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TECHNICAL EFFICIENCY, TECHNICAL PROGRESS AND LABOUR PRODUCTIVITY IN SMALL AND MEDIUM SCALE INDUSTRIES IN MALAYSIA

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ABSTRACT

The role of Small and Medium Scale Industries (SMIs) is increasingly important for Malaysian industrial development. Being operating at moderate level of technology with low financial requirement, SMIs is always taken as a platform for young entrepreneurs to start their businesses. However, one of the problems facing SMIs is low productivity of labour which subsequently lower their contribution to output or value added. Therefore, even though with large number of establishments, SMIs' contribution to output, value added and fixed asset is far below of that by the large scale industries. Nevertheless, technology has been gradually upgraded in this sector especially in the medium size firms. Technical progress has an effect on the demand for labour. It is commonly observed that technical progress will be a complement with more skilled labour but a substitute with less skilled labour. This paper aims to investigate this effect using Industrial Manufacturing Survey data of 1984-2005 collected by the Department of Statistics Malaysia. The analysis will involve two stages procedures, firstly, measuring technical progress using Data Envelopment Analysis framework developed by Coelli (1991). Secondly, to examine effect of technical progress on labour productivity using a regression model approach. We stipulate that technical progress will have a positive effect on labour productivity due to its complementarity with skilled labour and a positive relationship between skills and productivity.

Field: *Labour Economics*

INTRODUCTION

The small and medium scale industries (SMIs) play an important role in generating employment and supporting the large-scale industries (LSIs). With a small amount of capital requirement and a medium level of technology, SMIs can attract many new entrepreneurs to venture into new business. In other words, SMIs act as a platform to the young and aspiring entrepreneurs. SMIs can generate a massive desired route for employment due to the fact that their production techniques are still at low or medium levels and they are more labor intensive. The role of SMIs as supporting industries to the LSIs can be viewed from interdependency between them. SMIs provide inputs, parts and components to LSIs. In fact, in the Second

Industrial Master Plan (IMP2), 1996, a strong linkage between SMIs and LSIs was emphasized by the Malaysian government, which was aimed to be achieved through the development of cluster industry. If linkages can be strengthened, the dependency on the import market for obtaining intermediate inputs can be lessened, hence contributing positively to the Malaysian balance of payment.

In Malaysia, the majority of the manufacturing establishments are small and medium in size. Based on the census on establishments conducted by The Department of Statistics (DOS) in 2003, 86.7 percent of the establishments in the manufacturing sector were small and medium scale industries (SMEs). Even though SMEs are large in terms of number, their contribution to output and value of fixed assets are far less than that of the large enterprises. For example, in 2003, SMEs' value added comprised only 26.6 per cent of the total manufacturing value added and 26.7 per cent of fixed assets of this sector. In term of employment, SMEs' contribution was 26.9 per cent (DOS, 2005). The detail distribution is shown in Table 1.

Table 1
Relative Changes in Percentages Contribution of SMEs 1981, 1994 and 2003

	Contribution by Sector (Percentages)		
	1981	*1994*	*2003*
Number of Firms			
Small and medium size industries (SMEs)	94.7	84.5	86.7
Large size industries (LSEs)	5.3	15.5	13.3
Total Employment			
Small and medium size industries (SMEs)	28.2	31.5	26.9
Large size industries (LSEs)	72.8	68.5	73.1
Total Output			
Small and medium size industries (SMEs)	29.0	26.5	26.6
Large size industries (LSEs)	71.0	73.5	73.4
Total Fixed Assets			
Small and medium size industries (SMEs)	29.7	23.7	26.7
Large size industries (LSEs)	71.3	76.3	73.3

Source: Department of Statistics, Malaysia 2005.

Table 2 shows distribution of SMEs by sub-industries based on the Manufacturing Survey 2005. Three sub-industries, namely food and beverages, textiles wearing apparel and footwear, and wood-based accounted for more than two-third of the number of establishments surveyed. Textiles wearing apparel and footwear is the single largest sub-industry accounted for one-third of the total number of firms surveyed.

