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Globalization and Total Factor Productivity: The Case of the Manufacturing Sector in Malaysia

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Abstract: This study observes the impact of globalization on the Total Factor Productivity (TFP) performance of the Malaysia's manufacturing sector. By focusing on the manufacturing sector, this study analyse to what extent the TFP level affected by the globalization. More specifically, this study examines the impact on the TFP among sub sectors of the manufacturing sector. The indicators of globalization under examination comprise of foreign investment, technology, foreign labour and trade's openness in the economy in such a way to observe trade liberalization. By covering the study period from 1990-2010, the survey data of the industrial manufacturing was obtained from the Department of Statistics Malaysia. The findings indicate that the openness of the economy and foreign direct investment are statistically significant and have positive impact on the TFP level. In contrast, technology agreement and foreign labour are not significant. The findings by sub sectors show that transport equipment industry has significantly and positively influenced the sub sector's TFP level by all globalization's variables.

Key words: Globalization impact, total factor productivity, manufacturing sector, Malaysian, economy

INTRODUCTION

The well-known concept of globalization exhibits an increasing integration of the country into the world economy which presents uninhibited financial flows and trade, mutual exchange of knowledge and technology. Perfectly, it also includes migration of labour among the countries (Munck, 2010). Thus, globalization eliminates trade protection on imports as well as free flows of capital (inward and outward), migration of labour internationally, technology transfer and achieving economies of scale if firms are able to export their products competitively. This implies that a small country like Malaysia which implementing an open economic policy is more volatile to the uncertainty of world economy.

A rising integration of the country into the world economy, competitive firms have gain benefit to achieve economies of scale by organizing their production on a worldwide basis through exporting. As a small open economy, the importance of trade is highlight through the openness of the economy, whereby impact of exports and imports on the Total Factor Productivity (TFP) is certainly important to the Malaysian economy. In many cases from the past studies, the impact of trade on the economic sector, particularly the manufacturing sector was analyzed in terms of liberalization on the TFP. This can be seen in previous studies conducted by Kawai (1994), Hwang and Wang (2004). In a study conducted by Goldar and Kumari (2003), followed by Armita and Paramita, the implementation of tariff reform, by lowering tariff and adjustment in real effective exchange rate positively contributed to growth in productivity of the manufacturing sector in India.

Another study, however test the causality between TFP growth and openness of the economy obtained a positive relationship for the Tunisian manufacturing sector while it is a contradict finding for the OECD countries (Edwards, 1998; Mohd *et al*., 2011). The similar finding by Hwang and Wang (2004) also do not provide information on a positive result between TFP growth and trade in forty five industries of the manufacturing sector in Japan during the period from 1973-1998. The result is resembles with the finding discovered for the Korean manufacturing sector in a study by Kim, Lim and Park's over the period from 1980-2003.

Foreign Direct Investment (FDI) is the most important indicators of globalization has facilitated growth of Asian countries for the decade of 1970s and 1990's (Oguchi *et al*., 2002). By examining the impact of FDI intensity to growth in TFP per unit labour, study by Ahmed (2000) also confirmed that FDI has a substantial impact on the TFP in five ASEAN countries (Malaysia, Singapore, Indonesia, Philippines and Thailand), including South Korea and China. Another study by Anwar and Nguyen (2011) that has utilized panel data of twenty-three industries in Vietnamese manufacturing

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sector from 1995-2005 indicate that FDI significantly and positively facilitate growth in TFP. This finding is similar with other studie's findings that supported FDI positively contributes to TFP and significantly affect growth in TFP. This can be seen in the study obtained by Hong and Sun (2011) and preceding study by Girma (2005), De Mello (1999), Miyamoto and Liu (2005). Furthermore, those industries which can create more employments will gain more benefits from FDI.

However, few studies have failed to specify that FDI has a significant impact on the TFP growth. This is discovered in a study by Asheghian (2011) and Kawai (1994). Asheghian (2011) states that FDI has a different results in the case of Canadian manufacturing sector for the period from 1976-2008. The outcome by Kawai (1994)'s study also demonstrates that FDI might not be a useful influence in determining TFP growth, due to the fact that foreign company may operating in the oligopolistic sectors.

