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Globalization and Total Factor Productivity Growth in the Malaysian Construction Sector

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The process of globalization is happening so quickly thereby leading to rapid changes, particularly in communication and information technology. This situation has caused the economy to become interdependent. Basically, the process of globalization will improve efficiency and productivity of economic activities. However, the process of globalization may have a positive or negative effect on the TFP growth for different economic sectors. This paper aims to investigate the effect of globalization on TFP growth of the construction sector based on the data from the Construction Survey Malaysia collected by the Department of Statistics Malaysia. The analysis utilizes panel data of 1990-2009 for four construction subsectors, namely, residential buildings, non-residential buildings, civil engineering and special construction activities. TFP growth is obtained from DEA-Malmquist approach and this variable is used as dependent. The globalization indicators like foreign direct investment (FDI), foreign workers and economic openness are used as independent variables in the TFP model. The static panel data approach is adopted in running the models. The results show that all the globalization indicators positively and significantly affect the TFP growth of the construction sector.

JEL Codes: L74, O47, O49

1. Introduction

The world has become more complex and dynamic, and this has increased the uncertainty in all undertakings. The process of globalization is happening so quickly thereby leading to rapid changes, particularly in communication and information technology. Basically, the process of globalization will improve efficiency and productivity of economic activities. Nevertheless, the benefit from globalization is unequal for different economic sector. Enhancing productivity is not limited to inputs as separate variables, but what is more crucial is total factor productivity (TFP), which reflects the productivity for all inputs combining together. TFP refers to the productivity of all inputs, which are derived from better and more efficient utilization and management of inputs, such as labor, capital, technology and intermediate inputs. According to Malaysia Productivity Corporation (2013) TFP is being influenced by innovation and incentives like competition; government assistance and regulation; flexibility of labor arrangements; regulations impacting on production decisions; capabilities like skill people and knowledge; and infrastructure.

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Therefore, the TFP growth and its contribution to economic growth is seen to be more critical compared to the contribution or quantity of inputs (Rahmah 2012). Although many researchers reveal that labor and capital are important contributors to economic growth (Ayres *et al*. 2005), but the reliance on the quantity of inputs is not a good strategy because it will involve an increase in the cost of production. The TFP is considered to be a yardstick to boost economic growth because of the limited resources like capital and labor. An increase in TFP reflects a more efficient usage of inputs and this will increase competitiveness of a country. The best way to improve a country's economic development is the transformation from input-driven growth to productivity-driven, especially the TFP. For Malaysia, the transformation process towards achieving a higher growth in the TFP is in tandem with its vision to become a high-income economy by year 2020.

Globalization can be measured through four indicators, i.e foreign direct investment (FDI), economic openness, technology transfer and foreign labor. Past studies have shown mix results of the effect of these indicators on TFP growth. For example, the positive impact of FDI on TFP growth were found in the studies by Pessoa (2005), Girma (2005), Miyamoto and Liu (2005), Ng (2006), Subaran (2009), and Hong and Sun (2011). However, several studies found opposite results showing that FDI had no significant impact on the TFP, for example, in the Canadian manufacturing sector for the period of 1976-2008 (Parviz 2011, Kawai 1994).

Many past studies concern the tariff to reflect the volume of exports and imports under trade liberalization or as a measure of economic openness. The impact of trade liberalization on the TFP growth shows that lowering the tariff or tariff reforms and the relative adjustment of the real effective exchange rate has contributed positively to productivity growth (Goldar and Anita 2003, Arpita and Paramita 2010). Other studies test for causality between the TFP growth and the variable of openness of the economy (Serpil 2010, Mohamed et al. 2004). The result is significant for the Tunisian manufacturing sector, while it is not significant for the OECD countries. Hwang and Wang (2004), using data from 45 industries of the Japanese manufacturing sector over the period of 1973-1998, found that economic openness does not show a positive relationship to the TFP growth. This finding is similar to the findings of Kim, Lim and Park (2007) in respect of the Korean manufacturing sector for the period 1980-2003.

