FOREIGN DIRECT INVESTMENT EFFECT ON EAST ASIAN PRODUCTIVITY

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Abstract: This study empirically measures the impact of foreign direct investment (FDI) on productivity of ASEAN5 (Malaysia, Indonesia, Philippines, Singapore and Thailand) plus 2 (China and South Korea). Analytical interpretations in this paper have successfully corrected the defects of the predecessor study through a statistical estimation by way of arriving at the coefficients of the explanatory variables being used by econometric approach. A second step in a routine procedure has effectively plugged the parameters of the variables into a modified model in order to calculate the growth rates of productivity indicators being used by growth accounting. The examination envisages a key finding that the productivity growth of the aforesaid ASEAN5 and China has been 'input-driven'. However, South Korea is moving towards productivity driven. As reflected from the comparison among the results of total factor productivity (TFP) growth. The study also exposes a fact that the impact of FDI has been positive in the countries under considerations.

Keywords: *ASEAN5 plus 2; FDI; TFP growth; input-driven.*

INTRODUCTION

Following the free trade agreements between most of the countries around the global the foreign direct investment (FDI) had found its way to the majority of the countries in general and East Asian region in particular. In this regard, South Korea reserved FDI out unless necessary for technology access or exports, joint venture and licensing encouraged. It sustained drive to create giant private conglomerates to internalise markets, lead heavy industry and create export brands. Ambitious local research and development (R&D) in advanced industry, heavy investment in technology infrastructure, as well as targeting of strategic technologies was implemented. Moreover in Singapore case, aggressive targeting and screening of Transnational Corporations (TNCs), directed into high value-added activities. Whereas, in the case of other Association of Southeast Asian Nations (ASEAN) countries the FDI is generating most of the economic activities from the hypermarkets activities to industrial, services and most of the economic activities and it considered to be the most significant factor of economic growth in these countries.

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Contrasting others economist and analysts who forecast an eventual Asian superiority, Krugman (1994) believes that Asian economic growth rates will taper off significantly, well before a convergence with today's world economic leaders. Krugman concludes that rapid growth in the Asian newly industrialised countries (NICs) has been the result of three primary factors. First is the transition of labour from rural to industrial, the second is the education of these workers and the third contributing factor is the catching-up effect in the capital stock. What is critically lacking, Krugman argues, is an ability to innovate in technology. According to Krugman's empirical estimates, almost all of the rapid growth in the developing economies of Asia can be accounted for by the above two factors: increased labour force participation rates and a building of the capital stock. Consequently, total factor productivity (TFP) has shown little or no growth as increases in labour and capital account for the economic growth that has been occurring. Following the convergence hypothesis, we would conclude that ultimately many of the NICs of East Asia will achieve living standards enjoyed in Japan and The United States before settling into a steady-state level of growth. If current trends continue, China will emerge as the world's leading economic power before the middle of the twenty-first century. Other nations in the region such as Singapore, Thailand, Indonesia, Malaysia, and several others, will reside contentedly alongside the U.S. and Japan as economically powerful nations. As a region, Asia will dominate the world economy.

Oguchi et al. (2002), state that FDI helped economic growth in many Asian countries during the 1970s and 1990s. For example, Malaysia actively accepted foreign investment to accelerate its economic growth during that period. One merit of FDI that is often mentioned is technology transfer that accompanies new investments. Host economies expect direct productivity improvements with FDI as well as indirect spillover effects. However, the results of empiric studies on the effects of FDI on productivity are not clear. For example, Oguchi (1994) compared production functions of Korean and Japanese firms that were operating in the Masan free trade zone and determined that Korean firms were more productive. Ramstetter (1993) also found that there was no significant difference in the production functions of Thai local manufacturing firms and foreign operating in Thailand. Lichtenberg and de la Potteries (1996) examined the effects of FDI on productivity by cross section analysis of 13 countries and did not find significant positive effects. In contrast, Ramstetter compared foreign multinationals and local firms in Asian countries and found that foreign multinationals tended to rate higher than local firms in many characteristics (i.e., labour productivity, capital deepening, capital productivity). Thus, empiric results on the productivity effects of FDI are not clear.

There are various possible reasons for these seemingly unexpected results. Young (1991) points out that when the FDI requires adjustments in the host economy, including adjustment of labour allocations and quality, it takes time to take full advantage of the potential of new technology. Narayanan and Guan (1994) examined technology transfer in the electrical and electronics industries in Malaysia and found that, to have successful technology transfer, the receiving country must be ready to absorb new technology. In cases where labour is not ready for new technology, improvement in productivity cannot be realised with FDI. Another possible reason is that, in some cases, FDI might introduce technology that is obsolete in the supplying economy and that is not necessarily more productive than technology in the host country.