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; Xu and Chiang, 2005). As revealed by Savvides and Zachariadis (2005)' study, 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 1965-1992. Another study by Heshmati and Kumbhakar (2011) 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 increases the TFP level the manufacturing sector in Pakistan. Recent study by Abdoulaye 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.

In terms of foreign labour, different category of foreign labour would have different impact on the productivity. The study by Devadason and Meng (2009) show a different finding on a different type of labour where the high-skilled foreign labour 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 labour. 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 (Devadason and Meng, 2009; Mahadevan, 2002; Kadir *et al*., 2005). In Malaysia, the number of foreign labour has increased over the years. In 2005, the amount from 1.82 million has increased to 2.06 million in 2008. Several studies have examined the impact of foreign labour on productivity indicates a positive effect in the case of the manufacturing sector and the construction sector, though the contribution is rather small (Kadir *et al*., 2005).

In every study as discussed above, previous published studies are limited to analyse one characteristic/indicator of globalization/liberalization on the impact of TFP growth/TFP level/productivity. By taking into account as many as variables in examining the impact of globalization on the TFP level of the manufacturing sector, this study provide different analysis from previous studies. In addition, this study provides useful information on the impact of TFP by considering globalization characteristic as determinants. Also it is due to the fact that the manufacturing sector has strong relation with all characteristics of globalization examined in this study.

The variables used in this study consists of Foreign Direct Investment (FDI) inflows, trade involvement through openness of the economy, technology and foreign labour. By considering all variables into analysis, this study is able to predict to what extent the manufacturing sector can be affected by globalization and the uncertainty of the global economy as well. Moreover, it has to keep in mind that the more globalized the economy, the more affected economy to global economic environmental change, especially in the case of small open-economy like Malaysia. To address the question above, the study has two main objectives. Firstly, to examine the impact of globalization on the TFP of the manufacturing sector and secondly to analyse the impact of globalization on the TFP by sub-sector of the manufacturing sector.

Malaysia and South-East Asia economy: Malaysia managed to put herself as a one of the potential and brightest contender to compete with Singapore and other country in the region of South-East Asia. Statistical data of the recent years indicates a better performance shown by Malaysia in the economics area. The Gross Domestic Products (GDP) immensely increase from 193.1 million dollars in 2009-287.9 million dollars in 2011. This is the third highest after Indonesia and Thailand (Table 1).

Rapid globalization process too have widespread the flow of FDI particularly to a country that offer better

Table 1: Economic indicators among South-East Asia economy, 2009-2013

	GDP (USD millions)			FDI (USD billions)			Merchandise exportsand imports (USD millions)					High technology exports (% of manufactured exports)				R and D expenditure (% of GDP)
							2009		2010		2011					
Countries	2010	2011	2012	2010	2011	2012	Exports	Import	Exports	Import	Exports	Import	2009	2010	2011	2005-09
Cambodia	10.4	11.2	12.8	0.8	0.9	1.8	4.20	5.83	5.14	6.80	7.00	9.30	NA	NA	NA	NA
Indonesia	504.3	706.6	846.8	13.8	19.2	19.2	119.65	93.79	158.08	135.32	200.59	176.88	13	10	8	0.08
Malaysia	193.1	237.8	287.9	9.1	12.0	10.0	157.43	123.83	198.61	164.62	227.00	187.66	47	45	43	0.63
Myanmar	NA	NA	NA	1.0	1.0	1.9	6.71	4.40	8.75	4.81	9.33	8.00	NA	NA	NA	NA
Philippines	161.2	199.6	224.8	1.3	1.3	1.5	38.44	45.88	51.50	58.47	48.31	63.70	69	NA	46	0.11
Singapore	182.2	208.8	239.7	48.6	64.0	54.4	269.83	245.79	351.87	310.80	409.50	365.77	48	50	45	2.66
Thailand	263.8	318.5	345.7	9.1	7.8	8.1	152.42	133.71	195.31	182.92	228.82	228.50	25	24	21	0.21
Vietnam	97.2	106.4	123.6	8.0	7.4	8.4	57.10	69.70	72.24	84.84	96.91	106.75	6	9	NA	NA

World Development Indicator, 2011, 2012 and 2013; UNTACD, 2013; International Trade Statistics, 2011 and 2012; GDP, high technology exports and R and D obtain from World Development Indicator, FDI from Global Investment Trends Monitor; merchandise exports and imports from International Trade Statistics, 2011 and 2012

