The Demand for Foreign Workers in the Manufacturing Sector in Malaysia

(Permintaan Terhadap Buruh Asing dalam Industri Pembuatan di Malaysia)

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ABSTRACT

The objective of this study is to investigate the demand for foreign workers in the manufacturing sector in Malaysia. In order to achieve this objective, the simultaneous equation model is developed and the analyses are based on data from the Industrial Survey conducted by the Department of Statistics Malaysia for the period of 1994-2005. The Labor demand model is derived from the Cobb-Douglas production function. The results from the estimation of the production function show that foreign workers in the category of professional significantly contributed to the output growth of ISIC 35, ISIC 36 and ISIC 38, while skilled workers and technical-supervisors also give a significant contribution to output growth in ISIC 31. The demand for foreign workers reveals that professionals and technical-supervisors are positively related to output level and wage rates. However, they are negatively related to the price of capital and local wage rate. It means that the professional and technical-supervisor foreign workers complement the local workers and capital.

Keywords: Demand; output; foreign workers; wage

ABSTRAK

Objektif kajian ini ialah untuk menganalisis permintaan industri pembuatan terhadap buruh asing di Malaysia. Bagi mencapai objektif ini, model persamaan serentak telah dibina dan penganggaran dibuat berdasarkan kepada data Penyiasatan Industri Pembuatan dari Jabatan Perangkaan Malaysia selama tempoh 1994-2005. Model permintaan terhadap buruh asing diperoleh melalui proses pembezaan fungsi pengeluaran Cobb-Douglas. Penganggaran fungsi pengeluaran memperlihatkan bahawa buruh asing profesional mempunyai peranan yang signifikan terhadap peningkatan output kumpulan industri ISIC 35, ISIC 36 dan ISIC 38. Buruh asing mahir dan teknikal penyeliaan pula mempunyai peranan yang siknifikan terhadap peningkatan output kumpulan industri ISIC 31. Penganggaran fungsi permintaan buruh asing profesional dan teknikal-penyeliaan menunjukkan hubungan yang positif dengan output dan upah buruh asing itu sendiri. Bagaimanapun, kedua-dua kategori pekerja ini mempunyai hubungan negatif dan signifikan dengan harga barang-barang modal dan upah pekerja tempatan. Ini bermakna bahawa buruh asing profesional dan teknikal-penyeliaan merupakan penggenap kepada modal fizikal dan pekerja tempatan.

Kata kunci: Permintaan; pengeluaran; buruh asing; upah

INTRODUCTION

Over the past few decades, the Malaysian economic structure has been experiencing change; from agricultural sector to manufacturing and services sectors. As a result of this change, Malaysia is facing labor shortages at all job categories. The manufacturing sector, particularly, is severely affected than other sectors due to its rapid growth rate especially in early 1980s when export oriented and heavy industries were introduced. To overcome this problems, the Malaysian economy had to rely on foreign workers through the implementation of policies that permitted them to migrate legally into Malaysia. The neighboring countries like Indonesia, the Philippines, Thailand and Myanmar took advantage of this situation by sending their workers, especially the unskilled to work in Malaysia. This was done in parallel to overcome their labor surplus. Despite a legal channel provided by the government, the majority of foreign workers still used an illegal channel in order to save costs in terms of levy payments (See Azizah 1998; Mohd Anuar 1997; Zulkifly 1996).

Osili (2007) suggested that part from changes in the economic structure and dichotomy in the growth rate between countries in the region, labor mobility was also initiated by globalization which is significantly taking place all over the world. Changes in the international trade structure and a rapid interaction between all areas had motivated trade, investment, remittance, saving and the flow of information technology that

greatly influenced labor mobility. In the ASEAN region for example, the formation of growth triangle such as Indonesian-Malaysian-Thailand Growth Triangle (IMT-GT), Indonesian-Malaysian-Singapore Growth Triangle (IMS-GT) and Indonesian-Malaysian-Philippines Growth Triangle (IMP-GT) had stimulated the interaction among these countries. Moreover, the main objective of this formation is to increase investment, trade and export among the region as well as to increase tourism and labor mobility (See also Rahmah 1997; Zulkifly & Rahmah 1997).

Kanapathy (2008) supported the view that economic transformation changed the structure of labor demand. The rapid growth of the manufacturing and services sectors has required more professional and skilled workers to cope with the adoption of fast changing technologically. However, the demand for semi-skilled and unskilled workers is still high due to increase in the total number of employment. In this regard, the Malaysian economy facets two scenarios. The first scenario is labor surplus in certain job categories. This is as a result of fast improvement in the educational attainment among people and difficulties in planning its human resource in accordance to the country's need. Apart from this, people are becoming more selective in accepting job offer. Another scenario is job abundance especially in the lower rank; where by foreign workers are needed due to reluctance from local workers.

According to the Mnistry of Home Affairs report 2011 (Mnistry of Home Affairs 2011), the number of migrant worker in Malaysia by country of origin shows that Indonesia has the highest number of migrant, followed by Bangladesh, Pakistan, Thailand, and Philippines. The number of Indonesian migrant workers to Malaysia increased considerably from 269,194 in 1999 to approximately 1,1 million in 2008. They make up more than half of the total number of migrants in Malaysia. Migrations from the Philippines showed an increasing trend over time of which the number was at 7,299 and 26,713 in1990 to 2008, respectively. The number of migrants from Thailand showed an unstable trend, from only 2,130 in 1999 to 20,599 in 2002, and 5,751 in 2005 but then increased to 21,065 in 2008. Although, the percentage of the Philippine and Thai migrants was quite low, making up less than 5%, the impact was rather significant to Malaysian economy. The majority of the migrant workers are in the manufacturing sector, comprising with more than 30% of the total migrants in Malaysia. This shows that the manufacturing sector in Malaysia depends highly on foreign workers.

The objective of this study is to analyze the demand for foreign workers in the manufacturing sector in Malaysia. More specifically, the objectives of this study are to analyze: (1).The contribution of foreign workers to the manufacturing output sub-industries in Malaysia; (2).The determination of industrial demand factors to foreign workers; (3). The elasticity substitution of foreign workers to capital and local workers.

