Wage rate and employment in the manufacturing sector of Malaysia

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Abstract

This paper examines the importance of Malaysian manufacturing industries to the domestic economy and then estimates the demand for labor as a function of wage rate, output, and capital. The study uses the survey data of firms categorized according to the 3-digit Malaysian Standard Industrial Classification. The manufacturing sector has been contributing significantly to the Malaysia's economy in terms of its contribution to GDP, employment, and exports. The OLS results suggest that wage rate, output or production, and capital are all important determinants of labor employment in the manufacturing sector in Malaysia. Although their elasticities with respect to employment of labor are all inelastic, the demand for labor is relative more responsive to the changes in the output and capital than the wage rate. Therefore implementing policies to encourage capital accumulation and overall economic growth are indeed helpful to boost employment in the manufacturing sector. Malaysia's manufacturing output are mostly exported to foreign countries. This study indicates that the wage rate is an important determinant of labor demand in the manufacturing sector. Malaysia therefore has to manage it wage structure carefully such that the increase in wage rate must be in line with the increase in labor productivity. Otherwise Malaysian exports of manufactures will not be competitive in the world market and this will adversely affect the performance of Malaysian economy since Malaysia has been an export-oriented country in which exports have been the engine of growth.

Keywords: employment, manufacturing industry, Malaysia
JEL classification: J23, F24, F16

Introduction

In the early 1950s, Malaysia known then as Malaya, was a commodity-based economy relying heavily on the exports of tin and rubber to generate job opportunities and income. The export earnings were utilized to import consumption goods as well as capital goods to develop the economy. But the performance of the exports of the primary commodities was volatile. As the export earnings of the primary commodities had deteriorated, Malaysia switched to the import substitution development strategy during the 1957-1960 period designed to replace the imports with locally

produced goods by erecting tariff and non-tariff barriers to trade. Toward this end. in 1960, Malaysia established the Malaysian Industrial Development Finance (MIDF) as a means to extend financial support to the manufacturing firms; this was followed by the establishment of the Malaysian Industrial Development Authority (MIDA) in 1965 to promote investment in the industrial sector, particularly the manufacturing sector. Then in 1968, the Investment Incentive Act was introduced to enhance the process of industrialization through tax exemptions and other fiscal incentives.

In 1970s, the Malaysian economy took another stride shifting toward the export-oriented industries as it was realized that rapid economic growth rate could only be achieved through exports because the small domestic market was unable to absorb excess production. As a result, more lucrative incentives were offered to the export-oriented industries such as low interest credit, excise tax exemptions, sales tax exemptions, and import duty refunds. Free trade zones (FTZs) were then introduced to lure foreign direct investment, particularly in the export-oriented industries. The FTZs enjoy, among others, duty free imported materials and other subsidies.

In the mid-1980s, Malaysia reinforced the outward orientation development strategy. This was because both the heavy industry which was introduced as a means to diversify the industrial sector and import-substitution industries did not perform to expectations. This was exacerbated by the fact that most of the infant industries also did not show satisfactory performance which tended to impede the expansion of the manufacturing sector.

As a result of the 1984-85 recession, Malaysia implemented a three prong strategy to revitalize the Malaysian economy, namely through the: export promotion, import liberalization, and FDI liberalization. Thus, in 1985, Malaysia reduced the average tariff to about 13 percent. More reduction in tariff on imported items was introduced in 1989 to boost foreign direct investment and therefore from mid-1980 to late 1980s there was a significant inflows of foreign direct investment (FDI) in manufacturing sector as Malaysia relaxed more policies in favor of FDI along with the financial liberalization through the opening up of the capital account. As a result, the industrial sector has continued to record rapid expansion in both the production as well as industrial base, except during the 1997-1999 period due to the Asian financial crisis.