Table 2: Growth rate of the selected indicators of the manufacturing sector, 1990-2010

Economic indicators	1990	1995	2000	2005	2010
Employment ('000 people)	844733	1389418	1574797	1675163	1895365
Value added (RM '000)	24530	59629	88240	655520	870981
Capital intensity Foreign direct investment	0.1055	0.1348	0.2224	0.3207	0.1321
(RM million)	17629	9143	19848	17882	27547
Foreign labour ('000 people)	85704	110096	307167	581379	836711
Number of technology agreement	906	898	805	1 027	1293
Export (RM million)	79646	184987	373270	536234	640044
Import (RM million)	79117	194345	311459	432871	505531
GDP (RM million)	119081	222473	356401	522445	765965

Sources: Department of Statistics Malaysia, various years.

economic incentive to investors. However, high competitions among countries in order to attract FDI have made the FDI trends to South-East Asia economy fluctuated. FDI to Malaysia increased from 9.1 billion dollars in 2010-12.0 billion dollars in 2011 before reduce slightly to 10.0 billion in 2012 (Table 1). Other country likes Singapore, Thailand and Vietnam demonstrates the same pattern while Indonesia on the other hand, holds on the same amount in 2011 and 2012. Meanwhile, Cambodia and Myanmar are as less developed economy among the South-east Asia countries with an ample of low-paid labour stock enjoys an attractive FDI inflow during the period observed.

Globalization too has a significant impact on the performance of trade of the world economy. The reduction and elimination of particular trade tariff and other trade regulations that need to be implements by countries under the World Trade Organization (WTO) have alter the playing field and offers a huge potential market to any countries and region including South-east Asia. For example, for exports and imports of merchandise products, all South-East Asia countries recorded a significant increase for the period observed with Malaysia exports and imports of this product increased from 157 and 124 million dollars in 2009-227 and 188 million dollars in 2011 (Table 1).

The composition of exports show Malaysia has gained opportunities to strengthen survivorships in the global market based on the higher percentage of high technology products exports that make the country to be more competitive. In 2011, Malaysia is ranking as the third among South-East Asia economy with the highest percentage of high technology exports (43.0%) after Philippines (46.0%) and Singapore (45.0%). Realizing the importance of research and development (R and D) in nurturing innovations and high-technology product and to transform an economy to be a high developed nation, Malaysia is seen to be in the right track. For the period of 2005-09, we are in the second place after Singapore as the country with the highest amount of expenditure to R and D (Table 1).

Table 2 shows selected indicators of the variables use in this study. From the table, all economic indicators show an increasing trend from 1990-2010, except FDI and the number of technology agreement. It is not surprisingly because FDI and technology agreement seems to be the most affected from the financial economic crisis in 1997-1999. Similarly, both variables have yet declined in 2005 due to the oil price increased in 2005 till 2007. The economy however has a momentum after 2008, whereby FDI and number of technology agreement remarkably increased in 2010.

MATERIALS AND METHODS

TFP measures: TFP is estimated based on the Cobb Douglas Production function with the assumption of constant return to scale:

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

Equation 1 can be rewritten in the form of log-linear as:

$$\ln Y = \ln A + \alpha \ln K + \beta \ln L + \mu \quad (2)$$

Where:

Y = Output of value added
K = Net value of capital
L = Number of labour
α and β = Parameters respectively for capital and labour are assumed constant return to scale
μ = A residual term

Model specification: The model of TFP function is established using panel data regression as follows:

$$TFP_{it} = f(FDI_{it}, OPN_t, TEC_{it}, FL_{it}, D_t) \quad (3)$$

As shown in Eq. 4, the estimation model of TFP shows the natural log of the variables. The model estimates for TFP can be summarized as follows:

$$\ln TFP_{it} = \alpha + \beta_1 \ln FDI_{it} + \beta_2 \ln OPN_t + \beta_3 \ln TEC_{it} + \beta_4 FL_{it} + D_t + \varepsilon_{it} \quad (4)$$
$$i = 1, ..., n; t = 1, ..., t$$

Where:

TFP_{it} = Denotes total factor productivity of sector/sub sector i
FDL_i = Foreign direct investment inflow
OPN_t = Proportion of export and import out of GDP
TEC_i = Number of technology agreement
Fl_i = Share of foreign labour out of total labour
D_t = dummy time period of globalization
ε_{it} = Residual term

In addition i is sub sector classified into fifteen industries of the manufacturing sector (Table 3 and 4) t is time D_t is a dummy variable of the globalization's time period which 1 is referred to the year 2000 and above while 0 is the year before 2000. The stand point of the year 2000 as a time frame of after and before globalization is based on the explosion of Information and Communication Technology (ICT) during the period. The impact of globalization becomes substantial since China became a member of World Trade Organization (WTO) in December, 2001.

