



## Export and Foreign Direct Investment as determinants of productivity: Empirical Study on Malaysia

Lee Sin Yee<sup>1,3</sup>  
Har Wai Mun<sup>1,2</sup>  
Lee Shwu Yin<sup>1</sup>  
Tan Chee Chean<sup>1</sup>  
Yap Kai Li<sup>1</sup>

<sup>1</sup>Universiti Tunku Abdul Rahman (UTAR), Bandar Sungai Long, 43000 Kajang, Selangor, Malaysia), <sup>2</sup>Universiti Putra Malaysia (UPM), Jalan Upm, 43400 Serdang, Selangor, Malaysia, <sup>3</sup>Universiti Kebangsaan Malaysia (UKM), Pekan Bangi, 43600 Bangi, Selangor, Malaysia.

Email: [leesiny@utar.edu.my](mailto:leesiny@utar.edu.my)

Tel: 0163490095

*Abstract : Productivity growth is essential for every nation, especially for the developing ones. Hence, this paper aims to discuss the impact of exports and investment on productivity in Malaysia. Other than that, this paper also examines the existence of U-curve lies in the relationship. Several tests have been run in order to examine the validity of the applied model as well as the relationship between productivity and the independent variables taken in this paper. The result shows there is cointegrating relationship among the variables in the long run. Also, U-curve is found in the relationship between productivity and exports as well as investment. In other words, the relationship will go in opposite direction after a turning point.*

*Keywords: exports, investment, Productivity, U-curve.*

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### 1. Introduction

Export and foreign direct investment (FDI) are deemed catalyst of economic growth.

Developing countries' policy making mostly aims at increasing both export and FDI, citing plenty of research pointing to their importance.

Theoretically, export or net export (after minus import) and investment (foreign or domestic) are direct components in gross domestic products (GDP) calculation.



Thus, both export and FDI are theoretically positive contribution to GDP and its growth, especially in aggregate expenditure (AE) model or aggregate supply-aggregate demand (AD-AS) model. Since 1500, Mercantilist school of thought preached for maximizing net export to accumulate gold (foreign income) for the good of domestic economy. Subsequent classic trade theories like Smith's absolute advantage, Ricardo's comparative advantage. Despite voluminous of literatures on export and FDI on growth, results of their relationships are still inconclusive. Additionally, export and growth impacts on productivity are equally important but not being studied intensively. Productivity growth will help sustainable economic growth. Asian miracle years of high GDP growth, which fuelled by population and investment growth were deemed unsustainable by Krugman (1994: 63) because not supported by productivity growth. Hence, do export and FDI contribute positively to productivity growth? This motivated us on researching export and FDI as determinant of productivity. As in Malaysia and mostly South East Asia developing countries currently, many incentives are given by government to the benefit of foreign investors which may not have positive return to Malaysian citizens. FDI did create job opportunities but not necessary job productivity or quality job. Increasing export may need big improvement in competitiveness. Yet, export competitiveness may not necessary come from productivity but other sources like lower exchange rate and unfair export subsidy policies. In this case, increase export may not have any relationship with productivity. These issues have build up interesting research gap for this study.

advantage and Heckscher-Ohlin model encourage trade, which include both export and import. Attempt of theorizing or linking FDI with economy can be traced back to decades ago. Examples are Robert Mundell's model of international trade and FDI in 1957, Vernon's production cycle theory in 1966, Dunning's Eclectic Paradigm in 1973 and Buckley and Carson Internalisation Theory in 1976 (Denisia, 2010).

There are past researches on determinants of productivity, which is measured by total factor productivity (TFP) and GDP per capita. Measuring productivity in term of per person employed is not attempted. We believed GDP per person employed is a better proxy to productivity because it captures only the total employment within an economy. As compared with GDP per capita as a proxy, GDP per person employed ignores partial population which is not considered as workforce such as baby, school children, housewives and retired workers. There are also little researches studies the exports of goods and services and foreign direct investment as the determinants of productivity growth. In addition, there is no research examining the existence of U-curve between productivity and export as well as foreign direct investment. This is important because this outcome is able to tell if the relationship between those variables has reached their turning (maximum or minimum) point or not.

This research aims to study the determinants of productivity in Malaysia, measured in terms of gross domestic product per person employed. More specifically, it aims to determine



the relationship between productivity (GDPPPE) growth, export and FDI.

