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Sources of Labour Productivity Growth in Large Scale Industries in Malaysia

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ABSTRAK

Industri skel besar (ISB) berperanan penting dalam pembangunan industri di Malaysia. Ia menyumbang lebih kurang 60 peratus terhadap gunatenaga dan 70 peratus masing-masingnya bagi nilai ditambah dan aset tetap. Industri ini juga menyediakan saluran pemasaran kepada industri kecil dan sederhana yang seterusnya mewujudkan rantaian bagi keseluruhan sektor industri. Selain itu, ISB juga menyediakan asas bagi kemasukan pelaburan langsung asing yang seterusnya menggalakkan pemindahan teknologi. Memandangkan pentingnya industri saiz ini dalam pembangunan, maka amat penting bagi kita mengenalpasti dan memahami sumber pertumbuhan produktiviti dalam industri berkenaan. Kertas ini bertujuan menganalisis sumber pertumbuhan produktiviti buruh dalam industri bersaiz besar di Malaysia. Tiga sumber pertumbuhan yang dikenalpasti dalam kertas ini iaitu nisbah modal-buruh, kuantiti buruh dan kecekapan. Analisis dalam kertas ini menggunakan data tinjauan tahunan industri pembuatan untuk tempoh 1982 hingga 1994 yang dikumpulkan oleh Jabatan Perangkaan Malaysia.

ABSTRACT

Large-scale industries (LSIs) play an important role in the Malaysian industrial development. LSIs' contribution to employment is about 60 percent and 70 percent to value added and fixed assets respectively. LSIs also provide a broad marketing channel to small and medium industries (SMIs) which subsequently spur linkages within the industrial sector. Apart from this, LSIs also serve as a platform for foreign direct investment (FDI) that could potentially lead to technology transfer. Since LSIs play an important role in development, it is crucial to identify and understand the sources of labour productivity growth in this sector. This paper attempts to analyse the sources of labour productivity growth in the LSIs in Malaysia. Three sources of growth identified in this paper are capital-

labour ratio, quantity of labour and efficiency. The analyses in this paper are based on the Manufacturing Industrial Survey data of 1982 to1994 collected by the Department of Statistics Malaysia.

INTRODUCTION

Large-scale industries (LSIs) have been contributing to the development of the Malaysian industrial sector. Despite their low number, which constitute about 10 percent of total manufacturing establishments, LSIs' contribution to employment is currently about 60 per cent of total output. Their contribution to value added and fixed asset are estimated at 70 percent (Department of Statistics Malaysia 1996). The Industrial Census conducted by the Ministry of International Trade and Industry, Malaysia (MITI) 1993/94, showed that the LSIs accounted for more than 80% of the total employment, output and fixed asset of the manufacturing sector (MITI 1996). Differences in these statistics, however, may be due to differences in the definitions employed by the two agencies.

A relatively much higher contribution from LSIs to output and value added as compared to that of the small and medium scale industries (SMIs) is attributed to higher productivity, better management and economies of scale. This subsequently lower LSIs' cost of production and raise their production efficiency. Apart from these, production techniques employed by the LSIs are more modern, sophisticated, efficient and capital-intensive. In 1994, for example, the capital-labour ratio (K/L) and labour productivity (Y/L) in LSIs were far higher than those in the SMIs (Table 1) except for food and wood-based industries.

Apart from the above, the contribution of the LSIs in the industrial development process can be traced to several other factors. Firstly, the LSIs play an important role as marketing channel for SMIs' products. Consistent with the Malaysian industrial strategy, the interaction between LSIs and SMIs in the marketing aspect invariably promotes industrial linkages. The Second Industrial Master Plan (IMP2) specifically stated that a resilient industrial sector is achievable through industrial linkages (Ministry of Human Resource, Malaysia 1996). In order to realize this objective, the government of Malaysia has urged the LSIs to establish linkages with the SMIs due the fact that the former has a bigger control in the market. LSIs are encouraged to use local inputs from SMIs and reduce the consumption of inputs from the foreign market.