Source of data: Based on the data from Department of Statistics Malaysia (DOS), this study employs the survey from Industrial Manufacturing of 15 sub sectors from the year 1990-2010. By covering 21 years period of study, the analysis based on the 315 observations. In line with the objectives of this study, the impact of globalization on the TFP level is analysed in relations of the overall manufacturing sector and more specifically the impact on TFP level in 15 sub sectors of the manufacturing sector. The sub sectors were classified into 3 digit-level of the Malaysian Standard Industrial Classification (MSIC) (Table 3).

Table 3: Descriptions of sub-sector of the manufacturing sector

Sub-sectors	3-digit level of classifications
Food products	151, 152, 153, 154
Beverages and tobacco	155, 160
Textiles and textile products	171, 172, 181, 182
Wood and wood product	201, 202
Paper, printing and publishing	210, 221, 222, 223
Petroleum products	231, 232, 233
Chemical and chemical products	241, 242, 243
Rubber and plastic products	251, 252
Non-metallic mineral products	261, 269
Basic metal products	271, 272, 273
Machinery and equipment	291, 292, 293
Scientific and measuring equipment	300
Electronics and electrical products	311, 312, 313, 314, 315, 319, 321, 322, 323
Transport equipment	341, 342, 343, 351, 352, 353, 359
Furniture and fixtures	361, 369

MSIC, 2000

Table 4: Diagnostic test of the panel regression models

Test	PLS Model (Pooled Least Squared)	FE Model (Fixed effect)	RE Model (Random effect)
DW-Statistic	2.198	2.188	2.108
AR(1) test p-value	0.000	0.000	0.000
VIF	6.150	9.260	3.700
White test (Obs*R^2)	270.943	264.965	273.660

Data on the globalization indicators are gathered from various sources. The FDI data of the manufacturing sector is taken from Malaysian Industrial Development Authority (MIDA) is based on the project approved. The exports, imports, GDP and number of technology agreement are taken from Ministry of International Trade and Industry (MITI) and foreign labour is obtained from Department of Immigration Malaysia.

The data of TFP measures consists of value-added, labour and capital. All variables were taken from the survey of Industrial Manufacturing. The number of labour is only full time labour while capital is valued based on the net fixed assets as at the end of the year Net fixed asset is equal to gross fixed asset-depreciation rate+ gross fixed capital formation/capital expenditure. The deflation of all data is based on the 1990 base year of the producer price index.

RESULTS AND DISCUSSION

Table 5 presents summary of descriptive statistics of the variables used in this study. From the table, all explanatory variables, i.e., Foreign Direct Investment (FDI), Openness of the economy (OPN), number of

Table 5: Summary of descriptive statistics

Variables	Mean	Median	Max.	Min.	SD	N
FDI	16344257	4478091	436830770	1300745	39736478	315
OPN	1.651	1.690	1.920	1.330	0.186	315
TEC	911	895	1391	686	157.793	315
FL	10.307	3.254	146.247	0.257	20.705	315
Dt	0.429	0.000	1.000	0.000	0.496	315

MIDA, MITI, Department of Immigration, various years

Table 6: Unit root test

	Philips Peron test statistic			
	At level I(0)		At first-order difference I(1)	
Variables	Constant	Constant+trend	Constant	Constant+trend
TFP	56.533***	81.512***	1018.970***	234.064***
lnY	71.103***	28.402***	171.189***	136.997***
lnFDI	162.211***	150.376***	1899.900***	280.430***
lnOPN	21.254**	37.435**	285.818***	193.727***
lnTEC	80.568***	110.195***	751.721***	312.989***
FL	27.639**	46.338***	117.621***	188.964***
KL	66.844***	60.233***	678.129***	252.546***
D_t	18.036*	20.454**	152.177***	103.924***