In terms of foreign labor, different category of foreign labor would have different impact on the productivity. The study by Evelyn and Chan (2009) show a different finding on a different type of labor, where the high-skilled foreign labor has contributed to the productivity increase and demand for its skill relatively increased. On the other hand, an opposite results were obtained in the case of unskilled foreign labor. Therefore, many studies agree that in long-run, foreign workers can progress productivity and increase the level of average income of the economy without reduce the participation rate of local workers (Nikolaj et al. 2011, Peri 2010, Evelyn and Chan 2009, Mahadevan 2002) and Abdul Kadir et al. 2005). However, while some studies show a positive relationship, other studies concluded the reverse. For example, Bishnu (2011) examined the linkages between the TFP, FDI, trade openness, capital formation and economic growth in Bangladesh over a period 1986-2008 and found that trade openness had a negative effect on the TFP growth.

Although many studies examined the impact of globalization on the TFP, the studies investigated the indicators of globalization independently concerning a particular aspect, such

as FDI, foreign labor, exports, technology and trade liberalization. Therefore, by taking into account many variables in examining the impact of globalization on the TFP level of the construction sector, this study provide different analysis from previous studies. The variables used in this study consists of FDI inflows, economic openness and foreign labor. By considering all variables into analysis, this study is able to predict to what extent the construction sector can be affected by globalization process and the uncertainty of the global economy as well. Apart from this, study of the effect of globalization on TFP growth that focus on the construction sector are very rare, despite the increasing importance of this sector towards economic growth.

The Malaysian construction sector is very relevant in the context of globalization because of its reliance on foreign workers. Most semiskilled and unskilled workers for this sector come from abroad since the locals are not attracted to work in this sector. Other globalization indicators like economic openness and FDI may also affect the performance of the construction sector through various channels like obtaining intermediate inputs and skills transfer. The presence of FDI in producing parts and components for the construction sector eases the industry in terms of getting the intermediate inputs. In addition, economic openness will facilitate this sector in terms of importing inputs that are not available locally. As such, globalization will facilitate the construction sector to grow faster and be more competitive. However, conversely, globalization may have a negative effect on the construction sector through low quality of inputs, for example, low skilled foreign workers, which, subsequently, affect the quality of output. Therefore, understanding the impact of globalization on the TFP of the construction sector is particularly important. In a study by Chia (2015), it was found that trend of TFP growth in Malaysian construction sector decreased for the period of 1989-1998 and increased for the period of 1998-2012. The growth of the construction sector in 1989-1998 period is fuelled by capital injection, however for the period of 1998-2012 is a period witnessed by adoption of more advanced building practices and systems.

This paper will examine the effect of globalization on the TFP growth for the construction sector in Malaysia. This paper is organized into six sections. The following section discusses the growth of the construction sector in Malaysia followed by the literature review in section 3. Section 4 discusses the methodology and model specification. Section 5 analyses the results and section 6 is the conclusion.

2. The Growth of Construction Sector in Malaysia

The construction sector can be considered as the backbone of a country because it provides facilities for other sectors to move smoothly and for the people to have a more decent life. In Malaysia, the construction sector is one of the important sectors that contribute to economic growth. This sector experienced a transformation over the last decade and progressed in line with the rapid globalization that took place during that period. A tremendous change in the development of the Malaysian economy coupled with the relaxation of regulations in property ownership in Malaysia has contributed towards the increasing demand for property. The expansion of the construction sector can be observed from its product diversification from housing, shop lots, office buildings, schools, institutions and so on.

Generally, the construction sector encounters a moderate growth rate, which is between 3-4 percent for the period 1990-2000. But it is higher compared to some other subsectors such as

electricity, gas and water in the services sector which the growing rate is of 2-3 percent for the same period. During that period, construction output growth rate reached the highest in 1995, at 4.4 per cent compared with other years. The economic vibrancy drives this sector to grow before the economic downturn in 1997/1998. The construction sector performance had continuously improved and reached two digit growth in 2010 at the average growth of 11.1 percent. In 2010, the highest contribution came from the non-residential buildings with the contribution of 29.6 percent. The ouput value for this sector increased from RM10.8 billions in 2005 to RM27.0 billions in 2010. The tremendous growth were observed in the industrial buildings, offices and commercial buildings especially in the Klang Valley, where the industrial activities were heavily located.

