output growth fall to 2.9%.

Agricultural sector. As in the first subperiod, export expansion was also the major source of growth in the agriculture sector during the second subperiod, contributing about 94.9% of its growth, while intermediate-demand expansion and technological change contributed about 9.5% and import substitution contributed about 3.4%. Domestic demand reduced output growth by about 7.8%. The agriculture sector contributed 16.1% to the overall output growth of the economy, nearly twice that recorded in the first subperiod. Our results show that the export-oriented subsectors were agricultural production and forestry, while the livestock subsector was domestically driven. Intermediate-demand expansion continued as the main source of growth in the primary rubber industry subsector as it had been in the first subperiod. On the other hand, the fishery subsector experienced negative output

growth due probably to a decrease in domestic demand. Similarly, the oil-palm primary-products subsector experienced negative growth due to a decrease in export expansion.

Mining sector. Unlike in the first subperiod, the mining sector became export-oriented in the second subperiod. Export expansion contributed about 34.6% while import substitution accounted for 33.0% to the output growth. There were some positive effects of technological change on mining output growth. The sector contributed about 4.5% to the overall output growth of the economy, an increase from 1.0% in the first subperiod.

Light industry sector. As in the first subperiod, export expansion continued to be the dominant contributing source of growth during the second subperiod, contributing about 147.9%. The sector contributed 20.1% to the overall output growth of the economy, a decrease from the first subperiod. Oils and fats, bakery products, beverages, textiles, wearing apparel, sawmills, and furniture and fixtures were found to be export-oriented. However, two subsectors, namely, meat products and preserved foods, were domestically driven and three subsectors—grain milling, tobacco, and animal feed—were driven by import-substituting activities. Other foods and paper printing showed a negative expansion in output due probably to a reduction in the growth of domestic demand in the former and of import substitution and intermediate demand in the latter. During this subperiod there was a substantial reduction in the role of technological change in the output growth of the light industry sector.

Heavy industry sector. This sector's contribution to overall output growth increased by 23.6%, which took up the share lost by the light industry sector. Export expansion contributed substantially to the sector's growth, accounted for about 202.8%. Seven subsectors, namely, electrical machinery, industrial chemicals, paints, other chemicals, china and glass, rubber products, nonelectrical machinery and other manufactured products were found to be export-oriented. The processed rubber and nonelectrical machinery subsectors were driven by import-substituting activities, while other nonmetal mineral products, other metal products, petroleum, and cement subsectors were driven by intermediate-demand expansion. Our study also found that there were four subsectors, namely, plastic products, basic metals, motor vehicles, and other transport equipment which experienced negative output growth due probably to a reduction in import substitution in the first two subsectors and in domestic-demand expansion in the latter two subsectors.

Service sector. Like the mining sector, the service sector also became export-oriented, which contributed about 63.5% to its output growth. The sector contributed about 35.7% to the overall output growth of the economy, a decrease compared to the first subperiod. The wholesale and retail, transportation, insurance, and business services subsectors were found to be export-oriented while electricity and gas, and the public administration subsectors were predominantly influenced by

import-substitution activities. Intermediate-demand expansion was an important source of growth in the vehicle repair subsector. The remaining fourteen subsectors were driven domestically. A reduction in domestic-demand expansion could have been the cause of the negative output growth in the two subsectors of building and construction, and recreation and culture.

In sum, all the major sectors of agriculture, mining, light industry, heavy industry, and services were export-oriented during the 1983–87 subperiod. The heavy industry sector was the second highest sector contributing to the overall output growth of the economy (replacing light industry which had been the second highest in the first subperiod).

C. *Overall Period, 1978–87*

In the overall period, the whole economy appeared to be influenced substantially by the expansion of exports. About 65.0% of the economy's overall growth was due to export expansion, while domestic-demand expansion accounted for 41.3% and intermediate-demand expansion and technological change contributed 9.1%.

Agricultural sector. This sector was found to be export-oriented during the overall period. Export expansion contributed about 66.0% to sectoral growth while intermediate-demand expansion and technological change contributed about 25.6%, and domestic-demand expansion by 8.9%. Import substitution reduced the growth in agricultural output by about 0.6%. The agriculture sector contributed about 11.2% to the overall output growth of the economy. There were three export-oriented agricultural subsectors, namely, agriculture products, oil palm and forestry, while the domestic-driven subsector was livestock. Intermediate demand was dominant in the rubber subsector. The fishery subsector's negative output growth during this period might have been due to the reduction in domestic demand.

Mining sector. This sector was found to be domestically driven as domestic-demand expansion contributed about 62.9% to its output growth, followed by export expansion which contributed about 43.3%. The sector contributed about 2.1% to the overall output growth of the economy.