TABLE 1. Malaysia: Capital-labour ratio and labour productivity by industrial size, 1994

	LSIs		SMIs	
Types of Industry	K/L	Y/L	K/L	Y/L
Food	63.02	289.62	58.98	392.27
Beverage & tobacco	134.98	483.74	40.85	102.13
Textile & wearing apparel	36.30	75.83	24.06	64.33
Wood-based products	48.65	74.63	29.66	79.74
Plastic-based products	45.58	79.02	40.27	69.61
Rubber-based products	46.02	201.30	45.35	84.82
Chemicals	247.76	329.30	120.11	259.24
Metal products	87.45	199.91	72.67	151.04
Non-metallic mineral products	314.63	290.64	70.94	99.83
Electrical & electronics	37.61	182.30	28.53	72.62
Transport equipment	119.03	349.09	54.48	130.94

Source: Calculated from the data of the Manufacturing Industrial Survey, Department of Statistics Malaysia.

Secondly, the LSIs also serve as a platform for foreign direct investment (FDI). In Malaysia, the largest chunk of FDI is accounted for by this sector, producing high-technology products and hiring the most skilled work force. Total FDI in the manufacturing sector for 1997 was RM6285.2 million and most of it went to the electrical and electronics industry (RM620.0 million), fabricated metal-products (RM424.8 million) and metal-based products (RM359.1 million) according to statistics from the Ministry of Finance, Malaysia (Malaysia 1997).

Thirdly, LSIs act as a base for technology transfer that can take place through human resource development and management. Foreign or local firms that hire foreign expertise will be involved in technological transfer when they provide formal or informal training to their workers. Further, technology transfer in the form of research and development may lead to technological development within the firms especially the locals. This process is extremely important in view of the fact that technology transfer is sometimes difficult to take place owing to factors like lack of skills among local workers and incompatibility with local resources.

In fact, the government's strategy in the process of development is to reduce cost of production through raising productivity level. In the Seventh Malaysia Plan (1996-2000) the government introduced a new growth strategy namely productivity-led growth aiming to increase the contribution of total factor productivity (TFP). TFP refers to additional output that can be produced through higher efficiency as a result of educational improvement, skilled workers, better organizational management, new technology and innovation and information technology (Malaysia 1996: 16). In an effort to achieve a newly industrialized and developed nation by the 21st century, Malaysia's economy needs to improve its competitive edge, which again requires an improvement in sector productivity.

Statistics show that labour productivity in the Malaysian manufacturing sector had been increasing overtime except in the recession period of 1985 to 1988 (Table 2). However, they are still lower than the productivity achieved by the Japanese and Newly Industrialized Countries (NICs) in Asia like Hong Kong, Taiwan, South Korea and Singapore.

TABLE 2. Malaysia: Labour productivity in the manufacturing sector

Year	Value added ('000) current price	Number of workers	Labour productivity
1970	1,277,418	175,318	7,290
1975	3,181,245	311,009	10,229
1981	9,489,816	580,039	16,360
1985	12,115,431	476,260	25,439
1988	18,634,925	827,553	22,518
1990	24,529,564	844,733	29,038
1995	59,629,113	1,389,545	42,913

Note: Labour productivity is obtained through dividing value added with number of workers.

Sources: Department of Statistics. *The Manufacturing Industrial Survey*, (various years).

In 1985, labour productivity in the manufacturing sector was not even one-fourth of that in Japan but it was higher than that of Hong Kong, Taiwan and other countries in South East Asia. However, by 1990 the scenario had changed where all NICs' labour productivity were higher than that of Malaysia. Even though the Malaysian labour productivity was still higher than those of Indonesia, Philippines and Thailand the gap had become smaller as a consequence of lower productivity growth rate in Malaysia (Table 3).

This paper attempts to analyse labour productivity growth in the LSIs in Malaysia. The focus of this paper is to identify the sources of labour productivity growth that are usually traced to two broad factors. *First*, contribution

TABLE 3. Comparison of labour productivity in the manufacturing sector among various countries (nominal value)

Country	1985 (US$)	1990 (US$)	Annual Growth Rate 1985-1990
Malaysia	10248	10737	0.9
Japan	38747	79645	15.5
South Korea	12829	30822	55.0
Singapore	18930	32390	11.3
Taiwan	9580	24523	20.6
Hong Kong	7246	15046	15.7
Indonesia	3880	4467	2.8
Philippine	5576	8092	7.7
Thailand	8015	10059	4.6

Source: Department of Statistics of Malaysia. *Industrial Survey*, various years, and UNIDO, 1995. *Industry and Development Global Report 1992/93*.

from physical inputs namely capital-labour ratio and the quantity of labour and *second*, contribution from improved efficiency due to technological advancement, human resource development and management, institutional management and other factors that may increase quality of inputs. This latter set of factors is commonly called the "residuals" or contribution of TFP.