As the strong momentum of project awards has been sustained in the last few years, the construction sector remained the fastest-growing economic sector in 2015. The sector's GDP growth clocked in at 8.2% year-on-year. Notably, the 10th Malaysia Plan drew to a close in 2015, with the construction sector charting a solid compound annual growth rate (CAGR) of 11% in the five-year period (The Star 2016). The gross output in 2013 was RM131.3 billion, an increase of RM21.2 billion as compared to 2012 with an annual growth of 19.3 per cent. In line with the growth in output, the value of intermediate input also increased by RM16.4 billion to record RM89.5 billion with the annual growth of 22.5 per cent, thus resulting a value added of RM41.8 billion in 2013. The overall performance of the construction sector in 2015 recorded a positive growth in all key indicators. The gross output in 2015 was RM177.9 billion, an increase of RM86.6 billion as compared to 2010 with compound annual growth rate of 14.3 per cent (DOS 2014, 2016). Nevertheless, GDP from the construction sector in Malaysia decreased to 12892 MYR Million in the second quarter of 2017 from 13398 MYR Million in the first quarter of 2017. GDP from the construction sector in Malaysia averaged 9911.50 MYR Million from 2010 until 2017, reaching an all-time high of 13398 MYR Million in the first quarter of 2017 and a record low of 6464 MYR Million in the first quarter of 2010 (Trading Economics 2017).

3. Literature Review

Most single country studies using time series data showed that FDI had a positive and significant effect on the TFP growth (see for example Adhikary, 2011 for a study in Bangladesh, Nuzhart, 2009 for Pakistan, Hong and Sun, 2007 for China, Anuwar and Nguyen, 2009 for Vietnam). In these studies, FDI spillovers generated a strong positive impact on the TFP through backward vertical linkages. Thiam (2006) compared eight East Asian economies in studying the linkage between FDI and the TFP to include China, Hong Kong, Indonesia, Malaysia, Republic of Korea, Singapore and Taiwan using the Granger causality test and showed that only two countries – Singapore and Taiwan – revealed evidence of a one-way causality between inflows of FDI and the TFP growth. The findings from this study were supported by Bruno and Koen (2009), Bin and Eric (2005), and Carkovic and Levine (2002) who found that FDI had a significant and positive effect on the TFP growth.

Simeon and Bernard (2000) investigated firm-level data for the Czech Republic and found that between 1992 and 1996, foreign investment had the predicted positive impact on the total factor productivity growth of the recipient firms. This result is robust because they conducted the corrections test for the sample bias from the tendency of the foreign companies to invest

in the firms whose initial productivity is above average. Ram and Zhang (2002) used panel data for the period of the 1990s and their findings showed that FDI had a significant and positive relationship with technologies and TFP growth. Hong and Sun (2007) adopted a spatial dynamic model to assess the TFP effects from the externalities generated by FDI in China. The results show that the impact of FDI externalities on TFP growth was significant and positive over the period 1980-2005. However, while some studies showed a positive relationship between FDI and TFP growth, other studies concluded the reverse. Balasubramanyam *et al*. (1996), Aitken and Harrison (1999) Papi and Rovoltella (2003) found that FDI had no significant impact on TFP growth in the countries they studied. Tanna (2009), however, using time series data for the period of 2000-2004, found that the inward FDI had a negative short-term effect but a positive long-term effect on TFP change.

Economic openness has changed the pattern of sectoral output towards higher value- added, which, subsequently, raises the total factor productivity. The export-import activities will enlarge the market channel and supply chain of a country. These activities will lead to higher productivity of a sector and product diversification may easily take place. Many studies on the effect of economic openness on TFP growth showed significant and positive results. These include the studies by Anderson (2001), Jonsson and Subramanian (2001), Mahadevan (2002), Bin and Eric (2005), Kim, Lim and Park (2007), Alessandra (2007), Andrei, Romain and Mathias (2007), Andre (2008), Pedro and Alberto (2009), Yan et al. (2010), and Ousmanou and John (2011).

Many earlier studies on the trade-growth nexus imply that imports and exports enhance productivity growth because firms exposed to international competition tend to implement best-practice technology. Anderson (2001) used industry level data for Swedish manufacturing for the period 1980 to 1995 and found that domestic research and development (R&D) intensity do not contribute to the TFP growth. Instead, economic openness facilitates the spillover of technology, which contributes positively to the growth of total factor productivity. Mahadevan (2002), and Jonsson and Subramaniam (2001) examined the impact of trade liberalization and openness on TFP growth and technological progress for the manufacturing industries. Their study showed that trade liberalization had a positive and significant impact on the TFP growth in the Australian and South African manufacturing industries. Their study also showed that there was a positive long run relationship between the TFP and economic openness. Kim, Lim and Park (2007) investigated the effect of import and exports via economic openness on the TFP in Korea between 1980 and 2003 and the Granger causality from openness in the economy have a significant positive effect on the TFP growth. However, their empirical results suggest that lower trade barriers and higher imports would benefit Korea's productivity growth.