Light industry sector. As in the two subperiods, this sector was export-oriented for the overall period. About 80.1% of sectoral growth was due to export expansion, while intermediate demand and technological change accounted for another 23.9%. The sector contributed 22.9% to the overall growth of the economy. Four subsectors were export-oriented, namely, oils and fats, textiles, wearing apparel, and sawmills, while meat products, grain milling, bakery products, beverages, tobacco, furniture and fixtures, and paper and printing were domestically driven. Two import-substituting subsectors were other foods and animal feed. The decline in domestic-demand expansion caused a negative output growth in the preserved food subsector.

Heavy industry sector. As with light industry, this sector was export-oriented

during the overall period, as export expansion contributed about 120.7% to the sector's growth. The sector contributed 19.4% to the overall growth of the economy. There were eleven export-oriented subsectors, namely, industrial chemical, paints, other chemicals, petroleum, rubber products, plastic products, china and glass, other metals, nonelectrical machinery, electrical machinery, and other manufactured products. The subsectors of processed rubber and motor vehicles were driven by import-substituting activities. Three subsectors were domestically driven, namely, cement, other nonmetal minerals, and other transport equipment. The negative output growth of the basic metals sector was probably caused by export expansion.

Service sector. This sector was domestically driven during the overall period. About 74.0% of the total sectoral output growth was contributed by domestic-demand expansion, while the sector's contribution to the overall growth of the economy was about 44.4%. While most of the service subsectors were domestically driven, four subsectors were export driven, namely, wholesale and retail trades, transportation, business services and vehicle repairs, and one subsector, other repairs, was driven by intermediate-demand expansion.

In sum, agriculture, light industry, and heavy industry were found to be export-oriented in the 1978–87 period, while the mining and service sectors were domestically driven. The light industry sector became the leading sector in terms of contribution to the overall growth of the economy during the overall period.

D. *The Major Export-Oriented Subsectors*

This section looks at the contributions of the six major export-oriented subsectors.

Forestry and logging products subsector. This subsector was clearly export-oriented in the first subperiod, as export expansion contributed about 257.1% of the sectoral growth, while in the second period export expansion contribution was about 81.9%. The overall period saw export expansion contribute about 109.0% to sectoral growth.

Oils and fats subsector. Export expansion accounted for sectoral growth of about 64.7% in the first subperiod, 204.1% in the second subperiod, and 80.5% in the overall period. The subsector substantially influenced the overall growth of the economy. The export of oils and fats contributed 11.3% to total export growth in the first subperiod; this increased to 17.0% in the second subperiod. During the overall period the export of oils and fats contributed 12.1% to the overall growth of the economy. Technological change played quite an important role in output growth of the subsector, though it followed a declining trend during the overall period.

Textile products subsector. Export expansion accounted for 271.2% of the sectoral growth in the first subperiod, 255.5% in the second subperiod, and 278.4% in the overall period.

Sawmill subsector. Export expansion accounted for about 91.0% of the sectoral growth in the first subperiod, 68.9% in the second subperiod, and 73.5% in the overall period.

Industrial chemicals subsector. Export expansion accounted for about 83.2% of the sectoral growth in the first subperiod, 103.9% in the second period, and 93.1% in the overall period. Technical change contributed a small proportion to the sector's growth in output during the first subperiod, and this disappeared in the second period.

Electrical machinery subsector. Export expansion accounted for the sectoral growth of about 149.3% in the first subperiod, 354.6% in the second subperiod, and 234.1% in the overall period. The subsector substantially influenced the overall growth of the economy. Exports of electrical machinery contributed 21.5% in the first subperiod and then 20.3% in the second subperiod to total export growth, while during the overall period these same exports contributed 21.2% to the overall growth of the economy. Each of the subperiods saw a contribution of technical change to the growth of the sector's output, but this change was particularly significant during the latter.

E. *Changing Pattern in the Sources of Industrial Growth*

The Malaysian economy underwent significant structural change during the 1978–87 period which can be perceived by looking at the changes in the sources of industrial growth in individual subsectors and the shifting of sources as the dominant contributors to overall industrial growth. The following analysis focuses on the changing pattern of industrial growth by looking at the shifting of the sources of predominant industrial growth from the first subperiod to the second subperiod.