LITERATURE REVIEW

Most past studies in the sources of growth and productivity were conducted at the macro level using the countries' aggregate data. Early works by Solow (1957), Abromowitz (1956) and Denison (1962), tried to measure sources of economic growth in the United States. Their study found that 80 to 90 per cent of the growth per capita could not be explained by the growth of capital per capita. These findings provided an impetus for further research in this area to incorporate other variables beside physical inputs into the production function. The most common method used by many researchers is to include human capital variables measured by education level, training, educational expenditure, literacy rate and so forth (Denison 1967, Siddique 1992, Walter Rubinson 1983, Hague et al. 1988). Denison (1967), for instance, found in his earlier study that 23 percent of economic growth in the United States was contributed by the level of worker's education although the figure was revised in his later study to 15 percent.

Other studies that attempted to measure the sources of growth include Maddison (1970) which showed that infrastructure development, health and education contributed 40 percent of the output growth in developing countries. Jorgenson (1984) on the other hand showed that labour input accounted for 50 percent of the economic growth in the United States. Studies using cross sectional data include Anderson (1990), Barro (1985), Mankiw, Romer and Weil (1992), De Gregorio (1992), Brander (1992), Otani & Villanueva (1993). The main concern of these studies was the role of human capital variables to economic growth.

Apart from the above, many studies were done to look at the sources of growth using single country data including Rahmah (1998) for Malaysia, Liu and Armer (1993) for Taiwan, Williamson (1963) for the Philippine, Nishimizu and Hulten (1978) for Japan, Talman & Wang (1994) for Taiwan, Lau et al. (1993) for Brazil and Chow (1993) for China. These studies generally measured the contribution of the 'residuals' to economic growth. For example, Rahmah (1998) found that the contribution of the residuals (TFP) to the Malaysian economic growth was about 22 percent while Williamson (1963) found that the contribution of TFP in the Philippines had been decreasing overtime.

There were also several studies that focused specifically on the manufacturing sector. Katz (1969) who studied Argentina's manufacturing sector found that the contribution of TFP to output was quite small but increasing overtime. In Malaysia, the contribution of TFP to manufacturing output growth has been rather small (Maisom and Arshad 1992; Nik Hashim 1998; Nor Rizan 1999). Rahmah (1999) studied the sources of growth in the SMIs manufacturing sector and found that in some subindustries the contribution of TFP or efficiency were still small especially in the enterprises that are more labour intensive. Hwang (1989) looked into the level of labour productivity in the manufacturing sector in Taiwan and found that labour productivity was higher in the export-oriented industries compared to the non-export ones.

There is a close relationship between technological advancement and capital intensity. It was shown in a Japanese study that the more capital-intensive firm managed to reap higher level of productivity as compared to the more labour intensive firms (Hishashi 1991). Further, the contribution of capital to the growth of labour productivity was also higher in the capital-intensive firms. Another important determinant of labour productivity is capital-labour ratio. In the United Kingdom, a study by Haskel and Martin (1993) showed that capital-labour ratio contributed 2.2 percentage point to the manufacturing productivity growth of 4.7 percent.

DATA AND MODEL SPECIFICATION

Analysis in this paper is based on data from the Manufacturing Industrial Survey from 1982 to 1994 collected by the Department of Statistics Malaysia. There are 11 large-scale sub-industries selected for the purpose of this analysis namely:

1. food
2. beverage and tobacco
3. textiles and wearing apparel
4. wood-based products
5. plastic-based products
6. rubber-based products
7. chemical
8. metal-based products
9. non-metallic mineral products
10. electrical and electronics
11. transport equipment

LSIs are defined as enterprises with full-time workers of at least 200 persons. These sub-industries are chosen due to their significant contribution to employment, output, value added and export. The analysis employs the Cobb-Douglas production function, which can be written as

$$Y = AK^{\beta 1}L^{\beta 2}e^{\lambda t} \tag{1}$$

Y = output
K = capital
L = labour
t = time period

When there is constant return to scale, $\beta_1 + \beta_2 = 1$. Divide equation (1) by $L^{\beta 1}$ to yield

$$\frac{Y}{L^{\beta 1}} = \frac{AK^{\beta 1}L^{\beta 2}e^{\lambda t}}{L^{\beta 1}} \tag{2}$$