This paper seeks to study the impact of FDI on productivity of ASEAN5 plus 2.

This paper gives details of as follows. Section 2 contains descriptions on the estimation methods employed in this paper, Section 3 demonstrates details of the data. Results of the empirical analysis are explained in Section 4. Finally, Section 5 presents the conclusions.

METHODOLOGY AND ESTIMATION PROCEDURES

In this study, Cobb-Douglas production function and the Solow's residual have been used as modified model to fill the gaps of both estimations which had previously cast doubts on the results generated.

The modified Cobb-Douglas production function in this research has followed the conventional growth accounting framework utilised by Stigler (1947), Abramovitz (1956), and Kendrick (1956) to our study. This approach was initially developed by Solow (1956, 1957), finally brought to fruition by Kendrick (1961) and further refined by Denison (1962, 1979), Griliches and Jorgenson (1962), Jorgenson et al. (1987), Dewan and Kraemer (2000), used by Lee and Khatri (2003) and modified by Elsadig (2006). This approach provides wider space for decomposition of contributions of factor inputs and technological change to economic growth. This provides empirical evidence on the contributions of aggregate physical capital, employment and FDI to Gross Domestic Product (GDP) growth for a panel of developed and developing countries, including the ASEAN-5 plus 2 countries.

Production function is given in Equation (1):

$$GDPit = F(Kit, Lit; FDIit; Tit) \quad (1)$$

where for Country i = 1, 2,...,7 in Year t = 1965–2006, the output GDP is annual real GDP, and the inputs are: real aggregate physical capital K, number of persons employed L, real FDI and time T, that proxies for TFP as a technological progress of these countries.

The Cobb-Douglas production function for Country i (i = 1, 2,...,7) in Year t (t = 1965–2006) is given in Equation (2):

$$\Delta\ln GDPit = a + \alpha.\Delta\ln Kit + \beta.\Delta\ln Lit + \lambda.\Delta\ln FDIit + \varepsilon it \quad (2)$$

where

α is the output elasticity with respect to aggregate physical capital

β is the output elasticity with respect to aggregate labour

λ is the output elasticity with respect to FDI

a is the intercept or constant of the model[1]

ε_{it} is the residual term[2]

ln is the logarithm to transform the variables.

Δ is the difference operator denoting proportionate change rate.

ε_{it} is the random error term in the model, representing the net influence of all unmeasured factors. This is explained as the combination of the quality of the inputs involved, those proxies for the TFP growth.

This model is based on econometric estimation had gap of being based on the coefficients of the estimated explanatory variables (as a homogenous measure of the explanatory variables) and there is no calculation of contributions of productivity indicators of these explanatory variables.

Moreover, this study effectively attempts to close the gap of the divisia translog index approach that was developed by Jorgenson

et al. (1987). This approach which involves explicit specification of a production function has major drawback such as inability to evaluate its reliability using statistical models, thus casting doubts on its results. Therefore, the current study provides a statistical analysis for estimating the coefficients of the explanatory variables that have been used for econometric approach (Equation 2). These coefficients were substituted into the model (Equation 3). The divisia translog index approach was then used to calculate the growth rates and the contributions of productivity indicators which include the calculation of the residual of the model called TFP growth and the output growth that are used by growth accounting approach.

Since the intercept (a) in Equation (2) has no position in the calculation of the productivity growth indicators, a second step was proposed, which calculates the growth rates of productivity indicators transforming Equation (2) as an extension of the basic growth accounting framework, the Cobb-Douglas production function is specified in the parametric form of the above equation as follows:

$$\Delta \ln TFPit = \Delta InGDPit - [\alpha.\Delta InKit + \beta.\Delta InLit + \lambda.\Delta InFDlit] \quad (3)$$

where the weights are given by the average value shares as follows: -

ΔInGDPit	is the growth rate contribution of output
$\alpha.\Delta$InKit	is the contribution of the aggregate physical capital
$\beta.\Delta$InLit	is the contribution of the aggreagate labour
$\lambda.\Delta$InFDlit	is the contribution of the FDI
ΔInTFPit	is the total factor productivity contribution

The framework decomposes the growth of GDP into the contributions of the rates of growth of the aggregate physical capital, labour and FDI, plus a residual term typically referred to as the contribution rate of TFP.

SOURCES OF DATA

The data for this paper were collected from various sources. Real gross domestic product, real aggregate fixed capital, number of employment and real FDI were collected from Asian Development Bank: Key indicators of developing Asia and Pacific countries, Statistical and Data Systems Division, and international financial statistics of International Monetary Fund, yearbook. As well as from the individual countries databases, World Development Indicators and the International Labour Organisation

RESULTS AND DISCUSSION

Autoregressive estimator has been applied to Equation (2) of the model being generated from Cobb-Douglas production function to measure the shift in the production functions of ASEAN-5 plus 2. An annual time series data over the period of 1960–2006 for real GDP, real aggregate physical capital, number of employment and real FDI were employed for the individual countries.

