Asian Academy of Management Journal, Vol. 15, No. 1, 99–116, January 2010

SOURCES OF GROWTH IN THE MANUSFACTURING SECTOR IN MALAYSIA: EVIDENCE FROM ARDL AND STRUCTURAL DECOMPOSITION ANALYSIS

Rohana Kamaruddin[1*] and Tajul Ariffin Masron[2]

[1]Faculty of Business Management, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia.
[2]School of Management, Universiti Sains Malaysia, 11800 USM Pulau Pinang, Malaysia

*Corresponding author: rohana070@salam.uitm.edu.my

ABSTRACT

The manufacturing industry has been an important sector in the Malaysian economy for the past three decades. The important role of this industry to the Malaysian economy today is not only because Malaysia depends substantially on manufacturing for its foreign exchange earnings, but also because Malaysia is the main exporter of electrical and electronic products. This study examines the structural changes in the Malaysian economy by utilising two economics tools, namely, the econometric approach using the Autoregressive Distributed Lag (ARDL) model and the input-output approach using Structural Decomposition Analysis (SDA). These two approaches are used to analyse the sources of growth in the manufacturing sector in Malaysia. From both economic approaches, ARDL and IO, the results agreed on the importance of the domestic consumption effect as a source of growth in the economy. The empirical results from this study are very useful guide to the manufacturing industry for the need to generate more domestically oriented products.

Keywords: structural decomposition analysis, domestic consumption, autoregressive distributed lag, export

INTRODUCTION

Soon after the independence in 1957, Malaysia embarked on industrialisation as a major goal of economic development. As a result, the manufacturing sector is the fastest growing sector and the dominant force in Malaysia's growth experience. The structural transformation in the Malaysian economy has turned the country from an exporter of primary commodities into an exporter of high-value-added manufactured products. This unprecedented rapid economic growth for Malaysia has been accompanied by a marked structural transformation of the Malaysian economy. From Figure 1, we can observe that while the agriculture sector's share

in gross domestic product (GDP) declined from 22.89% in 1980 to 8.49% in 2004, the contribution of the industrial sector grew from 38.5% in 1980 to 44.5% in 2002.

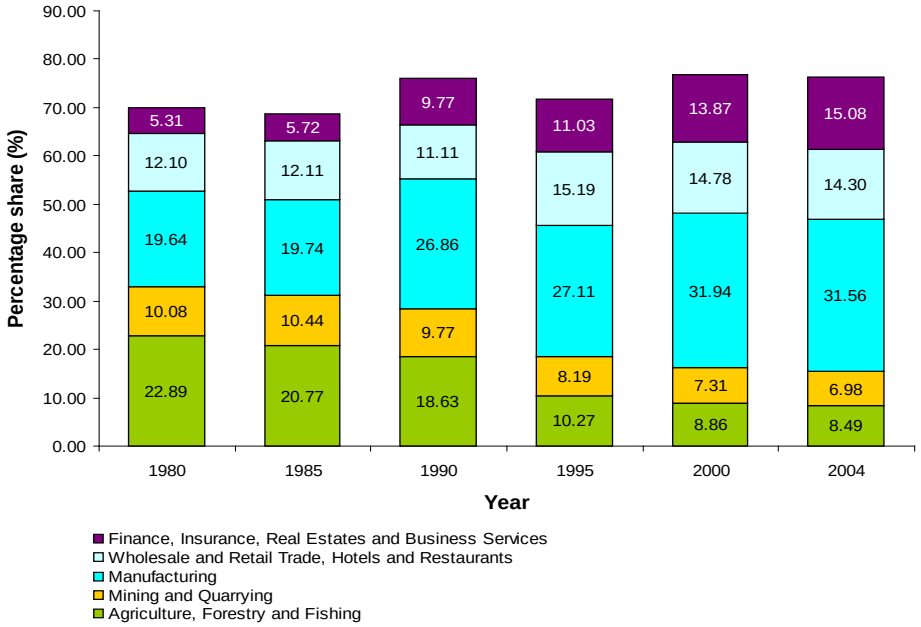

Figure 1. Contribution of selected sectors to GDP (%), 1980–2004

Source: Department of Statistics Malaysia (2004)

Most of this surge in the industrial sector's growth came from the expanding manufacturing sector. Its contribution to the GDP growth increased by 50% over the two decades from 19.64% in 1980 to 31.56% in 2004. Along with its declining significance in GDP, the role of agriculture as a major contributor to economic growth also declined, with negative annual growth of 0.2% from 1990 to 1995. On the other hand, the growth of the manufacturing sector, during the same period, resulted in an increased contribution to the GDP, although in terms of its annual growth, it showed a declining growth rate with negative 1.0% decrease from 2000 to 2002. This indicates that growth in some industries and stagnation or decline in others in the manufacturing sector are not well balanced in terms of its contribution to the overall economy. The overall objective of this study is to examine the structural changes in the Malaysian manufacturing industry. Specifically, this study aims to examine the industrial growth patterns in the manufacturing industry and to identify the sources of industrial growth from the demand side.