## 2. Literature Review

Labor productivity growth which is measured as GDP per person employed, is positively and significantly affected by FDI in high, upper middle and lower income economies from 45 countries (Choudhry, 2009). In addition, the positive relationship between productivity growth and FDI is also supported by another research which mentions a positive correlation between these two variables. However, the result is not statistically significant (Yazdan & Hossein, 2013). In another hand, there is a research paper shows a different result on the relationship between productivity growth and FDI. Using estimated firm-specific total factor productivity, its result shows that an increase in FDI in a particular industry decreases the productivity level in short term but increases the rate of productivity growth of domestic firms in long term (Nguyen, 2010). Apart from the productivity of a particular nation, another research obtains a result showing that there is no significant relationship between information technology (IT) investments and corporate productivity (measured by Return on Equity and Market Shares) of a firm (West & Courtney, 1993). Besides, a research paper's findings mention that FDI (foreign share) is positively related to labor productivity for inter-industry capital while it is negatively related to labor productivity for intra-industry capital. The outcome is obtained by using three models since the labor productivity is measured by three proxies which are labor productivity, total factor productivity and output (Kohn, 2010). In addition, Vahter (2004) mentioned that

foreign equity participation (a measurement for FDI) has a positive relationship with a firm's productivity in Slovenia, based on a research done by him. Another research supports the positive impact of FDI on labor productivity and exports in Cambodia (Soeng, 2008).

Besides, a research paper which examines the relationship between exporting and productivity of a firm doesn't obtain any evidence to conclude that exporting improves productivity which is the total sales in domestic and foreign market (Kim, Gopinath and Kim, 2009). However, Romer (1990) concluded that trade liberalization which promotes specialization in exporting can help plants to improve productivity through access to more advanced equipment, supported by the endogenous growth theories. Moreover, in supporting such positive relationship between export and productivity, a research paper concludes its findings that firms which involve in exporting activities are able to generate more total factor productivity (Loecker, 2007). Similar conclusion regarding positive correlation between export and productivity also suggests that firms with higher productivity are more likely involved in export market (Jensen & Bernard, 1999). In addition, there is evidence showing productivity has positive yet significant impact on exporting, such that a multinational firm which has higher productivity, tends to involve more in exporting activities than a purely domestic firm (Yang & Chen, 2011). However, findings from a paper mention the existence of casual direction from productivity to export in Korea light manufacturing sector. In other words, high productivity of a firm promotes its exporting activities (Lee, 2002). Yet, a



research paper concludes that there is unidirectional causation from foreign direct investment to export by using the Granger causality test (Shawa & Shen, 2013).

Another research which conducts a study between the variables of productivity (output per worker) and human capital investment (educational level) obtaining a result which also supports the positive relationship between these two, saying that an increase in educational level leads to an increase in productivity, especially for secondary education (Nandwa, 2004). Besides, Easterly and Rebelo (1993) conducted a research in which the result shows that public investment including transportation and communication investment is positively related with economic growth of a nation, measured in growth rate of per capita GDP. Such result is also supported by a research which concludes that private and highway capital are positively yet significantly related with the county's output of a nation (Ozbay, Ozmen-Ertekin and Berechman, 2007). Furthermore, a research's findings conclude the bidirectional causation relationship (long-run) between export and GDP growth in oil dependent and nonoil developing countries (Mehrra & Firouzjaee, 2011). In the research done by Shawa and Shen (2013), there is no causation between foreign direct investment and GDP growth.

Najarzadeh, Rahimzadeh and Reed (2014) concluded that Internet is positively and significantly related with GDP per person employed (GDPPPE) in a research paper. Similar result is also supported by another research, saying that the increase of Internet users has positive effect on economic growth (Choi & Yi,

2009). Endogenous growth model omitted by Paul Romer (1990) mentioned that knowledge spillover (Internet usage, in this case) positively affects economic growth. Furthermore, a paper concludes that increase in public research investments will cause the total factor productivity growth rate to increase as well, showing the positive relationship between these two variables (Liu, 2007).

### 3. Data and Methodology

#### 3.1 Data Description

Data for this research are from World Bank. This research uses time-series data in yearly basis from year 1980 to 2012, consisting 33 years for each of the variables, which are gross domestic product in term of per people employed (GDPPPE), exports and foreign direct investment (FDI).

#### 3.2 Model Specification and Estimation Approach

In exploring the effect of export and FDI on productivity (proxy by GDPPPE), the model is specified as follows.

$$GDPPPE_t = \beta_0 + \beta_1(EXPORT_t) + \beta_2(FDI_t) + \beta_3(EXPORT_t)^2 + \beta_4(FDI_t)^2 + \mu \quad (1)$$

GDPPPE is the logged gross domestic products per person employed (productivity), EXPORT is logged exports, FDI is logged foreign investment and  $\mu$  is the error term. In the economics theory, the higher the export induces higher productivity. Export revenue can be used to improved productivity which is needed for export competitiveness. FDI are believed to bring in funds, technologies and knowledge to improve productivity. Therefore, the expected sign for export and FDI coefficients are positive.