Of the total of sixty subsectors of the economy that we considered, thirty-three subsectors maintained their industrial structure during both sub-periods. Nineteen remained driven by domestic-demand expansion: livestock, fisheries, meat products, other foods, other transport products, water works, buildings, hotels, financial services, real estate, private education, private health services, recreation, other repairs, government education, government health services, other government services, private nonprofit service, and other private services. There were ten subsectors driven by export expansion in both subperiods, namely, oil palm, forestry, oil, textiles, sawmills, industrial chemicals, other chemical products, electrical machinery, other manufactured products, and transportation. The tobacco and animal feed subsectors were driven by import substitution, while the rubber and vehicle repair subsectors were driven by intermediate demand in both subperiods.

The above results show that the number of subsectors that maintained their dominance as sources of growth in both subperiods were clearly large in domestic-demand expansion followed by export expansion; and particularly small in import substitution and intermediate-demand expansions.

On the other hand, twenty-seven subsectors experienced a changing pattern in

their sectoral output growth as their dominant growth source in the first subperiod was replaced by another one in the second subperiod.

There were eighteen subsectors domestically driven in the first subperiod which came to be driven by other sources of growth in the second subperiod. Ten of them, agriculture production, mining, bakery products, beverages, furniture, paints, rubber products, china and glass, wholesale trade, and insurance, became export-oriented in the second subperiod. Four subsectors, paper printing, cement, other nonmetal mineral production, and other metal products, became driven by intermediate-demand expansion in the second period. Four subsectors, preserved foods, plastic products, nonelectrical machinery, and public defense became import-substituting sectors in the second subperiod. These findings imply that in the second subperiod, the economy's growth became more influenced by the external forces, not only as shown above by the number of sectors that were becoming export driven but also in terms of the proportion of output that was driven by exports. Technological change did not exert significant influence on the structural change of the economy.

Similarly, three subsectors, which were driven by intermediate-demand expansion in the first subperiod, became driven by other sources in the second subperiod. Grain milling and electricity became import-substituting subsectors while the business services subsector became export-oriented in the second subperiod. Three import-substituting subsectors in the first subperiod became driven by other sources in the second subperiod. Wearing apparel became export-oriented while motor vehicles became domestic-driven in the second subperiod, and in the petroleum subsector intermediate demand became the major contributor. If we were to make an argument for the advancement of production technology during the period, perhaps the experience of the petroleum subsector could be taken as an example.

There were three subsectors that were export-oriented in the first subperiod but became driven by other sources in the second subperiod. Two of the subsectors, processed rubber and basic metals, became import-substituting subsectors while the communications subsector became a domestic-driven subsector.

Based on the above results, we will try to establish the relationship between economic growth and sources of industrial growth. But this statistical analysis merely establishes a correlation between economic growth and its sources; it does not establish its causal relationship. Martin and Holland (1992) have approached the problem differently, i.e., by grouping the 477 U.S. sectors into twelve categories and associating them with the sources of growth without recourse to the calculation of correlation coefficient. Due to the smaller number of sectors in Malaysia's economy, we have considered all the sectors aggregately and carried out Pearson's correlation test. The results of the test are presented in Table V.

A Pearson correlation test showed that during the 1978–87 period, there was a

TABLE V

CORRELATION COEFFICIENTS FOR THE PERIOD 1978–87

Sources of Growth	Pearson Correlation Coefficients
Export expansion	0.7808*
Import substitution	–0.4506*
Domestic demand	0.3433*
Intermediate demand	0.6870*

* Significant at 1% and 5% confidence levels.

positive and highly significant ($r = 0.7808$) relationship between export expansion and economic growth. This implies that there is high probability of achieving rapid economic growth if Malaysia continues to pursue an export-oriented policy. The results also indicate that there exists a negative and highly significant correlation ($r = -0.4506$) between import substitution and economic growth, implying that a strong import-substitution strategy would slacken the growth of the economy.

The table also shows that the intermediate-demand expansion was correlated positively and highly significant with economic growth ($r = 0.6870$), implying that the more intermediate inputs are used by the economy the higher will be its growth rate. Embedded in the source of intermediate-demand expansion, inter-temporal changes in the technology matrix, is the notion of technical change. The results of our study show that while technical change had a small role, it did exert a positive and highly significant influence on Malaysian economic growth, second after export expansion. This indicates that there is a big potential for further output growth if technical change as a source of growth can be exploited fully. Domestic-demand expansion showed the lowest relationship with economic growth ($r = 0.3433$), implying that though it was the dominant and pervasive source, its potential to exert output growth was relatively minimal.

Changes in the relative prices of inputs endogenously induce changes in techniques of production, such that a fall in prices of material inputs encourages the use of them in production and thus increases their proportion relative to other primary inputs to gross output. This is a kind of technological change (as opposed to technological change caused by exogenous advancement in knowledge) that might occur in the Malaysian case, which is represented by the effects of intermediate-demand expansion. The limited improvement in technological change that was observed in this study can be explained by two factors: limited improvement in the domestic economy's industrial linkages and its heavy reliance on imported material inputs.[10]

[10] See Zakariah (1989) and UNIDO (1992).