Multiply both sides of equation (2) with $L^{\beta 1-1}$, we obtain the labour productivity equation

$$\frac{Y}{L^{\beta_1}}.L^{\beta_1 - 1} = \frac{AK^{\beta 1}L^{\beta 2}e^{\lambda t}}{L^{\beta 1}}.L^{\beta_1 - 1} \tag{3}$$

$$\text{or} \quad \frac{Y}{L} = A\left(\frac{K}{L}\right)^{\beta 1} L^{\beta 1+\beta 2-1} e^{\lambda t} \tag{4}$$

In terms of logarithm, we can write equation (4) as

$$\ln\left(\frac{Y}{L}\right) = \ln A + \beta_1 \ln\left(\frac{K}{L}\right) + (\beta_1 + \beta_2 - 1)\ln(L) + \lambda t \tag{5}$$

To obtain labour productivity growth equation, we differentiate equation (5) with respect to t.

$$\frac{1}{\frac{Y}{L}} d\left(\frac{\frac{Y}{L}}{dt}\right) = \beta_1 \frac{1}{\frac{K}{L}} d\left(\frac{\frac{K}{L}}{dt}\right) + (\beta_1 + \beta_2 - 1)\frac{1}{L}\left(\frac{dL}{dt}\right) + \lambda \tag{6}$$

$$\text{or} \quad G\left(\frac{Y}{L}\right) = \beta_1 G\left(\frac{K}{L}\right) + (\beta_1 + \beta_2 - 1)G(L) + \lambda \tag{7}$$

$$\text{and} \quad \lambda = G\left(\frac{Y}{L}\right) - \beta_1 G\left(\frac{K}{L}\right) - (\beta_1 + \beta_2 - 1)G(L) \tag{8}$$

We estimate equation (7) using ordinary least squares (OLS) procedure. The coefficients of β_1 and $(\beta_1 + \beta_2 - 1)$ are multiplied by the average growth of respectively K/L and L to measure the contribution of these variables to the productivity growth. The remaining coefficient, λ, is calculated by subtracting contributions from the total productivity growth as shown in equation (8). λ can be defined as the contribution from TFP that may be due to technological progress, human capital improvement or any factors that contribute to higher quality of physical inputs.

CHARACTERISTICS OF LARGE SCALE INDUSTRIES

Based on the 11 selected sub-industries there were 530 LSIs in 1994. Of these, electrical and electronics constituted a majority of the establishments, at 165, followed by textile and wearing apparel, rubber-based products and food with the number of establishments at 95, 56 and 54 respectively. For other sub-industries, the number of establishments was fewer than 50 each. Consistent with its size in terms of the number of establishments, electrical and electronics produced the highest output, value added, employment and fixed asset as shown in Table 4.

TABLE 4. Malaysia: Distribution of large size industries by number of establishments, output, value added, employment, fixed asset and capital-labour ratio 1994

Sub-industries	Number of establishments	Output (RM mil)	Value added (RM mil)	Employment	Fixed-Asset (RM mil)	Capital-Labour Ratio (RM mil)
Food	54	5538.9	1178.9	23195	1461.7	63.0
Beverage & tobacco	9	2025.9	813.0	4188	565.3	134.9
Textile & wearing	95	4009.7	1284.3	52878	1919.7	36.3
Wood-based products	43	1350.5	390.1	18095	880.4	48.6
Plastic-based products	43	1534.1	597.0	19412	884.9	45.6
Rubber-based products	56	2341.9	943.1	27609	1252.1	46.0
Chemicals	27	2916.6	837.4	8857	2194.7	247.8
Metal products	4	194.2	64.3	1245	227.5	87.4
Non-metallic products	13	1207.6	548.1	4155	1307.3	314.6
Electric & electronics	165	29565.0	5629.5	162218	6101.7	37.6
Transport equipment	21	5179.7	1010.8	14838	1766.1	119.0

Source: Department of Statistics. *The Manufacturing Industrial Survey 1994*.

It is interesting to note that despite the smaller number of establishments, the transport equipment industry produced higher output than other industries with larger establishment like textile, rubber-based products and food. Nevertheless, the transport equipment industry had lower value added due to higher cost of production. The value of output and value added in the textile and wearing apparel were relatively lower than that in the food industry despite its larger number of establishments reflecting less efficiency in its production process.