The Chinese openness policy had a strong effect on TFP growth, efficiency improvement and technological progress at an annual rate of 3.9 percent, 1.6 percent and 2.3 percent, respectively (Yan et al. 2011). Using panel data for Chinese manufacturing firms for the period from 1998 to 2007, the study showed that trade liberalization and outsourcing of services lead to a significant increase in the TFP of the firms located in east China. This finding is similar to that of Ousmanou and John (2007) study, which used firm-level data of Cameroon manufacturing to assess the effects of trade liberalization on the firm-level TFP growth. The results showed that the significant productivity gains from outward-orientation, and import competition have a positive and significant effect on the TFP growth. Elsadig (2008) examines

the role of FDI on TFP in in five ASEAN countries (Malaysia, Indonesia, Philippines, Singapore and Thailand), as well as South Korea and China. He found that FDI had positively contributed to the performance of the TFP in all countries under study. The recent studies of the TFP impact on the economic growth and decomposition of TFP in Malaysia were done by Rahmah et al. (2014) and Noorasiah (2012).

Though technology exhibits a positive relationship with productivity, most previous studies dispute that FDI brings technology into the host country. In addition, most researches consent that the host country will gain technology transfer from the spillover effect (Schiff and Wang 2008, Bin and Chiang 2005). As revealed by Savvides and Zachariadis' study (2005), there are impact of the technology used in foreign firm on the country's productivity level. Also, the finding shows the largest impact on the value added growth for the manufacturing sector in thirty-two countries, consists of low and middle income economies from the year 1965 to 1992. Another study by Almas and Subal (2010) confirmed that technology bring by FDI has a positive impact on the TFP in China. This result is verified by Ali et al. (2012) noted that technology increased the TFP level the manufacturing sector in Pakistan. Recent study by Abdoulaye (2011) also reveals that technology and, research and development from FDI's company has a significant impact on the increment an aggregate productivity in developing countries. Moreover, the remarkable growth of information communication technology (ICT) had a substantial effect on the performance of productive firms, both in technical efficiency and TFP level of the manufacturing sector in India (Mitra and Sharma 2011). Zhi et al. (2003) identified seven factors which are significantly related to TFP growth. Among them, economies of scale, R&D by the industry, investment allowance granted and labour union are leading contributors to TFP growth in Singapore.

The present study will focus on the effect of globalization on TFP growth in the Malaysian construction sector. Although there are few studies on the impact of globalization on the other sectors in Malaysia (Ferayuliani et al. 2013, Rahmah et al. 2012, Noorasiah et al. 2017), but the effect of globalization for the construction sector may differ from other sectors because of its different in nature. The construction sector in Malaysia has heavily relied directly on foreign workers. However, the effect of FDI is indirectly come from other supporting sectors like the manufacturing sector, where the inputs are used in the construction sector. The economic openness on the other hand, will affect the imported price of construction inputs. Therefore, the effect of globalization indicators, namely, foreign workers, FDI and economic openness on the TFP of the construction sector may be different. Viewing from lack of past studies conducted for this sector, the present study will fill up the gap to get a better understanding of the effect of globalization on TFP growth, particularly in Malaysia.

4. Methodology

The study uses Data Envelopment Analysis (DEA)-Malmquist to compute the TFP growth. This value is used as dependent variable, whereas the independent variables are globalization indicators, i.e. FDI, foreign workers and economic openness and other industry's characteristics variables firms such as capital labor ratio and ratio of skilled workers.

4.1 DEA Framework

The analysis in this article adopts the output-oriented approach of DEA-Malmquist to put greater weight on the expansion of output from a given amount of inputs. Therefore, the TFP index is a ratio of the weighted aggregate output to weighted aggregate input. The output and inputs of the industries are a set of data used to construct the index. This study uses one output; the yearly real total output of the industry and two inputs; the yearly value of capital and number of labor. The DEAP computer program version 4.1developed by Coelli (1996) was adopted.

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 point relative to a common technology.