This study differs from some of the previous studies such as Khalafalla and Webb (2001), Chiang (2005) and Fauzana (2007) in several aspects. Khalafalla and Webb (2001) utilised the econometric approach and directly examined the role of exports on Malaysia's economic growth. Based on the estimated results, Khalafalla & Webb (2001) argued that empirical testing of the export-led hypothesis in the case of Malaysia may only be valid and effective in the early and intermediate stages of economic development. As the nation develops further and the economic structure becomes more complicated, the causality test on aggregate trade and growth will likely fail to capture the complex inter-relationships. Meanwhile, Chiang (2005) argued, while valid and covering many aspects of the Malaysian economy, is merely a descriptive analysis. No formal inference was conducted. Finally, Fauzana (2007) had only focused on the palm oil sector. On the other hand, we have also found a research similar to this study, which is Zakariah and Ahmad (1999) in terms of the approach used. However, this study differs in terms of inclusion of additional effect on growth accounting. This study adds technological effect in the growth decomposition analysis, besides several components that have been suggested in Zakariah and Ahmad (1999) such as export expansion, domestic demand, intermediate demand and import substitution demand. This is very crucial information as the latest macroeconomic framework of economic growth highlights the modern growth theory as the main source of development strategy. Modern growth theory or new growth theory emphasises more on the role of productivity or innovation for high and sustainable economic growth. In addition, to our knowledge there is no time series study has been conducted so far to investigate the source of growth in sub-sectors of manufacturing sector. Hence, this study overcomes previous studies by conducting a more comprehensive analysis, capturing all sectors in the economy as well as utilising two powerful tools for economic analysis.

The rest of the article is organised as follows. Section two briefly reviews previous studies on structural change. Section three offers a discussion on the methodology, followed by data collection in the next section. Section five presents the results of the quantitative analysis and draws some inferences. Section five concludes the article.

LITERATURE REVIEW

The definition of structural change is not straightforward and is largely ambiguous. Structural change can be a narrow definition limited to a change in input-output structure of production, or it can encompass a broader definition of a change in the industry composition of total production or final demand. Different patterns of structural change can be distinguished at three levels:

i. Countries can experience equal or at least similar patterns but at different times (Chenery, Robinson & Syrquin, 1975);

ii. Countries can experience different patterns of structural change (or development), but the countries converge to a similar structural pattern; and

iii. Countries can experience totally different development patterns.

In the structuralist model (Chenery, Robinson & Syrquin, 1986), economic growth is defined as a succession of stages delimited by shifts in sector proportions, as a consequence of the intersectoral resource flow from the traditional to the modern sector. During this transformation, due to the increasing interaction among sectors, agriculture reduced its weight in the economy in terms of share of employment, value added, and exports (Syrquin 1988; Syrquin & Chenery 1989; Panchamukhi, Nambiar & Mehia, 1989).

According to Fisher and Clark's (1957), theory of structural change, an economy would have three stages of production namely, primary, secondary and tertiary. Primary production is concerned with the extraction of raw materials through agriculture, mining, fishery and forestry sectors. Low-income countries are assumed to be dominated by primary production. Secondary production is concerned with industrial production through manufacturing and construction. Middle-income countries are often dominated by the secondary sector. Tertiary production is concerned with the provision of services such as education and tourism. In high-income countries the tertiary sector dominates the economic. Indeed, having a large tertiary sector is seen as a sign of economic maturity in the development process. For Verspagen (2000), structural change includes inter alia the subcategories of final demand shift and sectoral shift. Structural change is defined as the shift in the share of total output between sectors. The sectors can be broadly defined, such as agriculture, industry and services, or can include hundreds of narrowly defined products or product groups.

On a broader perspective, Skolka (1989) defined structural change in terms of inter-country comparisons that are closely related to the two main aspects. The first is about the sources of the differences in the position of individual industries. The input-output structural decomposition analysis approach, reflects the logical structure of the input-output model, and relates the variations in the levels and compositions of value added and employment to differences in production technological processes, domestic final demand, foreign trade and labor productivity. The second aspects concerns the structural differences that are mainly caused by government economic policies. Considering the factors that affect the structural changes, Gera and Mang (1997) argued that it could be

caused by events such as oil price shocks and major recessions. Factors that cause institutional changes include the increasing liberalisation of world trade and capital markets. The shift in consumer demand patterns from commodities to services and the progress and diffusion of technology have also been major contributors to the economic changes taking place in the world's wealthy countries.

METHODOLOGY

Autoregressive Distributed Lag (ARDL) Model

Econometrics analysis of long-run and short-run relationships has been the focus of much theoretical and empirical research in economics. Thus, in recent decades considerable attention has been paid to empirical economics to test the existence of long-run relationships, mainly using cointegration techniques.