It is observed that there exist a positive relationship between the number of establishments and the number of workers, except in transport equipment. The number of establishment in transport equipment was relatively low but the number of employment was larger than other industries. However, the capital-labour ratio was quite high in this industry due to large capital usage as represented by the fixed asset value. Other industries, which were capital intensive, include non-metallic mineral products, chemical, beverage, and tobacco.

Table 5 shows the annual rate of growth for labour productivity, capital-labour ratio and quality of labour. Between 1982 to 1994, the transport equipment industry recorded the highest labour productivity growth fol-

TABLE 5. Malaysia: Growth rate of labour productivity, capital-labour ratio and quantity of labour in large size industries, 1982-94

Sub Industries	Y/L	K/L	L
Food	3.58	2.86	2.94
Beverage and tobacco	10.73	8.18	1.03
Textiles & wearing apparel	8.30	10.05	2.47
Wood-based products	8.00	8.23	1.95
Plastic-based products	7.69	7.29	18.28
Rubber-based products	3.04	5.34	4.34
Chemicals	10.66	17.91	3.10
Metal products	5.60	7.72	1.95
Non-metallic mineral products	7.54	5.37	1.43
Electrical & electronics	9.50	10.13	7.28
Transport equipment	14.80	11.74	1.70

Sources: Calculated from the *Manufacturing Industrial Survey*, Department of Statistics of Malaysia, various years.

lowed by the beverage and tobacco and chemical industries. Other industries with high productivity growth were electrical and electronics, textile and wearing apparel, wood-based products, plastic products and non-metallic mineral products with annual growth rate higher than 7.0 percent. The annual growth rate of the capital-labour ratio was highest in the chemical industry followed by transport equipment, electrical and electronics and textile and wearing apparel.

There was no positive relationship between the growth of capital-labour ratio and capital intensity. Some industries experienced low growth in the capital-labour ratio despite high capital-labour ratio as in metal-based products and non-metallic mineral products. The annual growth of labour was highest in the plastic-based industry at 18.28 percent. For other industries the labour growth rate was quite low, usually below 5 percent, except in the electrical and electronics at 7.28 percent.

RESULTS OF REGRESSION ANALYSIS

Results from the estimation of equation (7) are presented in Table 6. Most sub-industries equations do not have a problem of autocorrelation except for the food industry and wood-based products. Therefore, for these two sub-industries further estimation is conducted using Cochrane-Orcutt procedure. The values of R^2 are quite low for some sub-industries, which is a common phenomenon for the growth equation. The low R^2 reflect the existence of other factors besides capital-labour ratio and the quantity of labour that explain the growth labour productivity. These variables include technological progress, technical efficiency, and firms and personnel management. However, due to data limitation, we cannot incorporate these variables in the model. We did try to put time trend as a proxy for technology but it further lowered the value of R^2. In addition, we know that time trend is a weak approximation for technological change since it implicitly assumes that technology is improving over time. However, for the beverage and tobacco, rubber-based products, textile and wearing apparel industries, the values of R^2 are above 0.7. This indicates that more than 70 percent of the variation in the growth of labour productivity can be explained by the explanatory variables namely the growth of capital-labour ratio and the growth of quantity of labour.

Some other variables explain the growth rate of labour productivity. This may come in the form of technological advancement, human resource development and management and institutional arrangement. All of these are captured in the residual term in equation (8).

There is only one sub-industry where both explanatory variables explain the dependent variable significantly at least at 10 percent significant level i.e. the rubber-based industry. In this industry, a percentage point increase in the growth of capital-labour ratio increases productivity growth by 0.293 percentage point. However, an increase in the growth of the quantity of labour decreases the productivity growth in this industry.

In the relatively capital intensive sub-industries like beverage and tobacco, chemical, non-metallic mineral products and transport equipment, the growth of capital-labour ratio doesn't seem significant in determining labour productivity growth. This result implies that a further increase in the capital-labour ratio will not increase productivity due to the fact that the utilisation of capital is already large. For the textile and wearing apparel, wood-based products, plastic-based products, metal products and electrical and electronics, the growth in capital-labour ratio significantly increases the growth of labour productivity. The largest impact is found in the metal product sub-industry whereby a 1-percentage point increase in the growth of capital-labour ratio increases productivity by 0.481 percentage point. This is followed by electrical and electronics, rubber-based products, wood-based products and textile and wearing apparel.