However, if coefficient for export is negative and coefficient for its square term is positive, this implies a quadratic equation or "U-curve" with a minimum turning point value. If coefficient for export is positive and coefficient for its square term is negative, this implies a quadratic equation or "inverted U-curve" with a maximum turning point value. Same interpretation applies to FDI. This study investigates the effect of export and FDI on productivity by applying simple regression estimation.

As the nature of data is time series, Phillips-Perron unit root tests are performed to check stationarity. Regression equation for Phillips-Perron (PP) unit root test (Phillips and Perron, 1988) is estimated as in (2).

$$\Delta Y_t = \mu + \gamma Y_{t-1} + \phi \left( t - \frac{T}{2} \right) + \varepsilon_t \quad (2)$$

Where  $\varepsilon_t$  is a pure white noise error term,  $\Delta$  is differencing operator,  $Y$  are the variables in this study (GDPPPE, FDI and exports),  $T$  represents number of observation,  $\mu$  is the constant.

Co-integration test is performed to determine are the relevant variables do or do not obtain a long-run equilibrium. The Johansen-Juselius cointegration test is applicable. Other than that, lag length selection for the model can be determined through VAR equation using the Akaike information criterion (AIC) value (Akaike, 1973). Four other tests is performed s diagnostic check, which are Jarqua-Bera (JB) test for normality, White and Autoregressive Conditional (ARCH) heteroscedasticity test for heteroscedasticity, Durbin-Watson d test for autocorrelation and Auxiliary Regressions Test for multicollinearity. JB test is based on the skewness and kurtosis that measured by the OLS

model's residuals and if the error of skewness is equal to zero and the error of kurtosis is equal to 3 it is consider as normally distributed. The JB test can be defined as in (3).

$$\frac{N}{6} \left( S^2 + \frac{(K-3)^2}{4} \right) \quad (3)$$

Where  $S$  represents error of skewness,  $K$  represents error of kurtosis and  $N$  represents number of sample size. The decisional rule would be reject the null hypothesis if the p-value of JB-stat is smaller than alpha ( $\alpha$ ). It proves that the residuals are not normally distributed if the JB-state is not significant. U-curve model is developed by Lysgaard (1955) which holds the purpose to describe the stage of cross cultural adjustment. In this research, the quadratic or "U-curve" hypothesis is used to determine possible top or bottom limit of effect of independent variables on productivity.

## 4. Results and Discussions

### 4.1 Unit Root Test

The results of PP test are reported in Table 1, by taking into consideration of trend variable with intercept in the regression. Based on Table 1, the t-statistics for all first difference series in PP tests are statistically significant to reject the null hypothesis of non-stationary at 5% significance level. Johansen-Juselius cointegration test trace statistic is greater than 5% critical value at CE(s) is equal to at most 2, indicating all the variables are integrated and have long-run relationship. This is consistent with some previous studies that have been demonstrated the most of the macroeconomics series expected to contain unit root at first different and thus are integrated of order one, I (1).



Table 1: PPP Test (intercept with trend) Results

Variable	Level	First difference
GDPPE	-1.6026	-4.8291***
FDI	-4.6648***	-13.7354***
EXPORT	0.3886	-5.2585***

Notes: \*\*\*, \*\*, \* Denotes the rejected of the null hypothesis at 1%, 5% and 10% significant level.

4.2 Empirical Results

The estimated regression result is as in (4). All independent variable are significant at 1% except export significant at 5%.

$$\begin{aligned}
 \text{GDP} &= 28.8426 - 1.3594(\text{EXPORTt}) + 0.0320(\text{EXPORTt})^2 \\
 \text{PPEt} & \quad (0.6161)** \quad (0.5010)** \quad (0.0097)*** \\
 \text{(S.E.)} & \\
 & - 0.5337 + 0.0129 \\
 & \quad (0.1928)** \quad (0.0046)*** \\
 & \quad *
 \end{aligned} \tag{4}$$

$R^2 = 0.9919$       F-stat = 855.90\*\*\*

Notes: \*\*\*, \*\*, \* Denotes the rejected of the null hypothesis at 1%, 5% and 10% significant level.