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

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

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 technical change (TECHCH) as expressed (Cabanda, 2001):

$$\text{TFPCH} = \text{EFFCH} \times \text{TECHCH} \qquad (2)$$

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

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

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

4.2 Panel Data Analysis

When the value of TFP is obtained, the TFP growth model is established. The independent variables for this model include four globalization indicators as well as other variables. The equation was estimated using static panel data of pooled ordinary least square (PLS) and fixed effects (FE) models. The Random Effects (RE) model was not estimated because the number of cross sections (4 sectors) is less than the number of regressors (7 variables). In addition,

the dynamic panel regression cannot be performed because of short data series of 20 years. The dynamic panel data analysis would need more than 20 year data series. There are two advantages of panel data, first, it can control unobserved time-invariant heterogeneity in cross-sectional models and second, it can disentangle components of variance and estimating transition probabilities, and more generally to study the dynamics of cross-sectional populations (Arellano, 2003).

Adopting Cobb-Douglas non-constant returns to scale and adding the globalization indicators, the TFP growth function can be specified as follows:

$$TFP_{it} = f(Y_{it}, \frac{K}{L}_{it}, \frac{Lp}{TL}_{it}, \frac{Lt}{TL}_{it}, FL_{it}, FDI_t, OPN_t) \quad (4)$$

The PLS estimation model for TFP growth is as follows.

$$TFP_{it} = \beta_0 + \beta_1 lnY_{it} + \beta_2 (K/L)_{it} + \beta_3 (L_P/L)_{it} + \beta_4 (L_T/L)_{it} + \beta_5 lnFL_{it} + \beta_6 lnFDI_t + \beta_7 OPN_t + \varepsilon_{it} \quad (5)$$

And the FE model is written as,

$$TFP_{it} = \alpha_0 + \alpha_1 lnY_{it} + \alpha_2 (K/L)_{it} + \alpha_{3(} Lp/L)_{it} + \alpha_4 (Lt/L)_{it} + \alpha_5 lnFL_{it} + \alpha_6 lnFDI_t + \alpha_7 OPN_t + \gamma_i + \varepsilon_{it} \quad (6)$$

$i = 1, \ldots . N$ *are construction subsectors* $t = 1, \ldots . T$ *are years*

Where TFP is total factor productivity, Y is real output, K/L is real capital-labor ratio, L is number of labor, L_P is number of professional and managerial workers, L_T is number of technical and associate professional workers, FL is number of foreign labor, FI is national real foreign direct investment, OPN is national economic openness, i is the i^{th} subsector, t is year, γ is the individual specific effects that varies among individuals, ε is the error term, α and β, are the parameters to be estimated. The natural logarithm is applied to all variables except the variables in ratio.

The PLS does not capture the different of individual specific effects whereby the intercept and slope are restricted to be the same across sectors. The error term ε_{it} is likely to contain unobserved individual specific effects that are correlated with observed independent variables. Thus PLS may result in heterogeneity bias which may cause the estimates of independent variables to be bias and inconsistent. In order to accommodate heterogeneity bias, there is a need to control those unobserved time variant individual specific effects by incorporating individual specific fixed effects γ_i in the error term to take into account the unobservable factors in the FE model. The FE model is a linear regression, which introduces dummy variables that allow intercept to vary across sectors. The redundant test, namely the Wald test is conducted to choose the best model between the PLS and the FE models, whereby when the null hypothesis is rejected then the FE estimation is better than the PLS estimation.

4.3 Source of Data

Analysis in this paper uses panel data from the Construction Industrial Survey conducted by the Department of Statistics Malaysia. This approach combines time series and cross sectional data. The study covers 20 observations by times series, from 1990 to 2009 and 4 sub-industries, namely, residential buildings, non-residential buildings, civil engineering and other construction activities making a total of 80 panel data observations. Data on FDI was gathered from the Ministry of International Trade and Industry (MITI), and data on foreign workers from the Immigration Department. Economic openness is measured by the ratio of export plus import with total Gross Domestic Product (GDP). This data are gathered from the Ministry of Finance (MOF). All value data are in real using 2005 as base year.

5. Results

5.1 TFP Growth

Table 1 and 2 present results of TFPCH by years and by construction subsectors. In Table 1 it is shown that the mean value of TFPCH is 1.015 for the period of 1991-2009. It means that the construction sector experience a positive TFP growth of 1.5 percent. The highest value of TFP growth was obtained in 2000 at 7.8 percent, while the lowest was in 1991 with a negative growth of 24.7 percent. In that year the Malaysian economy had just recovered from the 1997/1998 financial crisis where the growth of the construction sector was also badly affected.