V. CONCLUSION AND RECOMMENDATIONS

The primary purpose of this study has been to examine structural change in the Malaysian economy by identifying the sources of industrial growth in the the economy during the 1978–87 period, approaching it from the demand side using input-output analysis. Chenery's factor decomposition method was employed, decomposing output growth into four sources: import substitution, export expansion, intermediate-demand and domestic-demand expansion. The present study used 1978, 1983, and 1987 input-output tables, each containing sixty industries. The overall period of 1978–87 was broken down into two subperiods: 1978–83 and 1983–87. The input-output tables for 1983 and 1987 were deflated to year 1978 constant prices by using both sectoral producer and sectoral import price indices in order to reveal the real changes in the structure of the economy. For the purpose of making the present study comparable with other studies, the result of the sixty industry analysis were aggregated into five sectors: agriculture, mining, light industry, heavy industry, and service sectors.

The results of the analysis indicate that domestic-demand expansion was the dominant source of growth in the Malaysian economy in the subperiod 1978–83. During this subperiod, domestic-demand expansion was the main growth source for the mining and service sectors. On the other hand, the growth in the agriculture, light industry, and heavy industry sectors were due mainly to export expansion. In the subperiod 1983–87, the economy's growth was mainly due to export expansion. This export expansion was dominant in the agriculture, mining, light industry, heavy industry, and service sectors. Export expansion also appeared to be the dominant source of growth during the overall period 1978–87, especially in the major sectors of agriculture, light and heavy industries. Domestic-demand expansion was dominant in the mining and service sectors.

The growth of the Malaysian economy entailed substantial change in its production structure. Export-oriented strategy not only played an important role in the development process, but also resulted in a substantial structural shift in the economy. The economy's development strategy has shifted from one reliant on import substitution to one that is more oriented toward exporting. Out study shows that this policy shift has benefited the growth process of the economy by contributing positively to output growth.

This study also shows that the economy is moving toward industrialization where the manufacturing sector plays a more important role in the growth process. In both light and heavy industries, the manufacturing sector's contribution to the overall growth of the economy has risen considerably, surpassing even that of the service sector. With the economy limited domestic market, Malaysia's import-substitution strategy which relied on high protective tariff wall was not optimal for the long-run development process, especially when the economy had to move from the

simple processing of consumer goods to the manufacturing of intermediate and capital goods. The export-oriented industrialization strategy, therefore, has to go together with the promotion of heavy industry; and here the electrical machinery subsector has been the most important, leading the Malaysian economy in both production and exports.

An typical problem for many developing countries is that export expansion always leads to an increase in imports, not only in consumer durables because of an increase in per capita income, but also in intermediate and capital goods. This reflects structural weaknesses in the economy's productive systems which prohibit internal sourcing due to deficiencies in domestic interindustrial linkages. This phenomenon is reflected in our results which show a sharp increase in the import ratio of manufacturing during the second subperiod; the highest was in the electrical machinery subsector. The long-term optimal development strategy in this context is to let the growth of the economy be propelled by the expansion of intermediate demand which is based on technological progress. A corollary to that is that the economy has to encourage the development of intermediate- and capital-goods industries so that domestic industrial linkages can be enhanced thereby reducing reliance on imports of such good.

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APPENDIX TABLE I

INPUT-OUTPUT SECTORS AND THEIR SITC CORRESPONDENCE

Input-Output Table Classification		SITC Two-Digit Classification	
Code	Sectors	Code	Sectors
1	Agricultural products, other	04	Cereal and cereal preparation
2	Rubber primary products	23	Crude rubber
3	Oil palm primary products	22	Oil seed and oleaginous fruits
4	Livestock etc.	00	Live animals chiefly for food
5	Forestry, logging products	24	Cork and wood
6	Fish etc.	03	Fish, crustaceans and molluscs, and preparation
7	Mining, quarrying products	34	Gas, natural and manufactured
8	Meat, dairy products	01 02	Meat Dairy products
9	Preserved foods	03 05	Fish, crustaceans and molluscs, and preparation Fruits and vegetables
10	Oils and fats	41[a] 42 43	Animal oils and fats Vegetables oils and fats, unprocessed Animal and vegetable oils & fats, processed, waxes
11	Grain mill products	04	Cereal and cereal preparation
12	Bakery, confectionery products	06	Sugar, sugar preparation, and honey
13	Other foods	07 09	Coffee, tea, cocoa, spices Miscellaneous edible products and preparations
14	Animal feed	08	Feeding stuff for animals
15	Beverages	11	Beverages
16	Tobacco	12	Tobacco and tobacco manufactures
17	Textile products	65	Textile yarn, fabrics, made-up articles
18	Wearing apparel	61 85	Leather, leather manufactures Footwear
19	Sawmills	63	Cork and wood (excluding furniture)
20	Furniture & fixtures	82	Furniture and parts
21	Paper & printing products	64	Paper, paperboard, and articles of paper pulp
22	Industrial chemicals	51 52 56 58 59	Organic chemicals Inorganic chemicals Fertilizer, manufactured Artificial resins and plastic materials Chemical materials
23	Paints & lacquers	53	Dyeing and coloring
24	Other chemical products	54 55 59	Medicinal and pharmaceutical products Essential oils and perfume materials Chemical materials