By considering the use of the limited annual data in this study, we use bounds test procedure as proposed by Pesaran, Shin and Smith (2001) to verify the determinants of manufacturing value-added function over the annual period 1970–2000. The bounds test procedure is based solely on an estimate of unrestricted error-correction model using Ordinary Least Squares (OLS) estimator and a simple reparameterisation of a general autoregressive distributed lag (ARDL) model. An unrestricted error-correction model (UECM) as an expansion of equation 1 for manufacturing value added function can be written as below:

$$\Delta \ln V_t = b_0 + b_1 \ln V_{t-1} + b_2 \ln Y_{t-1} + b_3 \ln N_{t-1} + b_4 \ln X_{t-1} + \sum_{i=0}^{p} b_{5i} \Delta \ln V_{t-1} + \sum_{i=0}^{q} b_{6i} \Delta \ln Y_{t-1} + \sum_{i=0}^{r} b_{7i} \Delta \ln N_{t-1} + \sum_{i=0}^{s} b_{8i} \Delta \ln X_{t-i} + e_t \quad (1)$$

where $\Delta \ln V$, $\Delta \ln Y$, $\Delta \ln N$, $\Delta \ln X$ are first differences of the logarithms of manufacturing value added, per capita income, population and export manufacturing, respectively.

Structural Decomposition Analysis (SDA)

The analysis of structural change using an input-output framework has evolved into an established field in the economic study. The method of structural decomposition of output growth as adopted in this study analyses major shifts within the economy by means of comparative static examination of the key parameters (Zakariah & Ahmad, 1999). From a policy analysis point of view,

Chenery and Taylor (1968) pointed out two advantages associated with this type of decomposition. First, the provision of a quantitative framework to assess different development strategies over time and among countries; and second, the determination of the relative importance attached to every source of growth. Dietzenbacher and Los (1998) explained that, "SDA is used to break down the changes in one variable into changes in its determinants". The methodology used in this study is based on the contribution of Albala-Bertrand (1999).

The decomposition of output change, i.e. absolute growth and the growth rate, between two periods amounts to calculating the first difference of equation (2). We have

$$\Delta X = \Delta(D^{-1}G) = D_0^{-1}\Delta G + \Delta D^{-1}G_0 + \Delta D^{-1}\Delta G \tag{2}$$

Using either the Paasche and Laspeyres index weighting, respectively, by taking the first or the second term on the right-hand side can absorb the third term, i.e.

$$\Delta X = D_1^{-1}\Delta G + \Delta D^{-1}G_0 \tag{3}$$

$$\Delta X = D_0^{-1}\Delta G + \Delta D^{-1}G_1 \tag{4}$$

The numerical results from the two alternative weightings are not normally equivalent and can be very different if the interaction term is large. A simpler method that distributes the interactive term proportionally in the other two terms is to take the simple arithmetical average of the Paasche and Laspeyres weighting results.

$$D_0^{-1}\Delta G = D_0^{-1}(\hat{U}_0^F\,\Delta F + \Delta E + \Delta\hat{U}^F\,F_I) \tag{5}$$

$$\Delta D^{-1}G_1 = D_0^{-1}(\Delta\hat{U}\,W_1 i + \hat{U}_0^w\,\Delta AX_1) \tag{6}$$

Therefore, letting $B_0 = D_0^{-1}$, to carry fewer notations, the total decomposition for the absolute growth or variation in gross output will be:

$$\Delta X = B_0\hat{U}_0^F\,\Delta F + B_0\Delta E + B_0\Delta\hat{U}^F\,F_1 + B_0\Delta\hat{U}^W\,W_1 i + B_0\hat{U}\,\Delta AX_1 \tag{7}$$

The decomposition for the gross output growth rate can be obtained by dividing equation (7) element wise by X_0. Each of the five terms on the right-hand side of equation (7), in variation or growth terms, represents a direct and indirect contribution to the total demand for the gross output of the economy. The terms have the following standard meanings:

$B_0 \hat{U}_0^F \Delta F$ = contribution of domestic demand expansion (FDE);

$B_0 \Delta E$ = contribution of export demand (EDE);

$B_0 \Delta \hat{U}^F F_1$ = contribution of import substitution of final goods (ISF). This term and the next listed are positive when there has been an increase in import substitution over the period, and vice versa. This represents the variation in demand over the period, exclusively as a result of variations in import substitution;

$B_0 \Delta \hat{U}^W W_{1i}$ = contribution of import substitution of intermediate goods (ISW);

$B_0 \hat{U}_0^W \Delta A X_1$ = contribution of changes in I–O coefficients (technological change) (IOCs). This term represents the variation in demand over the period, exclusively as a result of variations in the IOCs of the system. If the term is positive for a particular industry, then this means that more of the output of this industry is used as input for the production of other industries in the system. As such, it represents an increase in the contribution of intermediation of this industry toward the system and a version of backward linkages from the rest of the economy to this industry, or a version of the actual forward linkage of this industry toward the rest of the economy over the period (Hirschman, 1977).