LITERATURE REVIEW

Whether or not an involvement of foreign labors in the production process of a country will assist in economic growth is still debated (Osili 2007). Some findings showed a positive correlation between economic growth and foreign labor because they can create job opportunities and capital accumulation (Simon 1988). On the contrary, other studies found that foreign workers retarded economic growth because the majority of them are unskilled (World Bank 1995). On the positive side, some studies argued that the influx of foreign labors could increase demand for food and services in destination countries; and subsequently increased the rate of return from investment and capital accumulation (Greenwood & McDowell 1986).

The first opinion is generally argued that countries will get benefits from the influx of foreign workers because they can stimulate economic growth through the increasing of public demand for goods and services, and capital formation (Simon, Stephen & Sullivan 1993). This opinion is based on the *Say's Law* which suggests that supply will always create a demand (*supply create its own demand*). While others opinions expressed that if the influx of foreign workers is massive, they could hamper economic growth because they are of low-skilled and low-educated. In fact, some argued that the influx of foreign workers will only lead to problems in the social, economic and political areas of the importing country because many of those entered illegally (see also Orjithan 1985).

A study conducted by Simon (1988) in the state of California and the city of Los Angeles in the United States found that the influx of foreign workers has provided substantial benefits to a wide range of industrial output growth in both regions. While the negative effect of the influx of foreign workers to local workers was very small and mostly concentrated to the local workers who come from Latin American countries. Furthermore, the highest impact of the influx of foreign workers on economic growth was mainly due to strong growth of employment in both regions. During the 1970-1980 periods, employment had grown by 46.1% in California and 52.7% in Los Angeles. The increase in the growth of the labor force caused a 5.2% contraction in wage due to the influx of foreign workers in those two regions.

In Europe, the findings of a study conducted by Zimermann (1995) concurred the study conducted by Simon (1988). The influx of foreign workers significantly impact on economic growth, employment opportunities and wages of local workers. This is because the influx of foreign workers increases the capital formation and creates new job opportunities for local workers. In

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│   The influx of Foreign Workers │ ─────────────────→ │      The Effects of Stimulus    │
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│  Increase Demand for Products in│ ─────────────────→ │ - Increase Capital Rate of Return│
│      Countries Destination      │                    │ - Increase Industrial Marginal Revenue│
└─────────────────────────────────┘                    │ - Increase Output and Job Opportunities│
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│  Increase Capital Development in│ ─────────────────→ │  Increase Economic Growth in    │
│      Countries Destination      │                    │      Countries Destination      │
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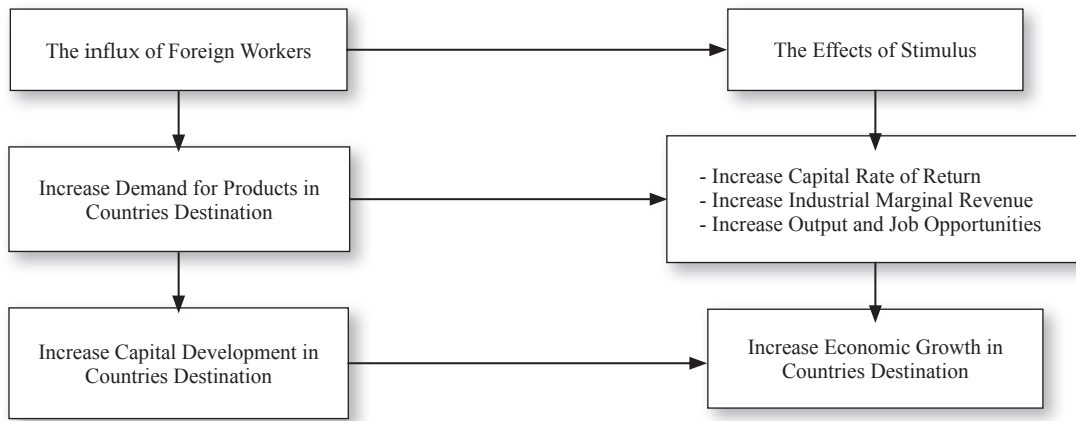
FIGURE 1 Effect of foreign workers against economic growth (opinion optimistic)

addition, the influx of foreign workers does not adversely affect the wages of local workers because they were complementary in the production process (see Figure 1).

In Australia, a study conducted by Dickson (1975), found that the influx of foreign workers acts as a stimulus to the economic growth of the country. The influence of this stimulus occurred through the complementary relationship between foreign workers with local workers, whereby the influx of foreign workers encouraged the local workers to be more productive; thus, stimulating the increase in output and consumer demand for goods and services produced. Shortly, we could note that the complementary relationship between foreign workers with local workers is believed to be one of the forces that could encourage an increase in the rate of economic growth in the country.

A study conducted by Norman and Meikle (1985) in the same state also supported Dickson's findings (1975). By using econometric analysis, Norman and Meikle found that the influx of foreign workers could improve job opportunities for local workers far exceeding's the negative effect caused by the influx of foreign workers. Creation of employment opportunities is not only done by foreign workers together with local workers to form a joint venture, but it could also be done by foreign workers themselves independently. Therefore, Norman and Meikle (1985) believed that the form of a complementary relationship between foreign workers with local workers provided considerable benefits to boost the country's economic growth.

In contrast to the studies by Dickson (1975), and Norman and Meikle (1985), other studies conducted by Greenwood and McDowell (1986) in the United States found that the opposite situation; whereby the influx of foreign workers resulted in a negative and significant impact on wages and employment opportunities for local workers. According to them, the influx of more foreign workers surrogate (substitute) against the interests of local workers for foreign workers to get involved and become a member of the labor union. They generally worked in non-permanent jobs and many of the foreign workers worked illegally. This situation led to various demands by local workers to improve their well-being that was affected because of the foreign workers. Therefore, Greenwood and McDowell (1986) believed that the influx of foreign workers, especially foreign workers without permits had reduced employment opportunities and wages of local workers.