APPENDIX TABLE I (Continued)

Input-Output Table Classification		SITC Two-Digit Classification	
Code	Sectors	Code	Sectors
25	Petroleum, coal products	32[a]	Coal, coke, and briquettes
		33	Petroleum, petroleum products
26	Processed rubber	62	Rubber manufactures
27	Rubber products	62	Rubber manufactures
28	Plastic products	58	Artificial resins and plastic materials
29	China, glass, & clay products	66	Nonmetallic mineral manufactures
30	Cement, lime, plaster	66	Nonmetallic mineral manufactures
31	Other nonmetal mineral products	66	Nonmetallic mineral manufactures
32	Basic metal products	67	Iron and steel
		68	Nonferrous metals
33	Other metal products	69	Manufactures of metals
34	Nonelectrical machinery	71	Power-generating machinery and equipment
		72	Machinery specialized for particular industries
		73	Metal-working machinery
		74	General industrial machinery and equipment
		75	Office machines and automatic data processing
35	Electrical machinery	76	Telecommunications and sound recording
		77	Electrical machinery, apparatus & appliances
36	Motor vehicles	78	Road vehicles
37	Other transport equipment	79	Other transport equipment
38	Other manufactured products	87	Professional, scientific, and controlling instruments
		88	Photographic apparatus and optical goods
		89	Miscellaneous manufactured articles
39–60	Services sectors		GDP deflator or overall IMP

Source: Malaysia, Department of Statistics, *Input-Output Table*, various years; idem, 1988b; Malaysia, Ministry of Finance, *Economic Report*, various years.

[a] Used only for import producer indices.

APPENDIX TABLE II

SECTORAL PRODUCER AND IMPORT PRICE INDICES

Sectors	Producer Price Indices (1978 = 100)		Import Price Indices (1978 = 100)	
	1983	1987	1983	1987
1. Agricultural products, other	112.7	111.7	98.4	84.6
2. Rubber primary products	113.9	116	150.9	142.5
3. Oil palm primary products	86.3	67.1	95.1	92.8
4. Livestock etc.	142.2	125.3	110.6	110.6
5. Forestry, logging products	140.6	140.4	115.6	128.9
6. Fish etc.	120.5	232.3	112.3	121.5
7. Mining, quarrying products	193.1	178.4	160.1	117.4
8. Meat, dairy products	134.6[a]	124.2[a]	129.3[a]	122.2[a]
9. Preserved foods	136[a]	201.8[a]	106[a]	111.8[a]
10. Oils and fats	90.4[a]	73.8[a]	105.9[a]	106.9[a]
11. Grain mill products	112.7	111.7	98.4	84.6
12. Bakery, confectionery products	125.2	108.6	97.5	114.2
13. Other foods	110.1[a]	163.5[a]	97.7[a]	123.3[a]
14. Animal feed	119.3	113.7	99.7	117.3
15. Beverages	148.4	157.8	125.3	139.4
16. Tobacco	165.7	185.9	166.3	204.6
17. Textile products	122.8	109.7	127.1	136.5
18. Wearing apparel	141.3[a]	151.3[a]	121.8[a]	141.1[a]
19. Sawmills	129.3	132.2	118.5	123.0
20. Furniture & fixtures	143.6	144.4	117.4	127.7
21. Paper & printing products	116.6	151.4	122.8	137.2
22. Industrial chemicals	125.1[a]	123.6[a]	130.2[a]	136[a]
23. Paints & lacquers	138.6	139.3	136.7	137.2
24. Other chemical products	125.2[a]	118.6[a]	123.6[a]	128.8[a]
25. Petroleum, coal products	144.4	103.1	202.8[a]	183.1[a]
26. Processed rubber	144.5	145.4	113.9	151.4
27. Rubber products	144.5	145.4	113.9	151.4
28. Plastic products	122.5	131.6	127.4	140.6
29. China, glass, & clay products	159.5	160.2	135.6	145.6
30. Cement, lime, plaster	159.5	160.2	135.6	145.6
31. Other nonmetal mineral products	159.5	160.2	135.6	145.6
32. Basic metal products	113.3[a]	92.9[a]	123.8[a]	126.6[a]
33. Other metal products	120.4	122.7	115.9	123.1
34. Nonelectrical. machinery	109.2[a]	110.4[a]	124.3[a]	129.4[a]
35. Electrical machinery	111[a]	109.9[a]	115.1[a]	115.9[a]
36. Motor vehicles	123.6	138.2	112.6	125.4
37. Other transport equipment	117.3	122	120.3	125.8
38. Other manufactured products	108.8[a]	117.6[a]	111.5[a]	115.9[a]
39–60. Services sectors	125.9[b]	122.6[b]	128.1[c]	130.2[c]