The positive impact of technological change in this method indicates that it induces a remarkable increase in the use of these industries' products in the production process and the negative sign indicates that inter-industry linkages for these sectors of the economy have weakened; in other words the intermediate use of these sector's products in production processes has decreased.

DATA

This study have utilised two kinds of data. The first set of data on industries was based on the Malaysian Standard Industrial Classification (MSIC) 2000 at three-digit level. The annual data for value added of industries at three-digits for the period of 1970 to 2000 was obtained from Census of Manufacturing Industries. The other data such as per capita income, population and export were from

Malaysian Economic Statistics, published by the Department of Statistics Malaysia. The detailed information regarding the variables is shown in the appendix.

The second set of data used two sets of Malaysia's I–O tables for 1978 and 2000 published by the Department of Statistics Malaysia. The 2000 I–O table is the latest available version and presumably delivers the most up-to-date information about the inter-industry relations. In order to reveal the real changes in the variables, the nominal values of 1978 and 2000 have been transformed into their 1978 constant prices, making all the tables comparable. The producer price indices and import price indices provided by the Department of Statistics Malaysia at three digits, which are expressed in Standard International Trade Classification (SITC), were used to deflate.

RESULTS AND DISCUSSION

ARDL Analysis

This section discusses the long-run relationships of the manufacturing sectors' growth patterns in Malaysia during the period, 1970–2000. Applying the bounds test procedure, the cointegration relationship between value added and its determinants was examined by imposing the restriction on the estimated coefficients of lagged one level variable. We have applied the three equations using the variables and the sample period of the study, and taking into consideration the limited number of observations (annual data), three lags were selected as the maximum possible lag length. It is important to note here that although choosing lag length as three could consume degree of freedom. However, the general to specific approach did suggest that the estimated models should end up with lower number of explanatory variables and thus, solved or minimised the risk of low degree of freedom. The results are summarised in Table 1. These results show that the calculated F statistic for all the value-added manufacturing divisions with the dependent variables *Y*, *N*, and *X* was higher than the upper bound critical value from 1% to 10% significant levels, which indicates that these equations have a long-run relationship.

The long-run growth elasticity's coefficient of total value-added of manufacturing, per capita income, population and export are presented in Table 2. The first row in Table 2 indicates that there was a positive effect of consumption in the total manufacturing value added with respect to per capita income and population. The estimated elasticities for per capita income and population were 1.372 and 0.9369, respectively. That is to say, the total value-added of manufacturing increased by 1.372% and 0.9369%, respectively, for

every one percent increase in per capita income and population. Therefore, we can conclude that taking both income and population coefficients together, there was a domestic consumption effect on the expansion of total manufactured value added. In the case of total manufactured exports which were positively related to the total manufacturing value-added with an elasticity of 0.4612.

Table 1
Bounds test for the existence of long-run growth

F-statistics						
VA	**V15**	**V16**	**V17**	**V18**	**V19**	**V20**
6.5699**	6.0008****	23..5644***	10.3617***	35.6435***	9.8763***	31.8510***
V21	**V23**	**V24**	**V25**	**V26**	**V27**	**V28**
4.4353***	6.8235***	3.8070***	15.2571***	9.1769***	20.5139***	10.6497***
V29	**V30**	**V31**	**V32**	**V33**	**V34**	**V35**
4.1685**	6.9919***	9.600***	81.590***	4.9277**	48.573***	12.37712***
			V36			
			3.8625*			

Critical value	Lower bound value	Upper bound value
1%	3.74	5.06
5%	2.86	4.01
10%	2.45	3.52

Notes: The relevant criteria value bounds are given in Table C1.iii (with unrestricted intercept and trend; number of regressors = 3 (Pesaran et al., 2001).

*, **, and *** denote that F-statistics falls above the 10%, 5%, 1% upper bounds, respectively.

Table 2
Estimated long-run growth elasticity

Division (MSIC 2000)	Independent variables			
	C	lnY	lnN	lnX
Total value added:				
VA	–51.0006	1.372*	0.9369**	0.4612***
Food products and beverages:				
V15	8.2847**	2.1330*	–1.9690*	0.5242*
Tobacco products:				
V16	6.5597**	4.6919***	–4.9766*	0.0699**
Textiles:				
V17	–17.3934***	–9.4463**	23.2123***	–0.7673*
Wearing apparel:				
V18	–35.6214***	0.6302***	2.7333**	0.3542***

(continued)