The study conducted by Baker (1987) in Australia, as well as a study conducted by Baker and Benjamin (1994) in Canada supported the results of studies conducted by Greenwood and McDowell (1986). According to those researchers the influx of foreign workers could hamper the economic growth, employment opportunities and wages of local workers because foreign workers enjoy the benefits from the use of capital without paying any cost for it. Foreign workers utilized public facilities of a country but they do not have to pay taxes, while taxes are used to construct public facilities. This situation would lead to an elimination of the amount of capital available for local workers. Therefore, those experts believed that the influx of foreign workers could hamper economic growth and the opportunity for raising wages earned by local workers.

A study conducted by Baker (1987) in Australia for example found that for every 1% increase in the number of workers caused by the influx of foreign workers would raise 1% of investment. Mean while, the increase of 1% in local workers could raise 8% capital formation compared to capital formation caused by the influx of foreign workers. This suggested that the effect of the influx of foreign workers against capital formation is very small and could inhibit the incoming of overall capital formation. Therefore, Baker (1987) believed that the influx of foreign workers could hamper economic growth, employment opportunities and rising wages of local workers.

In Malaysia, there are several studies that investigate the issues of foreign workers, such as the studies by Zulkifly (1995), Rahmah, Nasri, Zulkifly and Zulridah

(2003) and Idris and Rahmah (2006). For example, the study conducted by Zulkifly (1995) in the case of foreign workers in plantation sector, he found that the ratio of foreign worker to total labours had increased. Meanwhile, the wage rate of local workers had shown down ward trend due to the presence foreign workers influx. Although, this studied was not tested emperically, but it provides the indication that the influx of foreign workers to Malaysia had brought unfavorable condition to job opportunities and wage rate of local workers. The influx of foreign workers had caused the job opportunities and wage rate for local workers to decreased.

Rahmah et.al. (2003) studied the role of foreign labour on output growth, job opportunity and wage in the Malaysian manufacturing sector and found that professional foreign labour contributed significantly to manufacturing output growth. The study also found that professional foreign labour and local labour are complementary, while the unskilled foreign labour and local labour are substitutes. Similar to Rahmah et.al. (2003), Idris and Rahmah (2006) also analysed the elasticity of substitution between foreign and local workers in the Malaysian manufacturing sector. The results from the study showed that the foreign and local workers are more of substitute than complement. It indicates that when the foreign wage decreased, firms would be willing to take foreign workers to cut cost of production. A high substitutability are found in heavy industry of basic metal products. Idris and Rahmah (2006) also suggested that the influx of foreign labour may jeopardized the local in terms of job opportunity, especially in heavy industry.

THE DEMAND MODEL FOR FOREIGN WORKERS

As we know that the industrial demand for labor is derived from the demand of manufacturing output. Therefore, the demand function of the manufacturing industry for foreign labourer can be derived from two different approaches. The first is the production function with cost constraint, and the second is cost function with production constraint. The former can be done if the inputs of manufacturing production functions are fully available, while the second can be done if inputs of production function are limited (Hamersmesh 1984).

There are different types of production function – (eventhough they assume that labor is homogeneous or heterogeneous) – and they have long been developed by economics experts, for examples: Cobb-Douglas production function, production function with constant elasticity of substitution (CES) and translog function. Unfortunately, these three production functions have limitations when they are used to analyze the capital and labor roles through outputs of various industries. The Cobb-Douglas production function weakness is the aggregative, where by the total of all production functions at firms level cannot be formed as a function

that is commonly accepted in an industry (Osman & Maisom 1990). The CES production function is not easily developed if we use more than two inputs in the process of production. The translog production function cannot analyze the data with a value that is equal or close to zero (Bairam 1991).

The Cobb-Douglas production function has a limitation. However, it is still more suitable to achieve the objectives of this study. There are several reasons for it this. *First*, this production function can accept more than two inputs in the process of production where by this advantage cannot be found in CES and translog production functions. *Second*, it has a simple form and easier to understand as it is formed in log-linear (Hamermesh, 1984; Osman & Maisom1990). The common form of Cobb-Douglas production function is as the following (see Gujarati 1995; Zanias 1991):

$$Q = A\, K^{\alpha}\, L^{\beta}, \text{ where } A > 0;\ 0 < \alpha \text{ and } \beta < 1 \quad (1)$$

Where Q is output, K and L are capital and labor inputs, while α and β are parameters to show the extending of technology that intensively utilize capital and labor in the process of production.

This production function is a commonly written and used by economic experts. It can be generalized to more than two inputs that are used in the process of production. For examples, the utilization of inputs combinations: capital and local workers, capital and foreign workers, local workers and foreign workers. There by Cobb-Douglas production function with capital, local and foreign workers inputs, could be written in equation form as the following (Rahmah & Lum 2000):

$$Q = A\, K^{\alpha}\, L_n^{\beta}\, L_m^{\delta} \quad (2)$$

As like usual Q is output, A is the parameter that shows technological improvement; K, L_n and L_m are capitals, foreign and local workers in the process of production, respectively.

The costs that are spent by industry for these three inputs are very essential in determining the industrial profits. This is because the highs and lows of outputs' selling prices in the market depend on the fluctuation of inputs costs fluctuation. Nevertheless, in practice the calculation of costs spending by industry is complicated, especially the cost for foreign workers. In that respect, the industrial spending for various inputs can be estimated through costs that are paid out by an industry.

Cost function that expresses the high and low of outputs' selling prices in the market can be written as the following (Hebbink 1993):

$$C = r\, K + w_n\, L_n + w_m\, L_m \quad (3)$$

Where C is costs of r, w_n and w_m, are capital, goods price, local workers wage, and foreign workers wage, respectively. In this context, wage is seen as cost that has to be paid in production process. It means, the higher the wages for workers, the lesser the profits for employers.

The increasing of wages causes the employers to rethink and compare them between additional profits received and additional costs for workers' payment. In that case, the increasing of wage will cause the decreasing of industrial demand for foreign workers or the demand for capital goods will increase.