The Malaysian manufacturing sector

Manufacturing involves the production of goods by using machines, equipment, labor, and raw materials. The manufacturing sector is closely related to engineering and industrial design and indeed it has a large influence in a country's economy. Malaysia is a middle income country with a multi-sector economy based on manufacturing and services. Manufacturing industries has contributed significantly to the Malaysian economic development. And as of 2011 the share of manufacturing in GDP was at 27.5 percent. The sector can be divided into two major categories: the resource based industries and non- resource based industries and these industries are fairly well developed. The major manufacturing industries are: electronics, electrical machinery and appliance; chemicals, chemical and plastic products; petroleum products; iron, steel and metal products; wood and wood products; and textile and apparel. As of 2011 the share of manufacturing production by its major sub-sectors are: electrical and electrical machinery was at 26.4 percent, chemical and chemical products at 19.0 percent, and petroleum products at 15.9 percent while the contribution of other sub-sectors were small at less than 5 percent.

As Malaysia's domestic economy is small, in terms of physical size and population, much of its manufactured products are exported to the foreign market. As of 2011, the major importing countries of Malaysian exports are Singapore at 13.6 percent, China at 13.2 percent, EU at 12.6 percent, the United States at 11.0 percent, and Japan at 7.0 percent. The major exports of manufactures are: electronics, electrical machinery and appliance at 46 percent; chemicals, chemical and plastic products at 10.2 percent; petroleum products at 7.8 percent; and iron, steel and metal products at 6.0 percent. It is very obvious now that the Malaysia's manufacturing sector has been too heavily dependent on electronics, electrical machinery and appliance; chemicals, chemical and plastic products; and petroleum products in terms of production and exports.

Structure of employment in Malaysia

The development of Malaysian labor market followed closely with the macro-policy changes to gear-up the Malaysian industrialization process. The manufacturing sector was regarded as the source of employment expansion, especially during the labor displacement period in agriculture and mining sectors beginning in 1970 to early 1980s. As a result of these structural changes, Malaysia implemented a policy to encourage the migration of the rural workforce to the urban-based industries. Table 1 indicates the changes in the structure of employment in Malaysia. The agriculture sector had contracted considerably where in 1970 it contributed 50.5 percent to the total employment but by 2007 its contribution to total employment was merely 12 percent. On the other hand, during the same period the employment in the manufacturing sector increased significantly when its contribution to total employment increased from 11.4 percent in 1970 to almost 30 percent in 2007. Employment in the services sector has been increasing where its contribution increased from 31.5 percent in 1970 to 51.5 percent in 2007. The contribution of mining and quarrying sector has been declining from 2.6 percent in 1970 to only 0.4 percent in 2007.

Table 1. Employment by Sectors (% to total)

Sector	1970	1980	1990	2000	2007*
Agriculture, forestry & Fishing	50.5	40.6	26.0	15.2	12.1
Mining & Quarrying	2.6	1.7	0.6	0.4	0.4
Manufacturing	11.4	15.8	19.9	27.6	29.3
Construction	4.0	5.2	6.3	8.1	6.7
Services	31.5	36.7	47.2	48.7	51.5

Sources: Fourth Malaysia Plan (1985), Seventh Malaysia Plan (1999), Eight Malaysia Plan (2001), EPU (2007), * Estimates

Under the New Economic Policy (NEP), introduced in the 1970s, the strategy for the industrial development was through labor-intensive manufacturing as a way to create employment opportunities. But in the 1980s, the increase in the employment of labor in the manufacturing sector was rather low as there had been a shift in the industrial development strategy towards a more capital-intensive industries since Malaysia is no longer a cheap labor economy. As a result, many firms were more inclined to employ labor-saving technologies which were reinforced by the 1985 recession. The shift in the strategy to promote capital-intensive industry has been viewed as a way to diversify the industrial sector. As Malaysia is no longer a cheap labor economy, the transition from labor to capital intensification is indeed a step in the right direction.