Source: Malaysia, Department of Statistics, *Input-Output Table*, various years; idem, 1988b; Malaysia, Ministry of Finance, *Economic Report*, various years.

[a] Simple average was used.

[b] GDP deflator was used.

[c] Overall import deflator was used.

APPENDIX TABLE III

SOURCES OF GROWTH BY SECTOR, 1978–83, AS A PERCENTAGE OF SECTORAL OUTPUT GROWTH

Sectors	Export Expansion	Domestic Demand	Interme-diate Demand	Import Substitution
Agricultural products, other	31.5	93.5	−11.5	−13.5
Rubber primary products	−71.3	5.7	161.0	4.7
Oil palm primary products	47.4	7.6	41.7	3.4
Livestock etc.	4.8	48.5	16.3	30.4
Forestry, logging products	257.1	79.5	−151.3	−85.2
Fish etc.	−10.6	99.9	−80.5	91.2
Mining, quarrying products	70.8	185.9	−182.9	26.2
Meat, dairy products	4.9	79.2	−1.6	17.6
Preserved foods	−2.9	74.6	5.1	23.2
Oils and fats	64.7	−5.5	39.1	1.6
Grain mill products	20.8	65.7	77.8	−64.2
Bakery, confectionery products	19.5	92.4	−14.5	2.6
Other foods	15.3	56.9	19.5	8.3
Animal feed	−75.6	−351.3	−79.5	606.4
Beverages	−3.4	100.2	−11.6	14.7
Tobacco	1.3	19.4	−0.6	80.0
Textile products	271.2	−69.8	−83.8	−17.6
Wearing apparel	−5,991.8	−4,821.9	−2,419.6	13,253.3
Wood products	91.0	20.3	3.6	−14.8
Furniture & fixtures	−4.9	120.0	−3.4	−11.7
Paper & printing products	27.5	94.1	−18.9	−2.6
Industrial chemical	83.2	5.1	16.2	−4.5
Paints & lacquers	725.5	7,813.8	−7,332.5	−1,106.9
Other chemical products	45.5	22.0	32.3	0.2
Petroleum, coal products	24.6	18.7	1.5	55.2
Processed rubber	84.5	5.0	3.2	7.3
Rubber products	80.7	131.3	−101.6	−10.3
Plastics products	28.9	70.8	−10.1	10.4
China, glass, & clay products	79.3	360.4	−260.0	−79.7
Cement, lime, plaster	4.4	129.8	−16.9	−17.2
Other nonmetal mineral products	21.7	350.6	−281.7	9.4
Basic metal products	184.7	−36.6	−17.6	−30.5
Other metal products	35.6	107.9	−35.4	−8.0
Nonelectrical machinery	41.8	59.9	−11.4	9.8
Electrical machinery	149.3	−13.0	2.4	−38.7
Motor vehicles	2.1	30.8	9.9	57.2
Other transport equipment	33.7	112.8	−3.6	−43.0
Other manufactured products	163.2	75.5	−64.3	−74.4
Electricity & gas	−39.8	−121.1	134.1	126.7
Water	39.4	110.5	1.6	−51.4
Building, construction	0.8	105.5	−1.3	−4.9
Wholes & retail trade	47.4	86.6	−11.4	−22.5
Hotels & restaurants	7.6	102.4	−11.4	1.3
Transportation	74.1	14.9	54.3	−43.3
Communications	57.0	39.8	14.0	−10.8
Financial services	1.4	95.9	4.2	−1.5

APPENDIX TABLE III (Continued)