Table 2 *(continued)*

Division (MSIC 2000)	Independent variables			
	C	lnY	lnN	lnX
Leather and products of leather:				
V19	–54.3590***	–3.1678***	3.0860*	0.3028***
Wood and products of wood and cork:				
V20	–22.3963***	–8.6596**	18.7525***	–2.4785***
Paper and paper products:				
V21	–65.4622*	0.7219*	4.7418**	0.0830*
Coke, refined petroleum products:				
V23	–43.5719***	1.1742	7.1447**	0.2192***
Chemical and chemical products:				
V24	–50.4911*	–1.049	8.4409**	–0.2766**
Rubber and plastic products:				
V25	–14.7719**	–1.6891**	3.5711*	0.7919***
Other non-metallic mineral products:				
V26	–110.4501***	0.4103	9.9415***	–0.6353***
Basic metal:				
V27	–66.6469***	–0.7239	4.1442***	0.3212**
Fabricated metal products:				
V28	–25.0609***	–0.2291	4.6403***	0.2622**
Machinery and equipment n.e.c:				
V29	12.1487	3.8631**	–2.9368***	0.3126***
Office, accounting and computing machinery:				
V30	300.9548*	10.174**	–18.5838***	0.6166*
Electrical machinery and apparatus n.e.c:				
V31	–14.3904	1.0191	0.8467	0.6312***
Radio, TV and communication equipment:				
V32	39.5368*	3.5751***	–6.7407***	0.6987***
Medical, precision and optical instruments:				
V33	–61.6984***	–0.5229	10.2645***	–0.7584**
Motor vehicles, trailers and semi-trailers:				
V34	–38.0359***	1.9606**	3.8070***	–0.1524*
Other transport equipment:				
V35	35.0832***	0.8987	–6.9754**	0.8747***
Furniture and manufacturing n.e.c.:				
V36	–3.7440	1.7757	0.0225	0.4638**

Note: *, ** and *** indicate significance at 0.1, 0.05 and 0.01 significance levels, respectively. C represents the constant value. Variables are estimated in logarithmic form.

From the domestic demand side related to the population, the findings showed that the sectors that had long-run movement with positive, significant elasticities were "textiles", "wearing apparel", "leather and products of leather", "wood and products of wood", "paper and paper products", "coke and refined petroleum", "chemicals and chemical products", "rubber and plastic products", "other non-metallic mineral products", "basic metal", "machinery and equipment", "fabricated metal products", "medical, precision and optical instrument" and "motor vehicles, trailers and semi-trailers"; all were statistically significant. Six industries, namely, "food and beverages", "tobacco", "office accounting and computing machinery", "radio, TV and communication equipment", "machinery and equipment" and "other transport equipment" had negative signs and were also statistically significant. Among the domestic market-oriented industries, the fabricated metal products, basic iron and steel, and non-metallic products industries were becoming dominant due to the increase of more infra-structure projects.

Three industries that had positive per capita income and population elasticities were; "wearing apparel", "paper and paper products" and "motor vehicles, trailers and semi-trailers". This consumption effect for all these industries was statistically significant with elasticities of more than one, in particular in the industry of "motor vehicles, trailers and semi-trailers", Y (1.9606) and N (3.8070); the elasticity coefficient for export was negative, X (–0.1524).

We do not aim to present the results of short-run analysis here in this paper. The results are available upon request as the estimated error correction models consume a lot of space to be presented in this paper, even though it is presented as appendix.

Structural Decomposition Analysis

During the period of 1978–2000, the whole economy appeared to be influenced by domestic demand expansion and export demand expansion. Table 3 shows that about 82% of the economy's overall growth was domestic driven, and 61% export-driven, while technical change and import substitution of intermediate goods had negative contributions at –21.72% and –18.6%, respectively.

Table 4 reveals that the agricultural sector was found to be domestic-oriented during the whole period. Domestic demand expansion contributed considerably to the sectoral growth (417.64%), while export expansion contributed 283% and technical change had a contribution of –122%. Gross output growth rates for all the sub-sectors, namely, other agriculture, livestock, forestry, and fisheries showed positive growth but rubber plantations, and oil palm showed a decline in growth to the economy. The domestic and export expansion showed positive

growth rates but their shares in gross output declined for all sub-sectors. There were gains in shares for import substitutions of intermediate and final goods. Moving on to the mining sector, from Table 3, the output growth rate of the mining sector was found to be slightly higher in its export demand expansion (62.80%) than its domestic demand expansion (61.20%). The import substitution of intermediate goods share increased to 10.17%. The sector contributed about 6.24% to the overall output growth of the economy.

Table 3
Sources of industrial growth in Malaysia (1978–2000)

Sector	Domestic demand expansion	Export demand expansion	Import substitution of final goods	Import substitution of intermediate goods	Technological change	Total
Agriculture	150.00 **[2.81]**	73.03 **[1.37]**	–3.63 **[-0.07]**	–79.46 **[–1.49]**	–39.95 **[–0.75]**	100 **[1.87]**
Mining	61.18 **[4.15]**	62.80 **[4.26]**	–1.35 **[-0.09]**	–17.01 **[–1.15]**	–5.62 **[–0.38]**	100 **[6.79]**
Light industries	82.71 **[8.19]**	64.17 **[6.36]**	–1.88 **[–0.19]**	–23.23 **[–2.30]**	–21.77 **[–2.16]**	100 **[9.91]**
Heavy industries	60.66 **[37.04]**	61.41 **[37.50]**	–1.30 **[–0.80]**	–8.32 **[–5.08]**	–12.44 **[–7.60]**	100 **[61.06]**
Services	143.99 **[29.33]**	54.54 **[11.11]**	–3.20 **[–0.65]**	–42.15 **[-8.59]**	–53.18 **[–10.83]**	100 **[20.37]**
Total	81.53	60.59	–1.79	–18.61	–21.72	100

Note: Entries in [ ] indicate contribution as percentage of total output growth.