By using *the Langrange Equation (ξ)*, the industry optimum benefits can be gained by cost minimizing with production constraints as follow:

$$\xi = rK + w_nL_n + w_mL_m + \lambda(Q - AK^\alpha L_n^\beta L_m^\delta) \quad (4)$$

$$\partial\xi/\partial K = r - \lambda\alpha AK^{\alpha-1}L_n^\beta L_m^\delta = 0 \quad (5)$$

$$\partial\xi/\partial L_n = w_n - \lambda\beta AK^\alpha L_n^{\beta-1}L_m^\delta = 0 \quad (6)$$

$$\partial\xi/\partial L_m = w_m - \lambda\delta AK^\alpha L_n^\beta L_m^{\delta-1} = 0 \quad (7)$$

$$\partial\xi/\partial\lambda = Q - AK^\alpha L_n^\beta L_m^\delta = 0 \quad (8)$$

The equilibrium of inputs between foreign workers with capital; and local workers, can be found by the equation (5) to (8):

$$\frac{w_m}{r} = \frac{\delta K}{\alpha L_m} \quad (9)$$

$$\frac{w_m}{w_n} = \frac{\delta L_n}{\alpha L_m} \quad (10)$$

$$\frac{w_m}{r} = \frac{\beta K}{\alpha L_n} \quad (11)$$

By simplifying equation (9) to equation (11), the demand of each input in the production process can be written as follows:

$$K = \left(\frac{Q}{AL_n^\beta L_m^\delta}\right)^{1/\alpha} \quad (12)$$

$$L_m = \left(\frac{\delta r}{\alpha w_n}\right)K \quad (13)$$

$$L_n = \left(\frac{\beta w_m}{\delta w_n}\right)L_m \quad (14)$$

There are a few steps to complete the industry demand derivatives of foreign workers. *First*, insert the substitution equation (14) in equation (12) in order to get a new equation. *Second*, the result of the new equation is substituted in equation (13) to find the demand function for foreign workers:

$$L_m = \left\{\left(\frac{\delta r}{\alpha w_n}\right)^\alpha\left(\frac{Q(\delta w_n)^\beta}{A(\beta w_m)^\beta}\right)\right\}^{\frac{1}{\alpha+\beta+\delta}} \quad (15)$$

Where L_m is foreign workers demand, Q is output, and r, w_n and w_m are prices of capital goods, wages for local and foreign workers respectively.

MODEL SPESIFICATION AND VARIABLES

This study utilizes pooling data with cross section analysis and time series. This specification may appear

biased; caused by firms differences that occur in certain industry categories, for instance sizes, the amount of workers, industry locations, and technology that are used in the production process (Bregman, Fuss & Regev 1995). Moreover, the new firms that merge with certain industry categories cannot be observed during the study conducted as well as for the firms that have been bankrupt.

From the model it can be seen that the output variable (Q) and demand for foreign workers (L_m) interfere with each other. Thus, to get the correct estimation, the simultaneous equation is used as follows:

$$\ln Q_{it} = \alpha_{i10} + \alpha_{i11}\ln K_{it} + \alpha_{i12}\ln Ln_{it}$$
$$+ \alpha_{i13}\ln Lm_{it} + u_{i1t} \quad (16)$$

$$\ln Lm_{it} = \alpha_{i20} + \alpha_{i21}\ln Q_{it} + \alpha_{i22}\ln r_{it}$$
$$+ \alpha_{i23}\ln wm_{it} + \alpha_{i24}\ln wn_{it} + u_{i2t} \quad (17)$$

Where Q is output, and K, L_n and L_m are capital, local workers and foreign workers respectively. In addition r, w_n and w_m are prices of capital goods, wage for local and foreign workers respectively. Variables that have signs "it", for instance "Q_{it}" indicates that the Q variable is output that resulted in industry i in year t.

There are five categories of foreign workers to the analyzed in this study: Professional workers, teckhnical-supervisor, skilled, semi-skilled and unskilled. The specification for production and the demand functions for foreign workers can be rewritten as:

1. The Production Function

$$\ln Q_{it} = \ln \alpha_{11} + \beta_{111}\ln K_{it} + \beta_{112}\ln Ln_{it}$$
$$+ \beta_{113}\ln Lmp_{it} + \beta_{114}\ln Lmtp_{it}$$
$$+ \beta_{115}\ln Lmm_{it} + \beta_{116}\ln Lmsm_{it}$$
$$+ \beta_{117}\ln Lmtm_{it} + \mu_{it} \quad (18)$$

2. The Demand Function for Foreign Workers

$$\ln Lmp_{it} = \ln \alpha_{130} + \alpha_{131}\ln Q_{it} + \alpha_{132}\ln r_{it}$$
$$+ \alpha_{133}\ln wmp_{it} + \alpha_{134}\ln wnp_{it}$$
$$+ \mu_{13t} \quad (19)$$

$$\ln Lmtp_{it} = \ln \alpha_{140} + \alpha_{141}\ln Q_{it} + \alpha_{142}\ln r_{it}$$
$$+ \alpha_{143}\ln wmtp_{it} + \alpha_{144}\ln wntp_{it}$$
$$+ \mu_{14t} \quad (20)$$

$$\ln Lmm_{it} = \ln \alpha_{150} + \alpha_{151}\ln Q_{it} + \alpha_{152}\ln r_{it}$$
$$+ \alpha_{153}\ln wmm_{it} + \alpha_{154}\ln wnm_{it}$$
$$+ \mu_{15t} \quad (21)$$

$$\ln Lmsm_{it} = \ln \alpha_{160} + \alpha_{161}\ln Q_{it} + \alpha_{162}\ln r_{it}$$
$$+ \alpha_{163}\ln wmsm_{it} + \alpha_{164}\ln wnsm_{it}$$
$$+ \mu_{16t} \quad (22)$$

$$\ln Lmtm_{it} = \ln \alpha_{170} + \alpha_{171}\ln Q_{it} + \alpha_{172}\ln r_{it}$$
$$+ \alpha_{173}\ln wmtm_{it} + \alpha_{174}\ln wntm_{it}$$
$$+ \mu_{17t} \quad (23)$$

Where *Lmp*, *Lmtp*, *Lmm*, *Lmsm* and *Lmtm* are professional foreign workers, teckhnical-supervisor, skilled, semi-skilled and unskilled, respectively.