Sectors	Export Expansion	Domestic Demand	Interme-diate Demand	Import Substitution
Insurance	13.2	103.8	17.5	–34.6
Real estate	14.7	106.3	–12.3	–8.7
Business services	26.0	25.0	59.6	–10.6
Private education	0.0	100.8	0.0	–0.8
Private health services	0.0	94.4	0.0	5.6
Recreation, culture	0.2	87.8	10.6	1.4
Vehicle repairing	–803.5	–1,638.1	2,675.5	–133.9
Other repairing, cleaning	–29.3	273.6	–213.6	69.4
Public administration, defense	0.5	109.0	2.2	–11.7
Government education	0.4	97.3	–1.7	3.9
Government health services	0.0	77.8	9.4	12.7
Other government services	0.9	100.5	1.4	–2.8
Private nonprofit services	0.0	51.1	0.0	48.9
Other private services	0.1	128.9	8.5	–37.5
Total	37.7	58.8	9.1	–5.5

APPENDIX TABLE IV

SOURCES OF GROWTH BY SECTOR, 1983–87, AS A PERCENTAGE OF SECTORAL OUTPUT GROWTH

Sectors	Export Expansion	Domestic Demand	Interme-diate Demand	Import Substitution
Agricultural products, other	79.6	5.8	10.3	4.3
Rubber primary products	16.6	–7.1	66.0	24.5
Oil palm primary products	–298.2	–81.0	269.3	209.9
Livestock etc.	30.3	50.4	14.9	4.3
Forestry, logging products	81.9	–6.0	19.3	4.7
Fish etc.	–8.3	70.5	49.4	–11.7
Mining, quarrying products	34.6	22.2	10.2	33.0
Meat, dairy products	36.4	67.8	4.5	–8.7
Preserved foods	–29.7	62.6	–0.4	67.6
Oils and fats	204.1	1.3	14.2	–119.6
Grain mill products	18.7	25.0	–55.5	111.9
Bakery, confectionery products	42.2	39.4	0.9	17.6
Other foods	–13.1	107.9	58.3	–53.1
Animal feed	6.5	3.2	–19.0	109.3
Beverages	80.4	25.5	–24.1	15.2
Tobacco	–1.0	184.5	126.9	–210.4
Textile products	255.5	11.1	–21.8	–144.8
Wearing apparel	193.7	–11.5	–7.2	–74.9
Wood products	68.9	19.3	9.2	2.6
Furniture & fixtures	202.1	–69.4	7.0	–39.6
Paper & printing products	–228.3	–47.4	240.8	134.9
Industrial chemical	103.9	0.9	–4.5	–0.3
Paints & lacquers	416.1	–52.4	–121.4	–142.3
Other chemical products	244.3	75.8	–97.7	–122.4
Petroleum, coal products	369.4	289.1	–449.6	–108.9
Processed rubber	39.0	–5.3	–0.1	66.5
Rubber products	101.1	–3.1	7.2	–5.1
Plastics products	–4,508.6	654.9	–712.2	4,665.9
China, glass, & clay products	111.2	–78.8	38.9	28.7
Cement, lime, plaster	58.8	–80.5	82.8	38.9
Other nonmetal mineral products	9.8	–61.9	102.8	49.2
Basic metal products	–5.0	82.2	–123.0	145.8
Other metal products	62.4	–51.7	91.3	–1.9
Nonelectrical machinery	145.1	35.6	75.5	–156.1
Electrical machinery	354.6	40.7	31.2	–326.5
Motor vehicles	–3.6	162.3	12.6	–71.2
Other transport equipment	183.7	752.6	–286.3	–549.9
Other manufactured products	1,136.3	34.6	–30.5	–1,040.5
Electricity & gas	16.5	17.9	4.9	60.8
Water	12.3	79.9	–5.4	13.2
Building, construction	–3.0	82.2	8.7	12.2
Wholes & retail trade	194.8	–64.6	6.1	–36.3
Hotels & restaurants	33.6	79.7	14.8	–28.0
Transportation	112.5	–2.0	–14.1	3.6
Communications	8.9	52.5	26.4	12.2
Financial services	16.7	86.1	2.8	–5.5

APPENDIX TABLE IV (Continued)

Sectors	Export Expansion	Domestic Demand	Interme-diate Demand	Import Substitution
Insurance	67.5	60.9	–0.4	–28.0
Real estate	11.3	68.0	24.4	–3.7
Business services	128.7	20.3	–66.7	17.7
Private education	0.0	57.8	41.8	0.4
Private health services	0.0	111.3	14.6	–25.9
Recreation, culture	–3.4	79.3	17.1	7.0
Vehicle repairing	78.9	13.7	121.3	–114.0
Other repairing, cleaning	18.0	77.1	–25.9	30.8
Public administration, defense	2.2	–97.8	–7.3	202.9
Government education	0.0	100.5	0.2	–0.7
Government health services	0.0	111.4	3.6	–15.1
Other government services	0.9	107.1	–9.1	1.2
Private nonprofit services	0.0	99.6	0.0	0.4
Other private services	0.2	90.3	–0.5	9.9
Total	117.2	11.9	2.9	–32.0