A low level of productivity and input quality may attribute to low level of value added in the SMIs. This can be related to low skills acquired by workers and also inappropriate skill composition. A more appropriate skill composition would produce an optimum efficiency in the production process.[1]

REVIEW OF LITERATURE

An increase in the level of productivity reflects an increase in the efficiency of inputs. Hence, the same level of inputs can produce a higher output level, which means that the cost of

Table 2
Number of Establishments, Output, Value Added, Employment Fixed Assets and Capital-labour Ratio in SMEs, 2005

Industry	*Number of Establish-ments (%)*	*Output (RM'000)*	*Value Added (RM'000)*	*Employment*	*Fixed Assets (RM'000)*	*Capital-labour, ratio (RM'000)*
Food and Beverages	22.4	48,416,190	5,230,313	97,820	8,532,908	87.23
Textiles	33.8	2,699,344	599,676	45,303	890,467	19.66
Wood products	15.5	8,778,131	1,996,428	80,810	2,619,858	32.42
Plastic products	5.9	6,583,980	1,633,998	41,496	2,721,358	65.58
Rubber products	1.8	6,640,865	931,268	16,933	1,428,136	84.34
Chemical	4.1	18,274,229	3,847,212	25,514	8,000,574	313.58
Metal products	0.5	1,462,738	189,594	2,943	475,182	161.46
Non-metallic mineral products	4.9	5,513,067	1,415,442	28,063	2,982,564	106.28
Electrical and electronics	8.7	11,279,911	2,372,783	49,204	2,716,528	55.21
Transport equipment	2.5	2,699,344	599,676	17,351	890,467	51.32

Source: Department of Statistics 2006.

production is reduced. In other words, it reflects an improvement in the quality of inputs. There are several factors affecting productivity such as level of technology and socio-demographic (Bhatia, 1990). Other factors like human resource development (HRD), human resource management (HRM) and institutional restructuring may also influence productivity. Bhatia (1990) argued that lower level of technology and unstable socio-demographic changes causing low productivity in India as compared to the United States and the United Kingdom. In his study of manufacturing sector using 1965-1985 data, it was shown that efficiency was influenced by factor of production, workplace and working condition, socio-economic and socio-politics.

Human capital attainment especially in terms of education and training plays an important role in determining firm's performance such as output, productivity and profit (Sandra and Lynch 1996, Honig 2001, Blundell et al. 1999, Barron et al. 1989, Blackemore and Hoffman 1988). A study by Sandra and Lynch (1996) found that there was a positive relationship between workers' year of schooling and productivity. Further, this study found that an impact of training was very much dependent on the training programs whether it was in accordance with the firms' needs. Among the important training programs were related to technical and computer skills.

Labour productivity is very much related to skills among workers that can be acquired through proper training. Workers who have attended training will be more efficient, productive and contribute to productivity growth. Rahmah (2000), for example found that SMIs' expenditure on training had a significant positive impact on labor productivity. A positive relationship between human capital and productivity is also much influenced by workers' wage rate. A higher wage rate received by the workers will encourage them to work harder and contribute to higher productivity. Workers with higher level of education and attended formal training tend to receive higher wages and they are also more likely to contribute to career development, research and development and further human capital accumulation (see Blundell *et al.* 1999, Montague 1986). Consequently, this contributes to higher productivity growth. Therefore, it is very important for firms to have more educated workers to gain this added stimulus effect.

A study by Mason and Finegold (1997) in the United States and Britain supports the positive relationship between human capital and the firm's performance. They found that education and training are more important determinant of productivity as compared to physical capital. Moreover, human capital achievement will create services and geographic diversifications, especially, in the professional services where human interaction is important (see Hitt *et al.* 2001.) Firms with more educated workers are better able to sustain and control their present technology or adopt modern and new technology. They are more able to invest in human capital like training because knowledgeable workers learn and adapt faster and more innovative (see for example Bosworth and Wilson 1993, Bishop 1994 and Chapman and Tan 1990). Katz (1969) calculated residual factors to analyze the contribution of technological progress to output and labour productivity growth in Argentina in the period 1946-1961. He concluded that capital was a major determinant of labor productivity. Pickles (1990) found that apart from technological improvement experienced by Iraq, capital was still the main contribution to output growth.

Technical progress is closely related to capital intensity. Accordingly, in the capital- intensive firms, productivity may be higher. For example, Hishashi (1991) found that in Japan the contribution of capital to productivity growth was larger in the capital-intensive industry as compared with the labor-intensive industry. Another important determinant of productivity is capital-labour ratio. In fact, this ratio is frequently used as an indicator for level of technology where higher capital-labour ratio is associated with higher level of technology. In the United Kingdom, for example, a study conducted on 81 firms, between the 1980-1986 periods, found that productivity increased by 4.7 per cent. Of this 2.2 per cent was due to the growth of capital-labor ratio (Haskel and Martin 1993). Further, this study revealed that a decrease in skilled labor by 2.63 per cent led to productivity reduction by 0.7 per cent each year. In other words, if there was no reduction in the number of skilled labor, productivity would have increased higher than 4.7 per cent to achieve 5.4 per cent.