In view of the fact that the model used in this study was specified in first differences and the calculated growth rates were used in the discussion of results and findings of the study, the model was found to be stationary. In addition, Table 1 presents the results of the unit root tests conducted. Likewise, Engle and Granger (2003), state that if economic relationships are specified in first differences instead of levels, the statistical difficulties due to non-stationary variables can be avoided because the differenced

Table 1 Results of the Phillips-Perron (PP) unit root test first difference

Country	GDP	Capital	Labour	FDI
China	–6.26*	–6.13*	–6.32*	–3.63*
	–6.25**	–6.15**	–6.24**	–3.61**
Indonesia	–3.34*	–4.00*	–7.17*	–3.46*
	–3.89**	–4.59**	–7.07**	–3.42**
Korea	–2.30*	–3.65*	–6.14*	–7.04*
	–3.90**	–4.81**	–6.06**	–6.94**
Malaysia	–5.16*	–4.08*	–6.34*	–7.01*
	–5.11**	–4.13**	–6.26**	–6.92**
Philippines	–4.91*	–4.37*	–6.26*	–5.73*
	–5.50**	–4.82**	–6.19**	–5.64*
Singapore	–3.46*	–2.92*	–6.07*	–5.67*
	–4.31**	–3.78**	–6.29**	–6.69**
Thailand	–3.51*	–3.48*	–6.27*	–6.34*
	–3.67**	–3.55**	–6.25**	–6.30**

Note: Figures in Table 1 are *t* test-values showing significance at 1%, 5% and 10%
*Constant without trend
**Constant with trend

variables are usually stationary even if the original variables are not.

Analysis of the data using Equation (2) showed that the estimated coefficients of the explanatory variables of the model mainly were significant at 5% level. According to Durbin-H values the model has no problem of autocorrelation (Table 2). In addition, the adjusted R^2 and t-values did not indicate multi-collinearity in the model (Table 2).

Figures in Table 2 were estimated using Equation (2).

Empirical analysis

Analysis was carried out to compare the productivity indicators between the ASEAN5 plus 2 economies for the entire period of 1965–2006. In order to study the effect of governments' policies in improving the productivity growth, the study period was divided into two phases. These phases, which corresponded to the major policy changes, were 1965–1987; 1988–2006. The period of the 1960s; and 1970s witnessed the labour driven policies in these countries. The decades of 1980s, 1990s and 2000s saw a further diversification of the economy into more advanced industries through investment driven policies. As a result of these polices the range of economic activities and sources of growth had become more diversified. In addition, these decades witnessed further diversification of the economies of these countries into more advanced industries. During these decades, the economic structural transformation took place in most economies of these countries. The manufacturing sector became the engine of growth in these countries. Finally, this includes the period of 1997–2006, i.e., was the period of pre-and-post the Asian financial crisis of 1997 and its negative impact continued until 2000 with significant damage to the Asian economies.

Table 2 Estimated coefficients of ASEAN 5 + 2, 1965–2006

Country	Intercept	Capital	Labour	FDI	Adjusted R^2	D–H
China	0.19 (0.42)	0.41 (17.4)**	0.34 (2.78)**	0.25 (3.09)**	0.99	0.23
Indonesia	0.68 (3.07)**	0.43 (5.56)**	0.37 (2.98)**	0.20 (1.83)*	0.94	0.18
Korea	–0.03 (–0.66)	0.50 (17.2)**	0.25 (4.85)**	0.25 (1.79)*	0.99	0.15
Malaysia	–1.25 (–9.50)**	0.63 (14.4)**	0.10 (3.21)**	0.27 (3.96)**	0.98	0.33
Philippines	3.90 (1.56)	0.59 (6.00)**	0.26 (1.98)**	0.15 (1.21)	0.93	0.24
Singapor	3.08 (1.71)*	0.52 (5.39)**	0.10 (2.19)**	0.38 (1.89)*	0.93	0.36
Thailand	3.91 (2.51)**	0.58 (6.14)**	0.23 (1.97)**	0.19 (1.22)	0.94	0.29

Note: Figures in parentheses are t-values
**Significant at 5% level
*Significant at 10% level

However, the contribution of TFP growth to the economies of these countries in terms of average annual productivity growth was low (Table 3). The highest contribution of GDP by including FDI in the model to the productivity growth of the ASEAN5 plus 2 was the contribution of the sub period of 1965–1987 (Table 3). The lowest contribution of GDP to the productivity growth of the economies of these countries was the contribution of the sub-period of 1988–2006 (Table 3). This was found to be the period of labour and investment driven. And the sub period of 1988–2006 was the perceived period of investment driven. As a result the performance of the economies of these countries was rapid compared with the period before the transformation of these economies into investment driven that supported by FDI. The TFP growth contributed significantly low and the GDP was not the highest one to contribute to the economy's productivity growth. The reasons behind that were the financial crisis of 1997, the quality of human capital and the technology involved in the production of these economies.