Table 2 indicates that employment in the manufacturing sector has been generated by its three sub-sector: the electrical and electronics products, wood & wood products, and chemicals. The electrical and electronics products has been generating the highest number of employment contributing 32.9 percent in 2004 and increased to 35.5 percent in 2006; second is the wood & wood products contributing 12.8 and 12.7 percent and third is the chemicals sub-sector which contributed 12.1 and 12.0 percent respectively. As of 2006 these three sub-sectors generated 60.2 percent of the total employment in the manufacturing sector; the other sub-sectors have contributed less than 6.0 percent each to the employment in the manufacturing sector.

Table 2. Employment by Industry Sub-sector 2004-2006

Industry	Number of Persons		
	2004	2005	2006
MANUFACTURING SECTOR (Total)	962,813	998,553	1,084,571
Electric & Electronics	316,705	335,132	384,942
Wood & Wood Products	123,425	126,921	138,154
Chemicals	116,376	124,780	129,418
Textile & Apparel	69,074	66,506	65,023
Rubber Products	57,620	59,409	63,728
Transport Equipment	52,647	58,327	52,795
Fabricated Metal Products	39,197	38,340	46,276
Non-Metallic Mineral Products	39,798	39,772	41,423
Processed Food & Beverages	34,962	36,155	39,008
Professional & Scientific Equipment	28,423	25,986	31,279
Printing, Publishing & Allied Industries	23,168	23,570	24,979
Iron & Steel	15,509	15,696	18,385
Machinery & Equipment	11,152	12,450	12,700
Others	34,757	35,509	36,461

Source: Matrade, Malaysia.

There are several implications following the transition from labor to capital intensive industries. First, export-oriented industries were largely dependent on foreign direct investment. Hence, promotion of employment expansion has to be aligned with policies to lure foreign direct investment. The second factor is technology. The electronics sub-sector, for example, could not expand employment without first expanding their productive investment. This implies that technological change and new products play crucial roles in the expansion of these establishments which means that the skill requirements of labor would also have to move up towards higher technical skills.

Review of Literature

Heshmati, Almas & Mkhululi Ncubi (2004) study employment in the Zimbabwe's manufacturing industries by specifying the labor demand as a function of wages, output, quasi-fixed capital, and time variables as suggested by Layard(1986), Nickell (1986), and Symons (1985). The results of the estimated labor demand equation suggest that labor demand is more responsive to wage changes than capital and output. They argue that an excessive increases in real wages have a negative impact on labor retention in the Zimbabwe's manufacturing sector, and that investment and economic growth are essential for employment creation. Therefore, emphasis should be placed on policies that encourage

capital accumulation, aggregate demand and overall economic growth as a means to spur employment in Zimbabwe's manufacturing industries.

Polat, Ozgur & Enes Ertad Uslu **(**2011) examine the impact of international trade on employment in the manufacturing industry using a panel data of 95 manufacturing industries in Turkey. They use a labor demand equation which incorporate wages, output and international trade variables such as imports and exports. The results show that an increase in output had a positive impact on employment, while wages had negative impact on employment in all models analyzed in this study.

In another study, Nursel Aydiner-Avsar and Ozlem Onaran (2010) estimate the effects of wages, real output and trade openness on employment in the private manufacturing industry in Turkey based on panel data. They also distinguish sectoral differences with respect to skill intensity. Generally, they find a significant impact of domestic factors, namely real wage and real output on employment. Output elasticity of labor demand is higher than wage elasticity in the total manufacturing sector for the whole estimation period and in the high and medium-skilled sectors in the post-1980 period. This indicates that a stronger economic growth performance could have been a more effective policy than relying on low wages to stimulate employment. The wage elasticity of employment increases after trade liberalization, however despite this fact, the significant real wage declines in the post-1980s failed to create a strong employment boost in the Turkish manufacturing sector.

A study on labor use and adjustment in the Indian manufacturing industries using two-digit manufacturing industries data was done by Bhandari (2005). The labor demand was estimated as a function of real wage, value added or output, and capital. The results indicate that the mean of labor demand elasticity with respect to each of the independent variables is highest for output, followed by capital, and wages. These imply that more employment opportunities were generated by increasing the output. As for the capital stock that has a complementary relationship with labor employment, more employment opportunities would be created with the increase of capital stock.