MODEL SPECIFICATION AND SOURCE OF DATA

Human capital model developed by Corvers (1996, 1997) is based on a Cobb-Douglas production function, but use labour quality instead of quantity.

$$Y = AK^{\alpha}L^{*\beta} \qquad (1)$$

Where,

Y = output or value added

K = capital

L^* = effective labour

A = efficiency parameter

Effective labour can be defined as employment in three categories of workers; management and professional, technical and supervision, and direct production group.

$$L^* = L \bullet L_1^{\theta 1} L^{\theta 2} L^{\theta 3}$$

Where,

L = quantity of labour

L_1 = number of workers in management and professional group

L_2 = number of workers in technical and supervision group

L_3 = number of workers in production group.

Equation (1) can be written as,

$$Y = AK^{a}(L\ L_1^{\theta_1} L_2^{\theta_2} L_3^{\theta_3})^{b} \tag{2}$$

By dividing equation (2) by number of workers (L), we derive,

$$\frac{Y}{L} = \frac{AK^{\alpha} L^{\beta} L_1^{\beta\theta_1} L_2^{\beta\theta_2} L_3^{\beta\theta_3}}{L} \tag{3}$$

Rewriting equation (3), we obtain,

$$\frac{Y}{L} = A\left(\frac{K}{L}\right)^{\alpha} L^{\alpha+\beta-1}\ L_1^{\beta\,\theta 1} L_2^{\beta\,\theta 2} L_3^{\beta\,\theta 3} \tag{4}$$

and substituting 1-L_2-L_3 for L_1, we get,

$$Y/L = A\left(\frac{K}{L}\right)^{\alpha} L^{\alpha+\beta-1}(L-L_2-L_3)^{\beta(1-\theta 2-\theta 3)} L_2^{\beta\,\theta 2} L_3^{\beta\,\theta 3} \tag{5}$$

Labor productivity depends on the relative share contribution of the three types of labour. In terms of growth equation (5) can be written as,

$$\left(\frac{\dot{Y}}{L}\right) = \dot{A} + \alpha\left(\frac{\dot{K}}{L}\right) + (\alpha+\beta-1)\,\dot{L} + \beta(1-\theta_2-\theta_3)\frac{d\ln(1-L_2-L_3)}{dt}$$

$$+\beta\theta_2 L_2 + \beta\theta_3 L_3 \tag{6}$$

and in terms of logarithm, equation (6) can be written as,

$$\ln\left(\frac{Y}{L}\right) = \ln A + \alpha\ln\left(\frac{K}{L}\right) + (\alpha+\beta-1)\ln L + \beta(1-\theta_2-\theta_3)\ln(1-L_2-L_3)$$

$$+\beta\theta_2 LnL_2 + \beta\theta_3 LnL_3 + \mu_3 \tag{7}$$

There are other the external factors that can be added to labour productivity function of equation (7) and one of them is technical progress (TP) and equation (7) becomes,

$$\ln\left(\frac{Y}{L}\right) = \ln A + \alpha\ln\left(\frac{K}{L}\right) + \left(\alpha+\beta-1\right)\ln L + \beta(1-\theta_2-\theta_3)\ln(1-L_2-L_3)$$

$$+\beta\theta_2 LnL_2 + \beta\theta_3 LnL_3 + \gamma_1 TP + \mu_4 \tag{8}$$

Equation (8) is estimated using ordinary least squares estimation. The TP variable is obtained from DEA procedure using package developed by Coelli (1996).

DEA FRAMEWORK

Technical efficiency of small firms is central to the debate about the role of small scale industries in generating growth and employment in developing countries. Knowing their levels of efficiency, its distribution, and its correlates is critical if policymakers are to determine whether policies targeting SMIs are needed, and if so, what kinds of policies and delivery mechanisms are appropriate. The methodology we adopt to analyze firm efficiency is the Data Envelopment Analysis CDEA. The DEA is a special mathematical linear programming model and test to assess efficiency and productivity. It allows the use of panel data to estimate changes in total factor productivity and breaking it down into two components namely, technological change (TECHCH) and technical efficiency change (EFFCH).