Table 4
Gross output growth rates (%) change (1978–2000)

		ΔX/X78	DDE	EDE	ISF	ISW	IOC	S78
I	**Agriculture (1–6)**	**417.64**	**520.33**	**282.60**	**–12.15**	**–251.14**	**–121.99**	
1	Other agriculture	289.71	394.65	197.02	–9.68	–155.26	–137.03	2.59
2	Rubber plantation	–89.21	133.68	81.37	–3.91	–137.47	–162.87	1.93
3	Oil palm	–93.24	133.52	141.84	–3.87	–283.39	–81.32	1.27
4	Livestock	433.55	642.70	153.25	–14.92	–230.64	–116.84	1.47
5	Forestry	590.38	565.59	475.27	–13.33	–340.65	–96.49	2.82
6	Fisheries	360.13	601.32	103.49	–14.34	–232.26	–98.08	2.48

(continued)

Table 4 *(continued)*

		ΔX/X78	DDE	EDE	ISF	ISW	IOC	S78
II	**Mining**							
7	Petrol mining	**2123.75**	**1299.34**	**1333.71**	**–28.74**	**–361.15**	**–119.42**	**6.24**
III	**Light Industries**	**6092.54**	**3241.65**	**4072.88**	**–68.02**	**–553.67**	**–600.29**	
8	Dairy product	229.84	439.50	147.76	–10.93	–175.40	–171.10	1.19
9	Vegetable fruit	1339.77	715.68	863.90	–16.88	–96.91	–126.03	0.61
10	Oil and fats	86.60	364.00	334.94	–9.19	–255.06	–348.10	5.42
11	Grain mills	–19.57	159.82	74.01	–5.00	–109.59	–138.81	1.45
12	Baker Conf.	1342.64	996.04	558.01	–22.73	–104.29	–84.38	0.64
13	Other foods	504.92	785.70	344.50	–18.11	–248.15	–359.02	0.99
14	Animal feed	–191.35	360.80	82.62	–8.45	–506.79	–119.54	0.50
15	Beverages	769.35	958.65	251.09	–21.92	–168.85	–249.62	0.46
16	Tobacco	1349.80	793.12	609.73	–18.53	–19.52	–15.00	0.79
17	Textiles	1794.40	1161.80	867.34	–25.92	–226.08	17.28	1.57
18	Wearing apparatus	4718.65	2945.14	2304.69	–63.78	–175.60	–291.81	0.59
19	Sawmills	2371.01	1308.11	1289.39	–29.07	–197.73	0.31	2.53
20	Furniture fixture	12984.25	6573.49	7457.22	–140.21	–350.99	–555.27	0.21
21	Paper printing	983.21	2298.99	1087.49	–49.38	–1180.11	–1173.77	0.84
IV	**Heavy Industries**	**18533.87**	**9420.29**	**11504.05**	**–197.55**	**–884.60**	**–1308.31**	
22	Industrial chemicals	4972.19	4042.30	4790.70	–85.95	–1451.03	–2323.82	0.64
23	Paints, etc.	4046.05	2503.01	2030.70	–53.59	-592.63	158.56	0.16
24	Other hem. prds.	2524.91	1933.84	1927.22	–42.31	-525.29	–768.55	0.62
25	Petrol product	1892.01	2348.16	1342.64	–50.62	-828.16	–920.00	2.49
26	Processed rubber	180.14	72.75	77.61	–3.34	–6.24	39.36	3.88
27	Rubber products	2918.24	1682.48	1629.71	–36.93	–261.51	–95.50	0.81
28	Plastic Product	7181.10	4588.07	3737.93	–97.88	–659.90	–387.13	0.44

(continued)

Table 4 *(continued)*

		ΔX/X78	DDE	EDE	ISF	ISW	IOC	S78
29	Glass products	1561.52	2233.61	1879.02	–48.19	–1051.89	–1451.03	0.34
30	Cement	309.28	952.36	433.74	–20.89	–865.83	–190.10	0.33
31	Non-metallic prds.	–923.87	1043.23	525.56	–22.93	–1210.13	–1259.60	0.27
32	Basic metals	824.50	673.77	648.43	–15.80	–240.70	–241.19	4.33
33	Other metal prds	–882.88	1412.87	1082.93	–30.87	–1219.18	–2128.63	0.69
34	Non-electrical machinery	39186.72	19332.97	21628.23	–408.40	–597.13	–768.95	0.90
35	Electrical machinery	19399.52	10194.28	11488.18	–216.38	–568.25	–1498.31	3.07
36	Motor vehicles	674.35	1389.28	286.09	–31.05	–274.66	–695.31	1.50
37	Other transport equipment	364.49	1241.08	677.95	–27.72	–518.81	–1008.00	0.41
38	Other mfg product	7814.85	4539.33	4595.09	-97.11	-474.55	-747.91	0.49
V	**Services**	**564.44**	**532.30**	**–29.45**	**–420.03**	**–620.21**	**1101.83**	
39	Construction	1249.79	113.11	–28.03	–74.89	0.32	1260.29	7.96
40	Others services	1388.28	609.87	–30.78	–474.30	–620.50	872.56	34.10