APPENDIX TABLE V

SOURCES OF GROWTH BY SECTOR, 1978–87, AS A PERCENTAGE OF SECTORAL OUTPUT GROWTH

Sectors	Export Expansion	Domestic Demand	Interme-diate Demand	Import Substitution
Agricultural products, other	62.8	36.4	4.2	–3.4
Rubber primary products	–2.2	0.9	90.3	10.9
Oil palm primary products	84.5	20.6	16.5	–21.6
Livestock etc.	15.1	44.9	17.1	22.9
Forestry, logging products	109.0	3.5	–2.6	–9.9
Fish etc.	–7.5	84.2	21.0	2.3
Mining, quarrying products	43.3	62.9	–31.3	25.1
Meat, dairy products	14.8	75.3	–0.9	10.8
Preserved foods	5.3	66.6	7.8	20.3
Oils and fats	80.5	–3.9	41.0	–17.6
Grain mill products	20.8	44.4	6.3	28.6
Bakery, confectionery products	35.6	56.2	–5.0	13.2
Other foods	62.2	–16.7	–44.9	99.4
Animal feed	15.4	24.8	–29.0	88.8
Beverages	15.3	84.4	–14.6	14.9
Tobacco	0.5	68.8	37.9	–7.2
Textile products	278.4	–11.7	–48.5	–118.3
Wearing apparel	211.5	0.6	7.1	–119.2
Wood products	73.5	19.5	9.4	–2.4
Furniture & fixtures	33.2	79.4	0.5	–13.1
Paper & printing products	102.7	131.8	–90.5	–44.0
Industrial chemical	93.1	2.4	7.1	–2.6
Paints & lacquers	438.5	162.2	–327.9	–172.8
Other chemical products	114.1	37.8	–8.9	–43.0
Petroleum, coal products	51.3	31.2	–19.1	36.6
Processed rubber	–60.0	54.7	–8.0	113.3
Rubber products	98.6	25.9	–17.2	–7.4
Plastics products	109.3	54.7	1.4	–65.4
China, glass, & clay products	96.8	76.6	–60.2	–13.2
Cement, lime, plaster	25.6	47.4	24.1	2.9
Other nonmetal mineral products	14.9	69.8	–18.6	33.9
Basic metal products	138.9	–10.9	–37.3	9.3
Other metal products	49.9	34.6	22.4	–6.9
Nonelectrical machinery	90.7	48.2	24.3	–63.2
Electrical machinery	234.1	–0.1	9.9	–143.9
Motor vehicles	3.6	–1.4	6.5	91.3
Other transport equipment	22.9	27.6	26.5	23.0
Other manufactured products	1,219.9	130.6	–215.3	–1,035.5
Electricity & gas	118.5	179.2	–148.6	–49.1
Water	20.4	90.0	–2.9	–7.4
Building, construction	3.7	122.4	–8.7	–17.4
Wholes & retail trade	86.9	56.8	–11.6	–32.1
Hotels & restaurants	15.2	97.0	–5.3	–6.9
Transportation	94.5	6.4	18.4	–19.4
Communications	30.7	48.0	22.3	–0.9
Financial services	9.0	91.1	3.8	–3.9

APPENDIX TABLE V (Continued)

Sectors	Export Expansion	Domestic Demand	Interme-diate Demand	Import Substitution
Insurance	34.8	93.6	10.6	–39.0
Real estate	13.1	79.9	13.0	–5.9
Business services	45.4	24.3	37.0	–6.7
Private education	0.0	83.6	16.8	–0.5
Private health services	0.0	100.1	5.8	–6.0
Recreation, culture	0.8	98.4	3.3	–2.5
Vehicle repairing	241.8	201.8	–239.7	–103.9
Other repairing, cleaning	138.9	–280.4	287.6	–46.0
Public administration, defense	0.9	62.4	–0.4	37.0
Government education	0.4	98.7	–0.7	1.6
Government health services	0.0	91.7	7.7	0.5
Other government services	1.0	104.6	–4.5	–1.1
Private nonprofit services	0.0	104.9	0.0	–4.9
Other private services	0.0	104.6	2.1	–6.8
Total	65.0	41.3	9.1	–15.5