TFP growth measures how much productivity grows or declines over time. When there are more outputs relative to the quantity of given inputs, then TFP has grown or increased. TFP can grow through innovations such as machines and design, this offenly called “technological change” (TECHCH). TFP can also grow when the industry uses their existing technology and economic inputs more efficiently; they can produce more while using the same capital, labour and technology, or more generally by increases in “technical efficiency” (EFFCH). TFP change from one year to the next is therefore comprised of technological change and changes in technical efficiency.

This study uses the output-oriented model of DEA-Malmquist to put much weight on the expansion of output quantity out of a given amount of inputs. Therefore, TFP index is a ratio of the weighted aggregate outputs to weighted aggregate inputs, using multiple outputs and inputs. Input and output quantities of industries are sets of data used to construct a piece-wise frontier over the data points. Efficiency measures are then calculated relative to this frontier that represents an efficient technology. The best-practice industry determines the production frontier, that is, those that have the highest level of production given a level of economic inputs. Points that lie below the piece-wise frontier are considered inefficient while points that lie on or above the frontier are efficient.

Since many inputs are used, and shared outputs may be produced, the Malmquist approach was developed to combine inputs and outputs and then measure changes. The Malmquist index measures the total factor productivity change (TFPCH), between two data points over time, by calculating the ratio of distances of each data points relative to a common technology.

Fare *et al.* (1994) specify the Malmquist productivity change index as:

$$m_o(y_{t+1}, x_{t+1}, y_t, x_t) = \left[\frac{d_o^{t+1}(y_t, x_t)}{d_o^{t+1}(y_{t+1}, x_{t+1})} \, x \, \frac{d_o^t(y_{t,} x_t)}{d_o^t(y_{t+1,} x_{t+1})} \right]^{\frac{1}{2}} \quad (1)$$

The above equation represents the productivity of the production point (x_{t+1}, y_{t+1}) relative to the production point (x_t, y_t). This index uses period t technology and the other period t +1 technology. TFP growth is the geometric mean of two output-based Malmquist-TFP indices from period t to period t +1. A value greater than one will indicate a positive TFP growth from period t to period t +1 while, a value lesser than one will indicate a decrease in TFP growth or performance relative to the previous year.

The Malmquist index of total factor productivity change (TFPCH) is the product of technical efficiency change (EFFCH) and technological change (TECHCH) as expressed (Cabanda, 2001):

$$\text{TFPCH} = \text{EFFCH x TECHCH} \tag{2}$$

The Malmquist productivity change index, therefore, can be written as:

$$M_0(y_{t+1}, x_{t+1}, y_t, x_t) = \text{EFFCH x TECHCH} \tag{3}$$

Technical efficiency change (catch-up) measures the change in efficiency between current (t) and next (t +1) periods, while the technological change (innovation) captures the shift in frontier technology.

As expressed by Squires and Reid (2004), technological change (TECHCH) is the development of new products or the development of new technologies that allows methods of production to improve and results in the shifting upwards of the production frontier. More specifically, technological change includes both new production processes, called process innovation and the discovery of new products called product innovation. With process innovation, firms figure out more efficient ways of making existing products allowing output to grow at a faster rate than economic inputs are growing. The cost of production declines over time with process innovations - new ways of making things.

Technical efficiency change, on the other hand, can make use of existing labour, capital, and other economic inputs to produce more of same product. An example is increase in skill or learning by doing. As producers gain experience at producing something they become more and more efficient at it. Labour will find new ways of doing things so that relatively minor modifications to plant and procedures can contribute to higher level of productivity.

DATA SOURCE

This study uses annual time series data the period 1984-2005. Data on capital, labour and value added are compiled from the Annual Survey of Manufacturing Industries, published by the Department of Statistics, Malaysia. As data on capital expenditure is not published, fixed assets is used for capital stock. The value added variable was deflated by the GDP deflator for the manufacturing sector and the capital variable was deflated using the gross domestic fixed capital formation deflator. Both deflators with 1987 as the base year were obtained from The Economic Report, published by the Ministry of Finance, Malaysia.

ANALYSIS OF THE RESULTS

Sources of TFP Growth

The results of the study reveal that between 1985 and 2005 the overall mean of TFP growth (TFPCH) of the Malaysian manufacturing industry for the entire test period is negative due to negative contribution from technical progress (TECHCH). Taken individually, however, some industries are experiencing positive TFP growth and operating at its maximum potential output. There are variations in the TFP growth for the period 1985 to 2005. It reveals that only four industries, namely food and beverages, wood products, rubber products and chemical industries are experiencing positive TFP growth. The remaining industries suffer a declining TFP growth over the time period. This means that only food and beverages, wood products, rubber products and chemical industries are able to cause shifts in their own frontier due to innovation. Wood products industries register the highest TFP growth at the rate of 13.9 per cent per annum, followed by rubber products with growth rate 13.3 per cent; food and beverages industries with growth rate of 8.6 per cent and chemicals industries with growth rate of 5.7 per cent (Refer to Table 3).