Then *wnp*, *wntp*, *wnm*, *wnsm*, *wntm* are wages for professional local workers, teckhnical-supervisor, skilled, semi-skilled and unskilled, respectively.

Capital (K) influences output through inputs consumption in the production process. In this case, capital is consisted of fixed assets and current assets according to time and types of industry and technology that are used in production. Nonetheless, in producing output the owners or employers of the firms are still in need of machines and equipment. The fixed asset cannot change in a short time frame, as capital cost is too high. Moreover, in many cases when machines and equipment are bought, the owners of firms usually obtain loans from the banks with a low interest rate. Therefore, it is fair to surmise that capital is an exogenous variables in this model (Bedrossian & Petoussis1987).

Capital goods price (r) influences output through foreign workers demand. Thereby, the increase of capital goods will cause decrease in the number of physical capital inputs and skilled workers in the production process. Eventually, the firms or industries would switch to semi-skilled foreign workers (Griliches 1969; Borjas1983; and Hamersmesh 1984).

Foreign workers wage (w_m) influences output growth through industrial demand for foreign workers. The increasing of wage could stimulate firms or industries to their inputs' consumption in their production process. Then, the firms that are of an industry will usually dispense their demand for foreign workers. In contrast, there are many cases where increasing of wage causes industrial demand for foreign workers. In the labor market theory, there is a positive relationship between wage and industrial demand for foreign workers whereby it is discussed in higher wage economic theory (see Ress 1973 and Katz 1986).

In high wage economic theory, it is stated that improvement in wage can create better moral and prosperity among workers. It can also improve workers' motivation. In this situation, high productivity and competitiveness among the workers will cause them to achieve better heights. Even in the new version of the high wage economic theory, which is known as *efficiency wage theory*, it clarifies that the firms' profits can improve if wages are paid is above the equilibrium of the market wage. It means, that high wage is a stimulus for workers' motivation, which in turn will minimize workers' turnover cost, reduce labor union bargaining power, and attract more qualified workers (Katz 1986).

Local workers wage (w_n) can also influence output growth due to industrial demand for foreign workers. The increasing of local workers' wages can influence firms to replace their labor input with a cheaper alternative. In the short term, the employers' alternative is replacing the utilization of local workers with foreign workers in the production process. The adjustment of this labor input in labor market theory is known as cross elasticity substitution between local workers and foreign workers (Borjas 2000).

THE PROCEDURAL ANALYSIS AND SOURCES OF DATA

As explained earlier, the output variable (*Q*) and the demand for foreign workers (*Lm*) influences one another. That is why, the usual regression equation (OLS) often used by econometric experts is less precise. To overcome this problems, the simultaneous equations are use in order to obtain the estimation results that are more precise and accurate than OLS. To that end, there is an alternative that we can use; which is to swap the equation system's structure as shown by equation (17) up to equation (19) to the derivative equation form (*reduced form*). Structured equation is an equation in which the function of endogenous factors functions to the exogenous and endogenous factors. When the equation of this structure is transformed in the reduced form, the endogenous factors in the model will serve to exogenous factors alone (Greene 2000).

In general, the derivate equation (*reduced form*) presented in this study are as follows:

$$\ln Q_{it} = \Pi_{i10} + \Pi_{11} \ln K_{it} + \Pi_{i12} \ln Ln_{it} + \Pi_{i13} \ln r_{it} + \Pi_{i14} \ln wm_{it} + v_{i1t} \quad (24)$$

$$\ln Lm_{it} = \Pi_{i20} + \Pi_{i21} \ln K_{it} + \Pi_{i22} \ln Ln_{it} + \Pi_{i23} \ln r_{it} + \Pi_{i24} \ln wm_{it} + \Pi_{i2t} \quad (25)$$

Where Π_{ijk} is a function of the parameter α_{ijk} in equation (17) so that equation (19), or $\Pi_{ijk} = f(\alpha_{ijk})$, and $v_{ijt} = f(\alpha_{ijk}$ and $u_{ijt})$.

Instrument variables are used to avoid the mistakes in simultaneous equations models. In this study, the estimation for Production Function (Q_{it}) and Demand Function for foreign workers (Lm_{it}) used instrument variables, such as input of capital, price of capital, and wage for foreign workers based on job categories. Although, the utilization of instrument variables will not solve all problems that are related to simultaneous equations, the usage of instrument variables is expected to minimize cross section variation (Bregmant et al. 1995). Moreover, to estimate the parameters in simultaneous equations, the equation of 2-SLS (two stage least squares) is used. This equation is commonly applied in econometrics. To obtain the desired parameters, estimations are performed using the SPSS computer program package.

Data used in this study are based upon the Industrial Survey conducted by The Department of Statistics Malaysia for the period of 1994-2005. This is after the memorandum of understanding (MoU) between Malaysian and Indonesian officials, and some other countries in 1984. Specifically the data used in this study are as follows: *First*, production or output (Q) macro data of each industry have a four-digit classifications. The data

covers gross value of outputs produced by each industrial classification based on a constant price in 2000.

Second, capital data (K) consists of fixed asset and current assets, types of industry and technology that are used in the production process. In practice, the physical capital input data are very difficult to obtain,. This is because the capital represents certain types of assets, such as machines, equipments, vehicles, and building for plants and offices. Therefore, to calculate these assets for capital stock can create some problems. To estimate the stock value of capital, the data of machines and equipments depreciation from various industries are used as proxy.