Significant at level 0.01; significant at level 0.05; *significant at level 0.10

Table 7: Findings of the study

Variables	PLS Model	FE Model	RE Model
constant	3.497	3.442	3.188
	(6.902)***	(10.109)***	(11.374)***
lnFDI	-0.014	0.016	0.006
	(-1.748)*	(2.917)***	(1.149)
lnOPN	0.254	0.236	0.242
	(2.435)**	(3.960)***	(4.339)***
lnTEC	0.003	0.001	0.002
	(10.860)***	(1.641)	(8.015) ***
FL	0.041	0.046	0.034
	(0.825)	(1.292)	(1.218)
D_t	-0.119	-0.139	-0.135
	(-1.839)*	(-3.899)***	(-3.9156)***
R^2	0.837	0.892	0.753
F-statistic	177.693	130.673	105.010
p-value	0.000	0.000	0.000
No. of observation	315	315	315

Wald test; F-Wald test 1%; Pooled vs Fixed; reject H_o; (F critical>F in table); (49.747) (2.700); LM test; χ^2-test 1%; Pooled vs Random; reject H_o; (χ^2 critical >χ^2 in table); (72.485); (20.090); Hausman test: χ^2-test 1%; Random vs Fixed; reject H_o; (χ^2 critical >χ^2 in table); (369.640) (18.475); in parentheses is value of coefficientβ; ***significant at level 0.01; **significant at level 0.05; *significant at level 0.10, ^{ns}not significant

Technology agreement (TEC) and Foreign Labour (FL) represent globalization indicators of the manufacturing sector. These data of the manufacturing are based on yearly data from 1990-2010. The FDI with a minimum amount of 1.3 billion and maximum of 436.83 billion ringgit Malaysia. The financial crisis and oil price boom during the study period reflects the minimum amount of FDI remarkably declined. In addition, China's participation in WTO was also affected the FDI inflows to Malaysia and other ASEAN countries. The TEC indicates the minimum value of 686 of total number technology agreement while the maximum was at 1391.

The foreign labour is measured by the share of foreign labour out of total employment of the manufacturing sector. The number of foreign labour show an increasing trend from 0.81-2.06 million in 2000 and 2008, respectively. Surprisingly, the manufacturing sector indicates the largest share of foreign labour compared to other sectors (agriculture sector, construction sector and services sector) in which accounted for 38.1 and 35.3%, respectively.

Table 6 presents the results of unit root test for all variables used in this study. All data of the variables used in this study are verified by the stationary test. The unit root test of the Philips Peron shows that most of the variables are stationary at 1% level of significant at the first-order difference. In addition, to make sure the model is rigorous, few diagnostic tests were done in order to verify the model free from the multicolinearity problem, heteroscedasticity problem The heteroscedasticity problem referred to various variances of regression model and it may encounter problem in such heterogeneity units in statistical account in this cross-sectional data, whether by differentiation of size or scale data. and autocorrelation problem. The autocorrelation problem occurs with a correlation between members of series of observations ordered in time (in time-series data) or space (in cross-sectional data). This study take care the multicollinearity problem which is due to the existence of high linear relationship among explanatory variables and this is tested by pair-wise correlation. The test of Variance Inflation Factor (VIF) shows the value of Random Effect Model (RE), Fixed-Effect Model (FE) and Pooled Least Square Model (PLS), respectively at 3.70, 9.26 and 6.15 (Table 4). The VIF values <10 confirmed that all explanatory variables are not highly correlated, meaning that the model are free from the multi-collinearity problem. Furthermore, the White test results reject the null hypotheses of the R^2 observes for each model is greater than the Chi-squared value in the table. This results the model also free from the heteroscedasticity problem. Finally, the models also free from the autocorrelation problem which is indicated by Durbin Watson value of the three models are at 2.198, 2.188 and 2.108 and AR(1) p value is 0.00.

Table 7 presents the findings of panel data regression employ in this study. The usage of panel data regression is classified into RE, FE and PLS Model. In order to choose which model should be applied in this study, the Wald test is used to distinguish the selection between PLS and FE Model. Based on the Wald test, the FE Model is chosen due to the p-value of the Wald test is

statistically significant at 1% level of significance. Further, test should be extended in selection of whether PLS or RE Model would be applied. This is verified by the LM test which is found to reject null hypothesis to show that the RE Model to be selected. The LM test shows that the significant value at 1% level of significance in order to reject the null hypothesis. Finally, this study has to confirm again between the selection of RE Model and FE Model. This is verified by the Hausman test that shows the FE Model is favoured for this study due to the rejection of null hypothesis of the RE Model. As a result, this study adopted the FE Model which the model is fitted in the analysis of this study.