Equation (4a) showed that both coefficients for export and FDI are significant and negative while coefficients for export square and FDI square are significant and positive. Thus, empirical results supported U-curve relationship. Equation (4) is rewritten as (4a) for partial effect of export and (4b) for partial effect of FDI.

$$\text{GDPPE} = 28.08426 - 1.3594(\text{EXPORT}) + 0.0320(\text{EXPORT})^2 \tag{4a}$$

$$\text{GDPPE} = 28.08426 - 0.5337(\text{FDI}) + 0.0129(\text{FDI})^2 \tag{4b}$$

Minimum turning point is obtained when partial differencing GDPPE against

EXPORT and FDI respectively equal to zero.

$$d(\text{GDPPE})/d(\text{EXPORT}) = - 1.3594 + 0.0640(\text{EXPORT}) = 0$$

$$\text{EXPORT} = 21.24\%$$

$$d(\text{GDPPE})/d(\text{FDI}) = - 0.5337 + 0.0258(\text{FDI}) = 0$$

$$\text{FDI} = 20.69\%$$

4.3 Diagnostic tests

Normal distribution of the error term is one of the assumptions for achieving an unbiased yet efficient ordinary least square model. Jarque-Bera test statistic is 0.1381 and not significant. Thus, the residuals are normally distributed. White's Generalized Heteroscedasticity is performed in order to detect if there is any heteroscedasticity problem. The F-statistic value for the White's Heteroscedasticity test is 1.0972, which it not significant. Its probability Chi-Square is 0.6060, more than 10% level of significant. Results for ARCH Heteroscedasticity test also not significant. Its F-statistic is 0.0577 with probability Chi-Square of 0.8042. Hence, these diagnostic tests implied no heteroscedasticity problem. Autocorrelation is simply known as a condition where there is presence of correlation between the contemporaneous residuals. The value of Durbin Watson statistic (1.115878) falls in the zone of indecision (0.995, 1.510). Thus, there is no evidence of autocorrelation problem exist. Multicollinearity indicates the linear relationships between the independent variables in a regression model in which it is not a good condition. In testing multicollinearity, the squared variables



are excluded as they purpose of inclusion is to test existence of quadratic relationship (U-curve) through a linear regression model. Table 2 shows TOL and VIF value of export and FDI variables. VIF values for both dependent variables are less than 10, indicating no multicollinearity problem.

Table 2: TOL and VIF results

Dependent Variables	R <sup>2</sup>	TOL	VIF
LEXPORT	0.324529	0.675471	1.480448
LFDI	0.324529	0.675471	1.480448

#### 4.4 Discussion of Results

Malaysia's export since 1980 has been steady but getting lower. Export growths were highest between 1982 and 1995. Growths ranged between 10% and 22% in 13 years out of 14 years. Historically, export growths were less than the turning point of 21.24%, implying that export growth may contribute negatively to productivity growth. Perhaps, since Asian crisis, our export growths are mainly through low value of Ringgit. Export growths do not need or encourage growth in productivity to remain competitive. The results may also reveal labour structure in production of export goods. To remain cost competitive, especially facing price competition from China and Vietnam, Malaysian firms seem rely on low-skill cheap foreign labours to substitute high-skill productive labours. Perhaps, a sustainable huge improvement in export growth to over 21.24% may generate sufficient export revenues to be invested into improving productivity. Otherwise, current situation does consistent with empirical results in this study.

FDI inflows to Malaysia over the years were very volatile from negative 50% to over 100%. Based on empirical results, a high growth of more than turning point 20.69% will enhance productivity. Big investments from mega multinational corporations are more likely to bring together expertise and technologies that can enhance domestic productivity. Small scale of investment may come into Malaysia to tap our cheap semi-skill labour advantage only, thus may even harm our labour productivity.

#### 5. Conclusion

This paper aims to determine impacts of exports and investment on productivity in Malaysia. Different from other research, this paper suspect a quadratic relationship (phenomena known as U-curve) between export, FDI and productivity. Therefore, squared variables are used in a linear regression setting. Empirical results consistent with U-curve phenomena. Several tests have been run in order to examine the validity of the applied model as well as the relationship between productivity and the independent variables taken in this paper. The result shows there is co-integrating relationship among the variables in the long run, no heteroscedasticity, autocorrelation and multi-correlation problems exist. With volatile and uncertain global economy and political environment, results implied that government should focus on going for grand or big scale push in export and FDI inflow. As implies in empirical results, small growth that is less than turning point may bring harm. Contrary, a big growth can bring positive impacts to productivity.



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