Third, the number of labor data (L), the number of local workers (Ln) and the number of foreign workers (Lm) for each industry, have five job categories. They are professional workers, technical-supervisor, skilled workers, middle-skilled and unskilled workers. Professional workers are those who have professional training to conduct certain tasks such as research, and knowledge to solve problems related to technology, economy and social welfare. Professionals are usually connected to engineers, architects, doctors, lawyers, and accountants. Technical-supervisors are those involved in research and directed by professionals. Skilled workers are workers who have formal training. Middle-skilled workers are those with limited training and not included in the skilled workers category. Further, the unskilled workers are those who have never had related training to do their jobs.

Fourth, the wage data in this study are the data of wage paid by industry for all workers according to the industrial classifications and their job categories. The wage data is real wage data that is accepted by workers per year. In view that there is no detailed data available regarding wages for every worker, the wage data used in this study will be proxied by wage share that is paid by each industry category for all workers according to their job types. The data use consumer price index on the basis of constant price in year 2000.

Others data are also used in this study; namely those that are related to interest spent by each industry. In the case of capital (K), it is difficult to select the appropriate variable to be applied to measure the price of capital goods. This is because it involves various values such as assets values, depriciation, interest rates and tax (Hebbink1993)**.** The data used as proxy to measure the price of capital goods (r) is interest rate; this means the firm's cost's expenditure is as a consequence of getting bank loan.

EMPIRICAL FINDINGS

Table 1 shows the estimation results of the Cobb-Douglas production function and resources of outputs growth from various categories of industry. In general, it can be stated that the process of industrial development in Malaysia has shown some results whereby physical capital and local

TABLE 1 Cobb-Douglas estimation function base on industry categories and job types

Variable	ISIC (International Standard Industry Classifications)					
	31	32	33	35	36	38
K	1.177	.457	.817	.416	.770	.462
	(10.34)***	(2.71)**	(4.12)***	(3.29)***	(7.55)***	(5.66)***
Ln	-.037	.487	.160	.216	.263	.518
	(-0.27)	(4.47)***	(-1.35)	(2.58)**	(1.59)*	(5.91)***
Lmp	-.044	.170	-.167	.292	.431	.129
	(-.53)	(.826)	(-1.352)	(2.19)**	(3.06)***	(2.13)**
$Lmtp$	.114	.060	-.006	-.018	-.109	-.037
	(2.28)**	(0.597)	(-.062)	(-.214)	(-1.66)*	(-.951)
Lmm	.091	-.029	-.090	-.022	-.057	.014
	(1,80)*	(-.434)	(-.853)	(-.351)	(-1.17)	(.371)
$Lmsm$	-.122	-.090	,098	-.001	.082	.014
	(-3.14)***	(-.610)	(.570)	(-.011)	(.599)	(0.279)
$Lmtm$	.074	.052	.092	-.021	-.063	-.016
	(0.79)	(.404)	(.719)	(-.324)	(-.851)	(-.382)
Constant	2.225	3.964	3.864	6.859	1.793	3.888
	(2.44)**	(2.54)**	(2.54)***	(5.20)***	(1.21)	(6.43)***
R^2	.928	.983	.990	.925	.860	.956
N (Obs.)	56	18	24	39	34	93

Note: 31 = Food, Baverage and Tobaco Industry; 32 = Textyle, Garmen,and Leather industry;
33 = Wood, Wood Products and Furniture Industry; 35 = Chemical and Chemical products
36 = Non-Metal Products; 38 = Fabricated metals, Machinary, electronic and equipment
*** = Denote Statistical Significance at the 1%; ** = Denote Statistical Significance at the 5%;
* = Denote Statistical Significance at the 10%

workers have a positive role and they are significant at improving Malaysia's output, except for local workers participation in the food, beverage and tobacco industry (ISIC 31), wood, wood products and furniture industry (ISIC 33).

The testing of Cobb-Douglas production function shows that professional foreign workers have important contribution to outputs growth of various industries in Malaysia, particularly in heavy industries that are capital intensive. For instances, chemical, chemical products, petroleum, rubber and plastic industry (ISIC 35), non-metal products industry (ISIC 36), also as well as fabricated metals, machineries, electronics and equipments industry (ISIC 38). Meanwhile, skilled and technical-supervisors of foreign workers have significant roles in the outputs of light industries, especially for food,

beverage and tobacco industry (ISIC 31). This means the expatriate workers have consequential participation in outputs' growth of various industries in Malaysia.

Table 2 shows the estimation of demand function for foreign workers according to industrial categories and job types. In general it can be stated that outputs, the prices of capital goods and wage have influenced the industries at various levels. However, positive and significant elasticity of demand– outputs are founded in the textile, garment and leather industries (ISIC 32); fabricated metals, machineries, electronic and equipments industries (ISIC 38); chemical, chemical products, petroleum, coal, rubber and plastic industries (ISIC 35); and non-metal products (ISIC 36).

This study findings complement previous studies, of Stein (1981) and Myint (1984). In their studies, they

TABLE 2 The estimation of industry demand function for foreign workers base on industry and job categories