The FE Model shows 0.892 the value of R^2, meaning that 89.2% of the model can be explained by the explanatory variables on the impact of TFP growth of the manufacturing sector. The findings show the FDI and the openness of the economy statistically significant at 1 per cent level of significance and positively influenced TFP of the manufacturing sector. The finding implies that the 1% increase in FDI and the openness of the economy will result in the increase of 1.6 and 23.6% of TFP level, respectively. In contrast, the findings of technology and foreign labour are not significant, though have a positive impact on the TFP. The dummy variable of the year after 2000 negatively influence the performance of TFP of the manufacturing sector.

Based on the results obtained in this study, the openness of trade dominantly influenced TFP of the manufacturing sector. This study proved that the Malaysian economy heavily rely on the export and import of the manufactured products. This can be seen in electrical and electronics products amounted >60% of the manufacturing export from the period 2000-2005. Apart from that, the intermediate goods also indicates huge amount of import, whereby accounted for more than 70% from the period of 1998-2008 (http://www.epu.gov.my/external-trade). Heavy reliance on the exports and imports obviously affect the manufacturing sector on the uncertainty of world economic environment. The FDI also important for a fast developing country like Malaysia. Out of total investment, the statistics show an average of 60% of the foreign investment inflow goes to the manufacturing sector over the periods of 2000-2001. Out of total foreign investment, the largest FDI goes to the electrical and electronics industry with an average of 40% investment throughout the period 2000-2011 (https://www.statistics.gov.my). From those figures, it is not surprisingly FDI and the trade openness contribute the most to the TFP level of the manufacturing sector.

Table 7 presents the findings of fifteen industries of the manufacturing sector. Based on the cross section effect value, the overall findings show four industries have strong affection on the performance of TFP level. The highest percentage can be seen in the manufacturing of scientific and measuring equipment industry (83%), followed by the manufacturing of electronics and electrical products industry (63%), the manufacturing of machinery and equipment industry (46%) and furniture and fixtures industry (38%). A detailed findings show that FDI significant and positively influenced TFP level of non-metallic mineral products industry, basic metal products industry and transport equipment industry. However, it is significant but negatively correlated in petroleum products industry and chemical and chemical products industry.

In terms of trade openness, most of the industries show a significant and positive relationship with the TFP level by sub sectors of the manufacturing sector. These are industries of food products, textiles and textile products, paper, printing and publishing, chemical and chemical products, rubber and plastic products, non-metallic mineral products, basic metal products, scientific and measuring equipment, transport equipment and furniture and fixtures.

The number of technology agreement statistically significant at 1% level of significance and positively affects TFP in most industries of the manufacturing sector (Table 8). This is shown by food products, textiles and textile products, paper, printing and publishing, petroleum products, chemical and chemical products, basic metal products, scientific and measuring equipment, transport equipment and furniture and fixtures. Furthermore, beverages and tobacco and non-metallic mineral products industry significant at 10% level of significance. It is not exaggeration to say that the higher the number of technology agreement, the larger TFP will be increased in most industries of the manufacturing sector. This finding is supported by the finding from Abdoulaye's which indicate that an increase of 10% of expenditure in research and development and technology, the aggregate productivity has increased >2% in a study of 55 developing countries.

The variable of foreign labour also significantly affect TFP level of food products industry, paper, printing and publishing industry, textiles and textile products industry, scientific and measuring equipment industry, transport equipment industry and furniture and fixtures industry. The dummy variable of time period after globalization shows that globalization positively increased TFP level of textiles and textile products industry, paper, printing and publishing industry, petroleum products industry, chemical and chemical products industry, rubber and plastic products industry, basic metal products industry,