The growth of quantity of labour significantly determines labour productivity growth only in three sub-industries namely beverage and to-

TABLE 6. Results of labour productivity growth equation estimates

Sub-industries	Intercept	G(K/L)	G(L)	R^2	D.W
Food	0.882	0.724	0.252	0.269	2.147
	(1.702)	(1.484)	(0.372)		
Beverage & tobacco	0.243	0.224	1.660	0.828	1.863
	(3.462)***	(0.934)	(6.927)***		
Textile & wearing apparel	0.043	0.135	0.310	0.712	2.090
	(1.576)	(3.899)***	(1.649)		
Wood-based products	0.065	0.148	0.033	0.389	2.417
	(3.854)***	(1.901)*	(0.370)		
Plastic-based products	0.060	0.201	0.036	0.383	2.213
	(1.234)	(2.951)**	(0.285)		
Rubber-based products	0.043	0.293	–0.358	0.838	1.849
	(1.298)	(2.113)**	(–2.937)**		
Chemical	0.133	0.009	–0.239	0.256	1.808
	(4.780)***	(0.840)	(–1.854)*		
Metal products	0.091	0.481	0.406	0.520	2.238
	(0.635)	(2.933)**	(1.172)		
Non-metallic mineral	0.170	0.141	–0.901	0.273	2.327
products	(0.849)	(0.163)	(–0.691)		
Electrical and electronics	0.055	0.331	0.123	0.553	2.323
	(1.489)	(2.574)**	(0.953)		
Transport equipment	0.179	–0.084	–0.313	0.448	2.078
	(2.270)**	(–0.415)	(–1.219)		

Note: Figures in parentheses are t-values
* Significant at the 10 percent level
** Significant at the 5 percent level
*** Significant at the 1 percent level

bacco, rubber-based and chemical. However, the growth of quantity of labour is a positive determinant for labour productivity growth only in the beverage and tobacco where a 1 percentage point increase leads to a 1.66 percentage point increase in the productivity growth. In the other two sub-industries their relationship are negative.

SOURCES OF PRODUCTIVITY GROWTH

Table 7 shows the contribution of each explanatory variable and efficiency to the growth of labour productivity in the LSIs. The percentage contributions of these factors are shown in Table 8. Equation (8) is used to calculate the figures in Table 7. The growth of labour productivity G (Y/L), the growth of capital-labour ratio G (K/L) and the growth of quantity of labour G(L) are calculated from the data and presented in Table 5. The coefficients β_1 and $(\beta_1+\beta_2-1)$ are obtained from equation (7) and presented in Table 6. Differences between G (K/L) and the sum of G (Y/L) and $(\beta_1+\beta_2-1)$ G(L) produce λ.

From Table 8 many sub-industries in LSIs have gained labour productivity growth through efficiency. In some sub-industries this contribution is above 100 percent as in chemical, non-metallic mineral products and transport equipment. Other sub-industry with high contribution from efficiency is rubber-based industry. In these mentioned industries, a large contribution from efficiency is due to the negative contribution from physical input especially quantity of labour. In fact, in the transport equipment

TABLE 7. Contribution of physical inputs and efficiency to labour productivity growth rate

Sub-industries	$G\left(\frac{Y}{L}\right)$	$\beta_1\ G\left(\frac{K}{L}\right)$	$(\beta_1+\beta_2-1)G(L)$	λ
Food	3.58	0.724 (2.86) = 2.071	0.252 (2.94) =0.74	0.769
Beverage & tobacco	10.73	0.224 (8.18) =1.832	1.660 (1.03) =1.710	7.188
Textile & wearing apparel	8.30	0.135 (10.05) = 1.357	0.310 (2.47) = 0.766	6.177
Wood-based products	8.00	0.148 (8.23) = 1.218	0.033 (1.95) = 0.064	6.718
Plastic-based products	7.69	0.201 (7.29) = 1.465	0.036 (18.28) = 0.658	5.567
Rubber-based products	3.04	0.293 (5.34) = 1.565	−0.358 (4.34) = −1.554	3.029
Chemical	10.66	0.009 (17.91) = 0.161	−0.239 (3.1) = −0.741	11.24
Metal products	5.60	0.481 (7.72) = 3.713	0.406 (1.95) = 0.792	1.096
Non-metallic mineral products	7.54	0.141 (5.37) = 0.757	−0.901 (1.43) = −1.288	8.071
Electrical and electronics	9.50	0.331 (10.13) = 3.353	0.123 (7.28) = 0.895	5.252
Transport equipment	14.80	−0.084 (11.74) = -0.986	−0.313 (1.7) = −0.532	6.318