Yusop *et. al.* (2005) conduct a study to determine the linkages between output, wages, productivity and employment in the electronic and electrical sub-sector of Malaysia. The findings suggest that in the short-run, changes in productivity are linked with changes in real wage, real output and employment. In addition, real output and productivity has an impact on the changes in employment. In the long-run, an increase in output lead to the increase in employment while increase in real wage constitutes towards a decrease of the real output.

Dunne & Roberts (1993) estimate the long-run demand functions for production workers, production worker hours, and nonproduction workers using micro data from U.S. establishment surveys. The study focuses on the estimation of the wage and output elasticities of labor demand using data on U.S. manufacturing plants in 1975 and in 1981. The empirical results reveal that the OLS estimates of both the wage elasticity and the output elasticity of labor demand are biased downward due to unobserved heterogeneity of the date. Estimates of the output elasticity of labor demand indicate that there are slight increasing returns to scale for production workers and production hours, with a pooled data estimate of 0.92 ,while the estimate for nonproduction workers is 0.98. Estimates of the average wage elasticity vary from -0.50 for production hours, -0.41 for production workers, and -0.44 for nonproduction workers.

Haouas, Yagoubi & Heshmati (2003) investigate the process of adjustment in employment to a panel of six Tunisian manufacturing industries in the period 1971–96. Industries are assumed to adjust their labor inputs towards a desired level of labor-use. A translog labour requirement function is specified in terms of observable variables and is used to model the desired level of labor-use. The labor requirement is specified to be function of wages, output, quasi-fixed capital stock and technology. The empirical results show that in the long run, employment demand responds greatest to value-added, followed by capital stock changes, and the least is by wages. The speed of adjustment in employment and the degree of labor-use efficiency show large variations among the sectors and over time.

Aswicahyono & Purnagunawan (2013) estimate the labor Demand in the Indonesian Manufacturing to examine the relationship between employment and the value added, wages, a proxy for productivity(TFP), FDI and exports. The results indicate the employment elasticity is 0.14 with respect to value added. The labor cost coefficient is 0.14, negative and significant. The effect of TFP on employment is negative and significant as TFP has affected employment through the adoption of new technology appeared to have been labor-saving during the period. Both FDI and exports are positively related to employment. The export relationship is in line with the expectations that firms engaged in exporting are likely to employ more workers, building on Indonesia's comparative advantage in a relatively abundant supply of unskilled labor. The significant coefficient for FDI is perhaps because foreign firms seek to take advantage of an abundant labor supply.

The Model

For estimation, we specify the model as

$$L_i = \beta_0 + \beta_1 W_i + \beta_2 Y_i + \beta_3 K_i + \varepsilon_i \qquad (1)$$

where L is employment, W is the nominal wage rate, Y is the value of output, K is capital, $\beta_1 > 0$, $\beta_2 > 0$, $\beta_3 > 0$, ε is the error term, and i is the i-th group of firms with the 3-digit Malaysian Standard Industrial Classification. The wage rate is one of the components of the cost of production; higher wage rate reduces employment level. Employment is expected to be positively related to the output level while capital could be positively or negatively related to employment depending on the level of technology of the firms. If the technology is labor saving, then an increase in the utilization of capital reduces the employment of labor. On the other hand, if labor and capital are used in a fixed proportion or complementary then an increase in capital will increase the employment of labor.

Sources of data and definitions of variables

The study employs the 2010 survey data of firms categorized according to the 3-digit Malaysian Standard Industrial Classification (MSIC) published by the Department of Statistics (DOS) of Malaysia which is similar to the Standard Industrial Trade Classification (SITC) of the United Nations. The total number of observations is 67. The survey data publishes the information of the value of output, wages and salaries, the number of workers, and the value of fixed assets. Employment is represented by the number of workers employed by each of the MSIC 3-digit firms. The wage rate is the total wages divided by the number of workers while the value of capital is represented by the value of fixed assets.