Code ISIC	Variable	Job Categories				
		Professional	Technical Supervisor	Skilled	Semi-Skilled	Un-skilled
31	Q	.349	.507	.019	-.044	.017
		(5.26)***	(5.29)***	(.178)	(-.244)	(.144)
	r	-.041	-.031	.054	-.075	-.061
		(-.626)	(-.388)	(.484)	(-.416)	(-.469)
	wm	.954	1.012	.972	.844	.831
		(27.60)***	(35.06)***	(25.63)***	(13.96)***	(13.87)***
	wn	-.423	-.740	-.236	.071	.010
		(-9.51)***	(-10.12)***	(-3.21)***	(.455)	(.071)
	Constant	-4.442	-2.789	-.433	.033	-.008
		(-12.59)***	(-7.18)***	(-.735)	(.039)	(-.010)
	R^2	.971	.976	.949	.897	.925
	N(Obs.)	56	56	56	56	56
32	Q	.644	.845	.291	-.263	.063
		(4.99)***	(7.16)***	(2.56)**	(-.403)	(.458)
	r	-.242	-.416	-.277	.307	-.143
		(-1.253)	(-4.03)***	(-2.90)**	(.560)	(-.1.287)
	wm	.647	.839	.916	.691	.859
		(4.36)***	(14.69)***	(40.94)***	(4.410)***	(35.92)***
	wn	-.126	-.321	.023	.391	.204
		(-1.275)	(-2.05)*	(.391)	(.916)	(1.820)*
	Constant	-6.807	-6.123	-2.968	-2.899	-2.031
		(-8.10)***	(-1`2.37)***	(-6.53)***	(-1.368)	(-4.08)***
	R^2	.981	.989	.996	.916	.925
	N(Obs.)	18	18	18	18	18
33	Q	.014	.386	.279	.149	.535
		(.065)	(2.72)**	(1.039)	(.670)	(2.44)***
	r	.185	.184	.073	.342	.109
		(.672)	(1.166)	(.228)	(1.206)	(.501)
	wm	.586	.722	.908	.921	.810
		(5.70)***	(15.82)***	(15.24)***	(14.08)***	(24.40)***
	wn	-.002	-.347	-.388	-.645	.445
		(-.013)	(-3.69)***	(-1.272)	(-2.03)*	(-3.54)***
	Constant	-2.789	-4.936	-2.116	-.067	-3.897
		(-2.71)**	(-6.14)***	(-1.207)	(-.050)	(-3.39)***
	R^2	.984	.996	.990	.991	.994
	N(Obs.)	24	24	23	24	23

TABLE 2 (*continued*)

Code ISIC	Variable	Job Categories				
		Professional	Technical Supervisor	Skilled	Semi-Skilled	Un-skilled
35	Q	.882	.634	.162	1.252	-.283
		(3.95)***	(2.36)**	(.324)	(1.97)*	(-.938)
	r	-.054	-.226	.073	-.479	.110
		(-.329)	(-1.225)	(.213)	(-1.163)	(.561)
	wm	.563	.802	.756	.940	.870
		(3.90)***	(9.69)***	(10.02)***	(7.63)***	(27.99)***
	wn	-.322	-.049	.134	-.655	.230
		(-1.76)*	(-.273)	(,512)	(-3.045)***	(2.84)***
	Constant	-9.753	-8.318	-5.512	-8.670	-.249
		(-5.29)***	(-5.21)***	(-1.61)*	(-1.97)*	(-.124)
	R^2	.898	.932	.869	.780	.971
	N(Obs.)	39	39	39	39	39
36	Q	1.709	.062	-.251	.103	-1.100
		(4.44)***	(.296)	(-1.441)	(.305)	(-4.14)***
	r	-1.003	-.278	-.298	.087	.783
		(-2.99)***	(-1.60)*	(-1.92)*	(.232)	(2.77)***
	wm	.670	.895	.810	1.076	.848
		(7.04)***	(18.47)***	(19.76)***	(6.857)***	(18.82)***
	wn	-.844	-.183	.442	-.892	.450
		(-4.85)***	(-1.15)	(2.22)**	(-4.58)***	(3.56)***
	Constant	-7.130	1.288	.844	3.504	1.562
		(-3.93)***	(1.450)	(.919)	(1.93)*	(1.131)
	R^2	.687	.960	.985	.712	.938
	N(Obs.)	34	34	34	34	34
38	Q	.445	.020	.551	-.098	-.273
		(3.34)***	(.294)	(3.78)***	(-.618)	(-1.351)
	r	-.082	.151	-.114	.284	.167
		(-.986)	(3.06)***	(-716)	(1.89)*	(1.075)
	wm	.695	.841	.770	.776	.812
		(16.52)***	(31.88)***	(17.93)***	(17.36)***	(24.58)***
	wn	-.097	-.044	-.373	-.117	.208
		(-1.132)	(-.662)	(-3.74)***	(-1.030)	(1.61)*
	Constant	-6.250	-3.405	-3.876	-.853	-.291
		(-11.55)***	(-13.96)***	(-5.66)***	(-1.254)	(-.340)
	R^2	.970	.979	.900	.892	.911
	N(Obs.)	93	93	93	93	92

Note: 31= Food, Baverage and Tobaco Industry; 32= Textyle, Garmen, and Leather Industry;
33= Wood,Wood Products and Furniture Industry;35= Chemical and Chemical Products;
36= Non-Metal Products; 38=Fabricated metals, Machinary, electronic and equipment.
***= Denote Statistical Significance at the 1%; **= Denote Statistical Significance at the 5%;
*= Denote Statistical Significance at the 10%

found that the demand for foreign workers by export-oriented industries tends to increase. However, industrial demand for import substitution has a tendency to decline. This is becaused export-oriented industries are more likely to achieve the economic of scale than import substitution industries. In addition, the prices of goods of export-oriented industries are more stable than the price of goods for import substitution industries.

The negative relationship between industrial demand for foreign workers who have high skills with capital goods in ISIC 32 and ISIC 36, indicate that capital and foreign workers are complementary, especially for professional and technical-supervisor foreign workers. It matches the prior studies by Griliches (1969), Hamersmesh (1984), Borjas (1993), and Rahmah et.al. (2003). They found that there was a substitution relationship between capital and unskilled foreign workers. Meanwhile, the relationship between capital and high skilled foreign workers are complementary in the process of production. This means, if there is an increase in capital goods, the employers will shift from their capital and invest more in unskilled foreign workers.

The shift in response of industrial demand for foreign workers as an affect to the increase in foreign workers wage, is positive and significant to all industry categories. This positive relationship does not suit the theory. Instead, it relates to the introduction of lower wage labor applied by Malaysia since the 1970s. This policy has brought some multinational corporations into Malaysia (especially those who are labor intensive) to replace their workers with contracted workers and cheaper foreign workers from various countries such as Indonesia.