TABLE 8. Percentage contribution of physical input and efficiency to labour productivity growth rate

Sub-industries	Y/L	K/L	L	λ
Food	100.0	57.85	20.67	21.48
Beverage & tobacco	100.0	17.07	15.94	66.99
Textile & wearing apparel	100.0	16.35	9.23	74.42
Wood-based products	100.0	15.23	0.80	83.97
Plastic-based products	100.0	19.05	8.56	72.39
Rubber-based products	100.0	51.48	–51.12	99.64
Chemical	100.0	1.51	–6.95	105.44
Metal products	100.0	66.30	14.14	19.57
Non-metallic mineral products	100.0	10.04	–17.08	107.04
Electrical and electronics	100.0	35.29	9.42	55.28
Transport equipment	100.0	–6.66	–3.59	110.26

sub-industry both variables give a negative contribution to the productivity growth. This industry gains the highest labour productivity growth. Contribution from efficiency to the productivity growth is very low in the metal-products but its productivity growth is largely attributable to the growth in the capital-labour ratio. Other industries that have large contribution from the capital-labour ratio are food, rubber-based and electrical and electronics.

As a whole, the results show that the LSIs have benefited from efficiency in raising labour productivity except in food and metal-products where the contributions are very low. In the electrical and electronics industry, efficiency contribution is still relatively low. Most industries have a negative contribution from the growth of the quantity of labour reflecting that LSIs must move towards more capital intensive production.

POLICY IMPLICATIONS

Manufacturing is one of the most important sectors in Malaysian industrial development. This sector has been exposed to fast changing technology and is most affected by the process of globalization and liberalization. Thus, it needs to be highly competitive in order to survive in the international market. Indeed, the manufacturing sector in Malaysia has also been experiencing a dramatic change especially in terms of technological adoption towards high technology as in the transport equipment, metal products and electrical and electronics.

To what extent does this technological advancement raise labour productivity? The analyses in this paper reveal that most LSIs benefited from increased efficiency that is shown by a large contribution from the residual factor to the growth of labour productivity. This may reflect a benefit gained from technological advancement. Apart from this, the quality of input may have also increased due to factors like development in human resource and other management aspects within organization. An improvement in the production efficiency lowers firms' cost of production thus making Malaysian products more competitive in the international market.

Nevertheless, in some sub-industries like food, metal products and electrical and electronics, the contribution of efficiency to the growth of labour productivity are quite low, but are partially compensated by a large contribution from the growth of capital-labour ratio.

In order to overcome the problem of low efficiency in several sub-industries, appropriate steps can be taken as discussed below.

1. Increase human resource development through training. In this regard, it may be helpful if firms have their own training center to train their workers according to their needs.
2. Transfer of technology. Many foreign investors are involved in LSIs through FDI especially in transport equipment, electrical and electronics, chemical and metal products. Technology transfer can take place within the firms through providing training facilities or on the job training using expatriates as training instructors. The government could provide incentives for foreign employers to provide on-the-job training.
3. Upgrade research and development. This aspect is crucial for the manufacturing sector development because it will lead to new products, marketing avenue and technological development. An appropriate choice of technology is crucial in improving labour productivity.
4. Human resource planning. Enterprises must plan for their future labour requirements. Complete manpower planning allows them to optimally adjust their labour input mix through continuous human resource training.

CONCLUSION

The quality of labour, technological progress, personnel management and quality of other inputs directly influence firms' productivity. All these factors combined are commonly called efficiency or total factor productivity. This study found that the contribution of efficiency or TFP differ from one sub industry to another. Some industries gain a large benefit from TFP while others gain little. However, the majority of LSIs enjoys a high TFP's contribution to their productivity growth. This study also found that there are no positive correlation between capital intensity and the contribution of TFP. The more capital intensive industries like electrical and electronics and metal products are shown to have lower TFP contribution as compared to the less capital intensive industries like rubber-based products, wood-based products and non-metallic mineral products.

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