Note: ΔX/X gross output growth rate; DDE-final demand expansion; EDE – export demand expansion; ISF – import substitution of final goods; ISW – import substitution of intermediate goods; IOC-I-O coefficient change; S – gross output share; numbers in bold indicate weighted average of the column sectors.

In the manufacturing sector, which consists of three major sectors (light industries, heavy industries and services), the light industries sector was found to be driven by domestic demand expansion for the overall period. About 290% of sectoral growth was due to domestic demand expansion, while export expansion accounted for 180.12% (Table 3). The sector contributed about 16.34% to the overall growth of the economy (refer to Table 4, taking the weighted average of sum value in light industries). In the gross output growth rate, all the sub-sectors in the light industry experienced a positive growth rate for export and domestic expansion, but in terms of gross output share, the shares of sub-sectors, namely vegetable fruit, oils and fats, baker confectionery, other foods, animal feed, furniture fixtures and paper printing showed a decline. On the other hand, the heavy industries sector was found to be export-oriented during the overall period 1978–2000, which contributed about 61% to the sector's growth. The sector

contributed 29.9% to the overall growth of the economy. All the sub-sectors showed positive growth rate in the export and domestic side, and only a few sub-sectors made gains in their output shares, namely, rubber products, plastic products and electrical machinery. There were 13 sub-sectors that had negative output shares in both domestic and export expansions but gained in shares of import substitutions of intermediate and final goods. These include industrial chemicals, paints and lacquers, other chemical products, petroleum and coal products, plastic products, glass products, cement, non-metallic products, other metal products, non-electrical machinery, motor vehicles, other transport equipment and other manufactured products. Finally, the services sector was domestically driven during the overall period. In sum, agriculture, light industries and services were found to be domestic-oriented in the periods of 1978–2000, while the mining and heavy industries were export-oriented with a very slight increase over the period. The heavy industries sector was found to be the leading sector in terms of contribution to the overall growth of the economy during the overall period.

CONCLUSION

The main objective of this study is to investigate the source of growth in Malaysia for the period of 1970 to 2000. Two methods are employed to analyse the issues in hand. The first approach is Chenery's factor decomposition method and the second method is ARDL.

The results of the analysis indicate that the introduction of the export-oriented strategy in the 1970s and 1980s to replace the import substitution strategy gave fresh impetus to industrial growth. This was evidenced in the long-run movement in exports and the value-added of the manufacturing sectors in the ARDL method. As the results show, most of the industries were non-resource based such as textiles, electrical and electronic products, which is in line with the world's increasing demand for these products. Export followed by domestic consumption is increasingly an important factor of change in the industrial growth patterns for the Malaysian economy. The second part of the study employed the input-output analysis. The analysis computed the compositional structural change as a result of decomposition. The study found that the Malaysian economy underwent a number of structural changes, mainly caused by the reorientation of industrialisation strategies as well as by variations in the composition of domestic demand.

In summary, Malaysian government is doing right at the moment to persuade domestic consumers to keep on spending to support the local industries. In fact, during the difficult time such as after the wake of 1997 economic crisis that

struck East Asian region, Malaysian government lent its hand by increasing its spending to stimulate economic activities, partly to compensate the slack in private sector demand. Increase in industrial productivity would be meaningless if this improvement is not well supported by the substantial and consistent domestic demand. The results of ARDL analysis also offer another insight about the fact that external sector, albeit significantly influenced domestic productivity, contributes less compared to domestic demand. In other word, although many studies have shown the importance of export sector on Malaysian economic growth, the impact of inconsistent or volatile demand from external sector (or normally known as supply shock) could be eased by approaching domestic consumers to have a strong confidence on domestic market and keep on spending part of their income.

REFERENCES

Albala-Bertrand, J. M. (1999). Structural change in Chile: 1960–1999. *Economic System Research, 11*(3), 301–319.

Chenery, H. B., & Taylor, L. (1968). Development patterns among countries and over time. *Review of Economics and Statistics, 50,* 391–416.

Chenery, H. B., Robinson, S., & Syrquin, M. (1975). *Patterns of development, 1950 to 1970*. London: Oxford University Press

_____. (1986). *Industrialisation and growth: A comparative study*. New York: Oxford University Press.

Chiang, C. H. (2005) Oil and the Malaysian economy: Will structural changes be needed? *Penang Economic Monthly*, *7*(9), 1–5.