The positive relationship between wage and demand for foreign workers is also related to foreign employers or owners preferences of employing workers from their own countries. In Malaysia, most foreign multinational corporations prefer to hire workers from their own countries, particularly for professional and technical-supervisor workers. The demand for these high level foreign workers is determined by owners' decision, although their wages are high. Hence, this situation is also related to the owners' perceptions (including local owners); whereby they are more interested in hiring foreign workers rather than local workers. They think that foreign workers of this category are more efficient, productive, and have a higher commitment to their jobs (Immigration Department 2002).

The response of industrial demand for foreign workers to the change of local workers' wage shows varying relationships from one industry to another. However, the response of unskilled foreign workers to the increasing of local workers' wage is positive for all industrial categories. Meaning, the increase in unskilled local labors wage causes an increase in the industrial demand for foreign workers. The finding of this study indicates that unskilled foreign workers are substitutes for local workers of the same category.

Although there is a substitution relationship between local workers and unskilled foreign workers, for high skilled foreign workers such as professionals and technical-supervisors, there is opposite correlation, whereby the coefficient results are negative. As such, the high skilled foreign workers are complement to local workers in the production process. This matches prior studies such as by Dickson (1975), Norman and Meikle (1985) in Australia, Winegarden and Khor (1991) in the US, Zimmermann (1995) in some European countries, Venturini (1999) in Italy, as well as Idris and Rahmah (2006) in Malaysia. In their studies, they found that foreign workers are complements to local workers. Therefore, those foreign workers could not be seen as competitor for local workers in the production process.

CONCLUSIONS AND IMPLICATIONS

In conclusion, it can be stated that highly skilled foreign workers are still necessary for industrial development in Malaysia. At the same time, the presence of those foreign workers negatively impact local wage level. Therefore the dependence could be eliminated through several efforts. *First*, by redesigning the human resource development to produce the high skilled workers; that is through the cooperation between universities and industries. *Second*, by utilizing advanced technology and investing in more machineries and modern equipments. *Lastly*, by giving incentive to research and development (*R&D*) staff, i.e. technology that corresponds to local workers' abilities.

THE USING OF PROFESSIONAL WORKERS

For middle and heavy industries that are capital intensive in their process of production, such as in the chemicals industry, chemical products, petroleum, coals, rubber and plastic industries (ISIC 35), and non-metals industry (ISIC 36) the professional foreign workers are still needed, since they are as a catalyst for output growth. Meanwhile, the technical-supervisors, especially of the ISIC 36 should be reduced and replaced with local workers since these foreign workers can stagnant outputs. The use of professional foreign workers in these three industry categories is essential to push technological transfer.

The demand for professional foreign workers is still beneficial for heavy industries, for example in the fabricated metals, electronics, and equipments industries (ISIC 38). However, their contribution to outputs' growth is relatively small compared to middle and heavy industries that intensively utilize physical capital. For the food, beverage and tobaco industries (ISIC 31), the demand for skilled and technical-supervisor foreign workers are still needed due to technological development in the production process. In contrast, the use of middle skilled foreign workers should be reduced, since they can impede the output growth.

THE UTILIZATION OF ADVANCED TECHNOLOGY

Another way to reduce the dependence on foreign workers, especially for low skilled workers is by using modern technology. It is essential for those industries which are labors intensive replace workers with semi-automatic or automatic machineries. In the future, the manufacturing industry cannot rely only on the laborers of low cost, but to utilize technology and be of capital intensive.

THE REGULATIONS OF PRICE INPUTS

The substitution ability between capital and labor shows that each changes in price ratio, such as the increasing in interest rate, will stimulate the demand for workers, including foreign workers demand, especially for lower skilled and unskilled. For capital intensive industries or industries with high demand-capital elasticity, the policy to increase the interest rate will cause the diminishing of

industrial activities. Therefore, regulations that maintain interest rate is critical to improve the investment and utilization of technology for various industries in Malaysia.

THE WELFARE OF WORKERS

Since the 1980s the cheap labor cost strategy used is aimed to maintain the minimum wage rate. It has provided a lot of benefits for the growth of manufacturing industries in Malaysia. However, in the future the cheap labor strategy cannot be justified to maintain products' competitiveness. The benefits from lower labor cost have since diminished as several industrial countries namely the US and the European community had highlighted on the social issues of labor during the World Trade Organization (WTO) forum; whereby this problem is related to the ILO agreement. If the agreement is not followed, this issue will be a barrier of non-tariff trade for developing countries.

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APPENDIX

APPENDIX 1 Migrant worker in Malaysia by country of origin

Country of Origin	Year							
	1999		2002		2005		2008	
	Number	%	Number	%	Number	%	Number	%
Indonesia	269,194	65.7	788,221	73.8	1,211,584	66.7	1,085,658	52.6
Bangladesh	110,788	27.0	82,642	7.7	55,364	3.0	316,401	15.3
Thailand	2,130	0.5	20,599	1.9	5,751	0.3	21,065	1.0
Philippines	7,299	1.8	21,234	2.0	21,735	1.2	26,713	1.3
Pakistan	2,605	0.6	2,000	0.2	13,297	0.7	21,78	1.0
Others	17,644	4.3	152,833	14.3	507,507	28.0	591,481	28.7
Total	409,660	100	1,067,529	100	1,815,238	100	2,622,596	100

Source: Ministry of Home Affairs, Malaysia, 2011

APPENDIX 2 Mingrant workers in Malaysia by sector

Sector	Year							
	2002		2005		2008		2011	
	Number	%	Number	%	Number	%	Number	%
Maid	232,282	22.0	320,171	17.6	293,359	14.2	184,092	11.7
Manufacturing	323,299	30.6	581,379	32.0	728,867	35.3	580,820	36.9
Plantation	298,325	28.2	472,246	26.0	333,900	16.2	299,217	19.0
Construction	149,342	14.1	281,780	15.5	306,873	14.9	223,688	14.2
Services	64,281	6.1	159,662	8.8	211,630	10.3	132,919	8.4
Agriculture	NA		NA		186,967	9.1	152,325	9.6
Total	1,067,529	100	1,815,238	100	2,061,596	100	1,573,061	100

Note :na is not available
Source: Mnistry of Home Affairs, Malaysia, 2011.