TFP growth for the food and beverages, wood products, rubber products and chemical industries is mainly due to efficiency change, with an index growth ranging from 1.200 to 1.279. These four industries are operating at its optimum potential output. This result reveals that the growth in these industries is boosted by the enhancement of their productivity-based catching-up capability, specifically the effective use of human capital in the labor market and the adoption of the new technology. The least efficient industry is the metal products which could increase its output by 15.9 per cent without increasing the use of its inputs. All the remaining industries are inefficient industries. The results reflect that technical efficiency does not depend on capital intensity because some of the inefficient industries are highly capital-intensive. On the other hand, industries which are more labour- intensive like food and beverages are very efficient.

Table 3
TFP Growth Rates over 1985 – 2005

Industry	*EFFCH*	*TECHCH*	*TFPCH*
Food and Beverages	1.200	0.905	1.086
Textiles	0.852	0.968	0.824
Wood products	1.279	0.890	1.139
Plastic products	0.900	0.889	0.800
Rubber products	1.209	0.937	1.133
Chemical	1.202	0.880	1.057
Metal products	0.841	0.848	0.713
Non-metallic mineral products	0.952	0.899	0.855
Electrical and electronics	0.954	0.860	0.821
Transport equipment	0.852	0.889	0.757
Overall	1.011	0.896	0.905

Contribution of Technical Change to Labour Productivity

In this section, the technological change from the previous analysis used as independent variable in the productivity growth function equation 8. Other independent variables include capital labour ratio and labour growth.

Table 4 shows results of regression analysis of equation (8) using OLS procedure. Serial correlation test of the first order was carried out. The test indicates the evidence of first order serial correlation in the textiles, rubber products and chemicals sub-industries. Therefore, further estimation using iterative Cochrane-Orcutt procedures is performed to correct this problem.

The value of R^2 in all SMIs subgroups except wood products sub-industry are greater than 0.7 indicating that the independent variables explain more than 70 per cent in the variation of the dependent variables respectively. The value of R^2 for wood products is 0.6341.

In seven SMIs subgroups the results show that the TECHCH significantly determines the labour productivity. Exception is found in the rubber products, chemical, and electrical and electronic sub-industries. Total employment is a significant determinant of labour productivity in eight SMIs sub-groups except in textiles and metal products. On the contrary, capital labour ratio is a significant determinant of labour productivity in six SMIs sub-groups except in textiles, wood products, plastic products, and electrical and electronic sub-industries.

The results show that management and professional group of workers significantly determines the labour productivity in eight SMIs subgroups. Exception is found in the chemical, and non-metallic mineral products sub-industries. The firm's managers significantly influence labour productivity.

The technical and supervisery workers significantly determine the labour productivity in seven SMIs subgroups except in textiles, wood and metal products sub-industries. On the contrary, production workers is a significant determinant of labour productivity in the nine SMIs sub-groups except in chemical. Pearession results for in the food and beverages, plastic products and transport equipment reveal that all three categories of workers significantly determine their labour productivity. In fact, all five independent variables significantly determines the labour productivity for the food and beverages and transport equipment sub-industries.

Direct production workers has a negative impact on labour productivity in seven SMIs subgroups. This type of workers has a positive impact on labour productivity only for textiles, rubber products and transport equipment sub-industries. In rubber products sub-industries, however, technical and supervisory workers have negative impact on labour productivity.

SUMMARY AND CONCLUSIONS

Malaysia has been experiencing a fast changing industrial process from adopting relatively low technology to high technology. In this process the most affected sector is SMIs because they form the majority of the manufacturing establishments. Some SMIs manage to cope very well with the changing needs and current market requirements. Nevertheless, some have to struggle and suffer from many problems coping with the manufacturing development process as a result of liberalisation and globalisation.

One aspect that must be possessed by SMIs so as to compete in the global market is efficiency in using inputs. When efficiency increases there will be a comparable reduction in cost of production and output price can be kept relatively lower. Through this mechanism, SMIs can penetrate the export market if the quality of their output is competitive enough.