Department of Statistics Malaysia (various issues). *Statistics handbook Malaysia*. Kuala Lumpur: Department of Statistics Press.

Department of Statistics Malaysia (various issues). (2004a). *Annual National Product and Expenditure Accounts, 1987–2002*. Kuala Lumpur: Department of Statistics Press.

_____. (2004b) *Malaysia Economic Statistics – Time Series 2003*. Kuala Lumpur: Department of Statistics Press.

_____. (2002). *Census of Manufacturing Industries*. Kuala Lumpur: Department of Statistics Press.

_____. (2000a). *Input-output tables, Malaysia*. Kuala Lumpur: Department of Statistics Press.

_____. (2000b) *Malaysia Standard Industrial Classification*. Kuala Lumpur: Department of Statistics Press.

_____. (1991). *Input-output tables, Malaysia*. Kuala Lumpur: Department of Statistics Press.

_____. (1978) *Input-output tables, Malaysia*. Kuala Lumpur: Department of Statistics Press.

Dietzenbacher, E., & Los, B. (1998). Structural decomposition techniques: Sense and sensitivity. *Economic Systems Research, 10*(4), 307–323.

Fauzana, I. (2007). Structural change of the agricultural sector: Analysis based on input-output tables. *Department of Statistics (Malaysia) Working Paper*.

Fisher, A. G. B., & Clark, C. (1957). Production, primary, secondary and tertiary. *Economic Record*, *15*(28), 24–38.

Gera, S., & Mang. K. (1997). The knowledge-based economy: Shifts in industrial output. *Working Paper No. 15*, Industry Canada.

Hirschman, A. O. (1977). A generalised linkage approach to development, with special reference to staples. *Economic Development and Cultural Change, 25*(*suppl*.), 67–98.

Khalafalla, K. Y., & Webb, A. J. (2001). Export-led growth and structural change: Evidence from Malaysia. *Applied Economics*, *33*(3), 1703–1715.

Panchamukhi, V. R., Nambiar, R. G., & Mehia, R. (1989). Structural Change and Economic Growth in Developing Countries. In Williamson, J. G., & Panchamukhi, V. R. (Eds.). *The balance between industry and agriculture in economic development*. Vol. 2: Sector proportions. London, UK: MacMillan.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationship. *Journal of Applied Econometrics, 16*(3), 289–326.

Skolka, J. (1989). *Input output structural decomposition analysis for Australia, in contuche-input output structural decomposition for Andalusia and Madrid (Spain).* Serville, Spain: Business and Economics Development. University of Pablo de Olavide.

Syrquin, M. (1988). Patterns of Sturctural Change. In H. Chenery & Srinivasan, T. N. (Ed.). *Handbook of development economics* (1st ed.), 1(7), 203–273. Elsevier.

Syrquin, M., & Chenery, H. B. (1989). Patterns of Development: 1950 to 1983. *World Bank Discussion Papers No. 41*. Washington DC: World Bank.

Verspagen, B. (2000). *Growth and structural change: Trends, patterns and policy options.* Maastricht: Merit Research Memoranda No. 2000-015, Maastricht University.

Zakariah, A. R., & Ahmad, E. E. (1999). Sources of industrial growth using the factor decomposition approach: Malaysia, 1978–1987. *The Developing Economies, 37*(2), 162–196.

APPENDIX

Table A
Definitions of variables

Variables	Division	Description
VA		Total value-added of manufacturing division
Y		Per capita income
N		Population
X 15–36		Export of division 15–36
V15	15	Value-added manufacture of food products and beverages
V16	16	Value-added manufacture of tobacco products
V17	17	Value-added manufacture of textiles
V18	18	Value-added manufacture of wearing apparel; dressing and dyeing of fur
V19	19	Value-added manufacture of leather and products of leather
V20	20	Value-added manufacture of wood and products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
V21	21	Value-added manufacture of paper and paper products
V23	23	Value-added manufacture of coke, refined petroleum products and nuclear fuel
V24	24	Value- added manufacture of chemicals and chemical products
V25	25	Value-added manufacture of rubber and plastic products
V26	26	Value-added manufacture of other non-metallic mineral products
V27	27	Value-added manufacture of basic metals
V28	28	Value-added manufacture of fabricated metal products, except machinery and equipment
V29	29	Value-added manufacture of machinery and equipment n.e.c.
V30	30	Value-added manufacture of office, accounting and computing machinery
V31	31	Value-added manufacture of electrical machinery and apparatus n.e.c.
V32	32	Value-added manufacture of radio, television and communication equipment and apparatus
V33	33	Value-added manufacture of medical, precision and optical instruments, watches and clocks
V34	34	Value-added manufacture of motor vehicles, trailers and semi-trailers
V35	35	Value-added manufacture of other transport equipment
V36	36	Value-added manufacturing of furniture, manufacturing n.e.c.

Source: Department of Statistics, Malaysia (2000)