Table 1: TFP growth for 1991-2009

Year	EFFCH	TECHCH	TFPCH
1991	2.822	0.267	0.753
1995	0.931	1.025	0.954
2000	1.008	1.070	1.078
2005	0.998	0.989	0.987
2009	1.025	0.969	0.994
Mean (1991-2009)	1.057	0.960	1.015

Source: Computed from the Construction Industrial Survey data

In Table 3, it is shown that the subsector of civil engineering (3) obtained the highest TFP growth during the period of 1990-2009, while the lowest growth was in the special construction activities (4), where the negative growth was observed. While the TFP growth for the residential buildings (2) was 3.6 percent and non-residential buildings was 5.5 percent during the same period.

Table 2: TFP growth for 1991-2009 by subsector

SUBSECTOR	EFFCH	TECHCH	TFPCH
1	1.074	0.949	1.019
2	1.085	0.955	1.036
3	1.072	0.983	1.055
4	0.999	0.951	0.950

Source: Computed from the Construction Industrial Survey data
Notes: 1- Residential Buildings; 2- Non-Residential Buildings; 3- Civil Engineering; 4- Special construction activities such as craft works and building installation.

5.2 Estimation Results

Table 3 shows the descriptive statistics of the variables. Overall, the construction sector had experienced a positive TFP growth with the mean value of 1.028 or 2.8 percent in 1990-2009 period. The mean value for the real output is RM10.2 billion and the capital-labor ratio is RM16.6 thousands. This sector has a small percentage of professional and managerial workers as well as the technical and associate professional workers with an average of 4.9 percent and 5.7 percent, respectively. On average, the number of foreign workers involved in the construction sector is about 44,735 persons and FDI of RM181 million. On average, the degree of openness for the Malaysian economy stands at 1.727 that shows the exports value exceeds the imports value during the study period.

Table 3: Descriptive statistics of the variables

Variable	Mean	Maximum	Minimum	Standard Deviation	N
TFP	1.028	1.487	0.248	0.137	80
Y	10198515	21181561	2273622	4981063	80
K/L	16.6162	38.9682	0.4166	7.5735	80
L_P/L	0.0489	0.1995	0.0058	0.0278	80
L_T/L	0.0572	0.2192	0.0049	0.0315	80
FL	44735.47	430114.2	2658.000	48573.89	80
FDI	181.3043	48098.80	6287.000	10579.27	80
OPN	1.727	2.75	1.33	0.3001	80

Notes:
Y =real value gross output of construction sector (RM '000), K/L = real value of capital per total labor (RM'000), LP/TL= ratio of professional and managerial workers per total labor LT/TL = Ratio of technical and associate professional workers per total labor, FL = Number of foreign labor, FDI = real value of national foreign direct investment (RMmill), OPN = degree of economic openness for overall Malaysia, real (export + import/total GDP)

Table 4 presents the estimation results of the PLS and FE estimations. From the Wald test, it is confirmed that we reject the null hypothesis at the 1% significance level. This implies that the FE estimation is more appropriate than the PLS. We also checked for autocorrelation. The results show no problem of autocorrelation based on the value of Durbin Watson (DW) of 1.81 and 2.06 in the PLS and FE models, respectively. All variables in the FE model are shown to be significant in affecting the TFP growth except the ratio of technical and associate

professional workers. The coefficient of determination R^2 is 0.6721, which shows that 67.21 percent of the variation in the TFP growth can be explained by the independent variables.

Value of output, capital-labor ratio of professional and managerial workers are significantly positive in affecting the TFP growth in the construction sector. This reflects that the more capital intensive is the sector, the higher is the TFP growth, which indicates the importance of the level of technology. In addition, the higher is the share of professional workers out of total labor, the higher will be the TFP growth. These two ratios give a clear signal to the policy makers that any policy direction should embed enhancing capital utilization and skills.