Estimation Methods

Equation (1) suggests that the error terms, ε_i, might be correlated across firms in the 3-digit Malaysian Standard Industrial Classification. Estimating the model using OLS will still give consistent estimates but they are not efficient. We then test the presence of heteroskedasticity of the error term by employing the Breusch-Pagan-Godfrey test suggested by Breusch-Pagan (1979) and Godfrey(1978) which is a Lagrange multiplier test with the null hypothesis of no heteroskedasticity. The test is done by using the auxiliary regression where the estimated squared residuals from the original equation is the dependent variable and the regressors of the original equation are the independent variables. The estimated explained sum of squares from this auxiliary regression is then divided by $2\hat{\rho}^4$ to obtain the LM-statistic which follows a Chi-squared distribution with degrees of freedom equal to the number of variables under the null hypothesis of no heteroskedasticity. Koenker (1981) suggests a test statistic of Obs*R-squared which is also distributed as a Chi-squared with degrees of freedom equal to the number of independent variables.

Results and Discussion

The results of the Breusch-Pagan-Godfrey heteroskedasticity test gives the scaled explained sum of squares = 2.613781 with probability Chi-Square(3) = 0.4551. The Koenker statistic gives obs*R-squared =1.1350 with the probability Chi-Square(3) = 0.7686. Therefore the null hypothesis of no heteroskedasticity is accepted. We then estimate equation (1) using the ordinary least squares (OLS) in logarithm form.

Table 3. Results of Ordinary Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Probabilty
C	-5.751393	1.199439	-4.7950	0.0000
W	-0.238961	0.094187	-2.5370	0.0137
Y	0.427641	0.142874	2.9931	0.0039
K	0.392377	0.143076	2.7424	0.0079

R-squared =0.8433, Adjusted R-squared = 0.8359,
F-statistic = 113.0824 with probability = 0.0000.

The results of OLS given in Table 3 indicate that all the variables are significant at 1% level and have the expected correct signs as suggested from theory. Specifically, a 1% rise in wage rate would reduce employment in the manufacturing sector by 0.24%; an increase in production of 1% would increase employment by 0.43%; and a 1% increase in capital would increase employment by 0.40%. The goodness of fit of the model is satisfactory as indicated by the high adjusted R-squares which indicates that 84% of the variation in employment could be explained by wage rate, output, and capital. The F-statistic is significant at 1% level suggesting that all the regressors are capable of explaining employment in the manufacturing sector.

Conclusion

The descriptive analysis of this study clearly indicates that although the Malaysia's manufacturing sector is fairly well diversified, it is heavily dependent on three major sub-sectors, namely: the electronics and electrical machinery, chemical and chemical products, and petroleum products to generate production activity and employment opportunities. The electronics and electrical machinery exports, in particular, are highly susceptible to the performance of the world economy. As the world economy faces a down-turn, the Malaysian exports fall which will result in unemployment problem.

This paper also examines the wage rate, production (output), and capital as the determinants of the employment of labor in Malaysia's manufacturing industry. The OLS results suggest that all the variables are important determinants of labor demand in the manufacturing industry. The labor employment is relatively more responsive to the changes of manufacturing output and capital than the wage rate. The manufacturing production in Malaysia is mostly exported to foreign countries such as China, the United States, EU, and Japan as Malaysia is a small open economy. The results imply that a fall in the Malaysia's exports of manufactures will reduce the production of manufactured goods which adversely affects employment in the manufacturing sector. Labor employment is also more responsive to the changes in capital suggesting that an increase in capital usage will help increase employment. Therefore implementing policies to encourage capital accumulation and overall economic growth are indeed helpful to boost employment in the manufacturing sector. This study also indicates that the wage rate is an important determinant of labor demand in the manufacturing sector. Malaysia therefore has to manage its wage structure carefully such that the increase in wage rate must be in line with the increase in labor productivity, otherwise the Malaysian exports of manufactures will not be competitive in the world market and this will adversely affect the performance of Malaysian economy since Malaysia has been an export-oriented country in which exports have been the engine of growth.

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