The results from the analyses in this paper reveal that SMIs are slow in adopting technology. This may be due to several reasons such as smaller firms are less able to assess new methods

Table 4
Results of Labour Productivities Growth Regression Analysis In SMEs 1984-2005

Industry	*Intercept*	*K/L*	*L*	L_1/L	L_2/L	L_3/L	*TP*	R^2	*LM test*[1]
Food and Beverages	-1.36533	0.6477***	0.1519**	0.1556***	0.1427***	-2.8818***	1.1000***	0.9971	
	(0.694)	(0.034)	(0.061)	(0.035)	(0.023)	(0.685)	(0.142)		
Textiles	-6.9646	0.0287	1.2989	0.5014*	0.2170	0.8263**	0.0107**	0.7158	5.6239
	(7.068)	(0.021)	(17.28)	(0.924)	(0.114)	(0.283)	(0.004)		(0.01771)
Wood products	1.5977	0.0788	0.7751*	0.5330**	0.2152	-0.7205**	0.3948**	0.6341	
	(2.642)	(0.206)	(0.430)	(0.220)	(0.255)	(0.326)	(0.181)		
Plastic products	-3.5952	0.2119	0.0433*	0.5716**	0.3874***	-0.4454***	0.0555**	0.9825	
	(1.934)	(0.178)	(0.020)	(0.238)	(0.050)	(0.076)	(0.015)		
Rubber products	23.6614	0.8998*	2.0468**	0.5137*	-0.0818*	0.2342**	0.0310	0.9861	5.9518
	(6.304)	(0.317)	(0.481)	(0.169)	(0.028)	(0.073)	0.015)		(0.01470)
Chemical	5.0182	1.2406***	0.6319***	0.3904	1.2838***	-0.4205	0.0577	0.7968	10.6049
	(-0.114)	(0.201)	(0.063)	(0.356)	(0.319)	(0.393)	(0.034)		(0.00113)
Metal products	6.5436	0.0161*	0.0006	1.6233*	1.2498	-1.1691**	1.2482*	0.7237	
	(1.463)	(0.006)	(0.00037)	(0.681)	(8.481)	(0.397)	(0.487)		
Non-metallic mineral	17.1058	0.4742**	1.1341**	1.1743	0.1713**	-1.3438***	0.0544**	0.9321	
products	(7.948)	(0.138)	(0.350)	(1.186)	(0.033)	(0.203)	(0.013)		
Electrical and electronics	5.3547	0.0181	0.00002**	1.2959**	0.6226*	-0.0724*	0.4358	0.7833	
	(0.951)	(0.0187)	(0.00001)	(0.593)	(0.285)	(0.040)	(0.264)		
Transport equipment	1.8021	0.3643***	0.9856***	1.5269**	0.0256*	0.9709*	2.6428***	0.9444	
	(1.546)	(0.099)	(0.323)	(0.649)	(0.014)	(0.494)	(0.881)		

The dependent variable is labour productivity growth which is measured by the ratio of value added and number of workers.
Note: [1] Breusch-Godfrey Serial Correlation LM Test: $(n-1)R^2$
The figures in the parentheses below the estimated value of LM test are their probability of Chi-square(1)
Figures in parentheses are t-values
*** - significant at 1 per cent
** - significant at 5 per cent
* -significant at 10 per cent

and new process technologies are often based upon large firm experience. Advice to firms on this matter should be provided by the relevant authorities.

In general, SMIs pay lower wages than larger firms; therefore, smaller firms may be last in the queue for highly skilled labour. Firms need skilled workers to embrace new methods and to get the best use from new investment. Consequently, SMIs may find themselves located towards the low end of a productivity/wage/skill scale. As regression results show that direct production workers have a negative impact on productivity.

SMIs need to have a more educated work force, and provide formal structured training to their workers. They have to adopt greater automation and quality control in production, and improve on the human resource management and compensation practices that emphasize job stability and skill acquisition. This is an important step to move to a greater efficiency level in their operation. Efficient firms have better access to new technology through know-how licensing agreements, joint-ventures with foreign partners, and export contacts with foreign buyers and suppliers. Consequently, SMIs will likely becomes an important source of growth and employment generation in the economy.

Note

1. MIDA defines skilled workers as those who obtain certificate from the vocational schools or Industrial Training Institutes. The Ministry of Human Resource defines skilled workers as those who receive training for a period of more than 6 months, whereas semi-skilled workers are those who receive 3-6 months training. The Department of Statistics defines skilled workers as those who receive formal training for their specific job (either in service training or other type e.g. formal training in an institution). Unskilled workers are those who have not received any formal training for job they are performing. While semi-skilled workers are those who are not classified as skilled or unskilled workers.

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