Globalization variables like foreign labor, FDI, and economic openness have a positive and significant relationship with the TFP growth in the Malaysian construction sector. This shows that an increase of 1% of foreign labor will increase the TFP by 0.0048 points. This study is supported by Nikolaj *et al*. (2011), Peri (2010), and Everlyn and Chan (2009). Meanwhile, an increase in 1% of FDI and economic openness will increase the TFP by 0.0008 points and 0.37 points, respectively. These findings are consistent with Adhikary (2011) for a study in Bangladesh, Hong and Sun (2011) for China, and Anuwar and Nguyen (2009) for Vietnam. In the studies by Andre (2008), Kim et al. (2007), and Yan et al. (2011) it was found that economic openness, foreign trade, imports and exports are positive and significantly affect the TFP growth. The cross section effect shows that subsector 4 (special construction activities) has the highest TFP growth followed by subsector 3 (civil engineering) and subsector 1 (residential buildings).

Table 4: Estimation result of TFP equation

Variable	Pooled Least Squares	Fixed Effect
C	11.7671***	12.9574***
	(3.1694)	(3.4216)
lnY	0.0231**	0.0254***
	(2.4738)	(2.7158)
$\frac{K}{L}$	0.0248***	0.0252**
	(2.7398)	(2.5641)
$\frac{Lp}{TL}$	0.5273***	0.0255***
	(3.6788)	(2.2166)
$\frac{Lt}{TL}$	-0.4302	-0.4254
	(-0.5651)	(-0.5411)
lnFL	0.3849*	0.4879***
	(1.9156)	(3.4144)
lnFDI	0.0234**	0.0874*
	(2.5146)	(1.8775)
OPN	0.4978***	0.3746*
	(3.0585)	(1.8879)
R-Squared	0.6149	0.6721
F-Statistic	21.0840	17.5583
p-value	{0.0000}	{0.0000}
Cross section Effect		
Cons1		0.0779
Cons2		-0.1362
Cons3		0.2083
Cons4		0.2666
DW – Statistic	1.8139	2.0583
F-Wald Test		4.8325
F-critical (5%)		2.79
F-critical (1%)		4.13

Notes: figures in brackets are t-values. *, ** and *** denote significant at 10%, 5% and 1% level.

6. Conclusion

This study analyzes the impact of globalization indicators such as foreign labour, FDI and economic openness on TFP growth of the construction sector in Malaysia. The analysis utilize panel data of 1990-2009 and four construction subsectors. TFP growth is obtained from DEA-Malmquist approach. The TFP growth model is run using a static panel data analysis involving POLS and FE models.

The results from this study demonstrate that the relationship between output, capital intensity, professional and managerial workers, foreign labor, FDI and economic openness with the TFP growth is positive for the construction subsectors. This means all the globalization indicators have affected the TFP growth positively. The construction sector needs to be more capital-intensive and employ more workers at the professional level. The ratio of the professional and managerial workers in the construction sector is noticeably low, as shown by the data (less than 5 percent). Therefore, an increase in these types of workers is required, for example, through increasing the number of engineers and architects.

All globalization indicators have positive and significant effects on the TFP growth. This implies that the globalization process leads to higher efficiency and productivity of the construction sector. The government cannot curb the presence of foreign workers in the construction sector, because the locals are reluctant to work in this sector. In addition, at present, Malaysia still relies on foreign expertise in building high-rise buildings and giant construction projects. Therefore, the inflow of expatriates, especially in the short run to facilitate the construction sector, cannot be avoided. However, in the long-run, Malaysia must lessen its dependency on foreign expertise by enhancing its own human capital.

FDI should be encouraged in the construction related subsectors like producing parts and components. In addition, economic openness will definitely increase trade volume, especially in terms of the importing of goods and services for the construction sector. Most of the intermediate inputs are still imported, especially high quality inputs like roofing and tiling. If these inputs can be produced locally, it will lower the cost of production, which will help this sector to be more competitive.

In conclusion, the importance of the construction sector cannot be denied. The demand for the construction products of all kinds is increasing continuously and higher efficiency from the supply side is certainly needed. The TFP growth, which reflects efficiency, must be kept positive and this is deemed important for the construction sector. The negative TFP growth as demonstrated by the construction sector throughout the study period is quite alarming and this needs a proper policy to counter the problem. Any policy direction must take into account the important determinants of the TFP growth, as shown by the study.

The study has some limitations that can be considered in future study. The present study uses subsectors aggregate level data where all firms within the same subsectors are aggregated. The future study may use firm level data which are better than the aggregate data since they capture individual's firm characteristics. The future study also must include a longer data series so that the dynamic panel data analysis can be performed.

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