Table 8: Results by sub sectors of the manufacturing sector

Variables	Food products	Beverages and tobacco	Textiles and textile products	Wood and wood product	Paper, printing and publishing	Petroleum products	Chemical and chemical products	Rubber and plastic products
C	3.23	3.25	3.26	3.22	16.51	2.96	3.39	3.10
	(113.19)***	(6.95)***	(64.97)***	(14.13)***	(2.90)**	(26.88)***	(23.45)***	(6.21)***
lnFDI	0.01	-0.02	0.001	-0.01	-0.004	-0.002	-0.003	-0.02
	(1.23)	(-0.64)	(1.29)	(-0.42)	(-0.15)	(-1.90)*	(-2.38)**	(-0.78)
lnOPN	0.03	0.07	0.02	0.03	0.87	0.01	0.02	0.06
	(7.66)***	(1.65)	(4.22)***	(0.92)	(2.20)*	(1.05)	(2.22)*	(2.03)*
lnTEC	0.02	0.026	0.02	0.01	1.13	0.03	0.02	0.01
	(10.31)***	(1.92)*	(11.11)***	(0.75)	(12.02)***	(6.95)***	(6.43)***	(1.13)
lnFL	0.02	0.04	0.02	0.01	1.53	-0.01	0.02	0.01
	(2.10)*	(0.75)	(5.11)***	(0.24)	(8.66)***	(-0.8821)	(1.78)	(0.16)
D_t	0.01	-0.02	0.02	0.002	0.77	0.02	0.02	-0.07
	(1.28)	(-0.50)	(6.38)***	(0.06)	(3.35)***	(2.46)**	(2.37)**	(-2.02)*
R^2	0.999	0.996	0.998	0.996	0.999	0.999	0.999	0.997
F-statistic	4070.47	295.32	669.16	325.34	10646.51	1552.45	1655.39	374.90
Cross section effect	-0.15	-0.42	0.11	0.24	-0.06	-0.56	-0.08	-0.03

Variables	Non-metallic mineral products	Basic metal products	Machinery and equipment	Scientific and measuring equipment	Electrical and electronics	Transport equipment	Furniture and fixtures
C	0.86	3.36	-4.14	3.20	5.96	3.13	3.22
	(0.19)	(10.78)***	(-1.58)	(76.52)***	(6.06)***	(67.40)***	(71.13)***
lnFDI	1.63	0.003	0.03	0.0001	-0.11	0.001	0.001
	(2.49)**	(2.28)**	(0.36)	(0.45)	(-1.07)	(2.28)**	(0.50)
lnOPN	1.57	0.02	-0.141	0.03	0.04	0.02	0.02
	(1.98)*	(2.44)**	(-0.37)	(4.99)***	(0.35)	(3.04)**	(3.80)***
lnTEC	-0.28	0.02	-0.05	0.02	-0.001	0.02	0.02
	(-2.14)*	(6.34)***	(-0.28)	(11.86)***	(-0.01)	(10.31)***	(15.59)***
lnFL	1.47	0.0003	-0.41	0.02	0.01	0.02	0.02
	(1.76)	(0.05)	(-1.40)	(4.49)***	(0.13)	(2.53)**	(10.26)***
D_t	0.71	0.04	-0.16	0.03	-0.1325	0.02	0.0175
	(1.38)	(7.48)***	(-0.57)	(5.36)***	(-2.24)	(4.602)***	(6.58)***
R^2	0.999	0.999	0.972	0.999	0.992	0.999	0.999
F-statistic	2221.89	3313.78	42.75	3694.34	145.23	2396.46	2827.08
Cross section effect	-0.18	-0.19	0.46	0.83	0.63	0.22	0.38

Figure in parentheses is value of coefficient β; ***significant at level 0.01; **significant at level 0.05; *significant at level 0.10 and ^{ns}not significant

scientific and measuring equipment industry, transport equipment industry and furniture and fixtures industry. From the findings, we can see that only the transport equipment industry has all variables significant and positively correlated with the TFP level.

CONCLUSION

From the results as discussed above, in general this study concludes that globalization has a significant influenced on the TFP performance of the manufacturing sector. The FDI and trade openness of the economy are obtained dominant in determining TFP level of the manufacturing sector. This study consent that both variables have strong contribution to the performance of country's economy and the manufacturing sector, particularly. This findings is in line with government's incentive to foreign investor in terms tax relief on the exports performance and employment generation to the country. In contrast, foreign labour has an opposite result though the number of foreign labour has gradually increased during the study. The similar finding can also be seen for the number of technology agreement to the performance of TFP level of the manufacturing sector.

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