The highest contribution of aggregate physical capital to GDP in terms of average annual productivity growth of the ASEAN5 plus 2 was during the sub-period of 1965–1987. Likewise, the contribution of aggregate labour to GDP in terms of average annual productivity growth of these countries was fair during all the periods of the study (Table 3). This reflects the fact that the comparative advantage in unskilled labour intensive that eventually helped to attract FDI in the latter half of the 1980s. These countries accelerated trade liberalisation policies and drastically eased restrictions with respect to capital ownership of foreign companies. That fostered the significant increase of global capital.

Table 3 ASEAN 5 + 2 productivity indicators (in percentage)

Country	GDP	Capital	Labour	FDI	TFP
China					
1965–2006	9.13	11.2	8.21	7.8	1.07
1965–1987	9.28	10.6	9.39	6.15	1.18
1988–2006	10.1	11.8	10.3	10.1	1.46
Indonesia					
1965–2006	8.32	7.32	7.39	5.65	0.79
1965–1987	9.29	8.88	7.67	4.71	0.84
1988–2006	6.33	6.25	8.21	3.92	0.92
Korea					
1965–2006	9.28	7.60	10.9	5.80	1.40
1965–1987	9.13	8.63	11.6	4.41	1.76
1988–2006	7.64	8.37	12.2	7.67	2.20
Malaysia					
1965–2006	6.45	7.21	3.93	12.3	0.83
1965–1987	6.89	8.11	3.67	12.7	0.94
1988–2006	5.34	6.77	4.28	7.26	0.99
Philippines					
1965–2006	7.45	7.12	6.28	5.91	0.72
1965–1987	9.29	8.09	7.65	5.01	0.79
1988–2006	6.12	5.26	7.31	413	0.86
Singapore					
1965–2006	8.54	7.01	9.79	5.71	0.99
1965–1987	9.29	8.89	10.7	4.70	1.76
1988–2006	6.76	11.8	11.3	7.07	1.85
Thailand					
1965–2006	8.93	7.01	7.00	5.86	0.74
1965–1987	9.49	8.89	7.28	4.99	0.83
1988–2006	5.25	6.27	8.13	3.04	0.98

Note: Figures in Table 3 were calculated using Equation (3)

Finally, the contribution of FDI used in the economies of ASEAN5 plus 2 was significant during most of the periods of the study. By examining the role of FDI to achieve productivity driven economy through TFP growth, it was found from the results that there was a positive contribution of FDI to TFP growth of the economies of these countries during all the periods of study (Table 3). Due to the fact that FDI is the source of technology transfer brought to these countries through TNCs investment.

CONCLUSION

This study argues to fill in the gaps of pervious studies by providing a statistical analysis in the first step of the estimation to attain the coefficients of the explanatory variables that have been used by econometric approach. It can be reiterated here that in addition, a second step that plugs the parameters of the variables into the model in order to compute the growth rates of productivity indicators including the calculation of the residual of the model (TFP) and output growth being used by growth accounting approach.

The results show that the productivity growth of ASEAN5 plus China is input driven. On the other hand, South Korea is moving towards productivity driven; this is supported by the ability of its companies to compete in international markets of products and investment. The study also finds that the impact of FDI is positive with little contribution to TFP growth. These findings are in line with the findings of the studies undertaken by Young (1992, 1995) and Kim and Lau (1994), in which the authors state that other Asian newly industrialised countries' productivity was input driven. Sarel (1996) also expressed concerns that some East Asian countries may face the same fate as the Soviet Union. His perception bears reasonable assumptions as these countries invested primarily in labour and capital rather than in technology over the past few decades and there was no real technological drive that can sustain the progress of the industrial development. According to Krugman (1994), the high growth rates in East Asian are, however, not sustainable because Asian growth has come primarily from increases in the amount of labour and capital rather than in TFP (i.e., knowledge and technical change). At some point, according to his argument, it will no longer be possible to continue raising levels of capital and labour. Consequently, East Asian growth rates must eventually fall in the absence of improvements in TFP.

These results also confirmed that FDI had a very significant role in achieving higher output growth that produced by these economies through using huge input to produce output. Thanks to FDI that helped the manufacturing sector to become the engine of economic growth instead of agricultural sector when economic structural transformation took place at these economies in 1980s.

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NOTES

[1] The intercept term, as usual, gives the mean or average effect on dependent variable of all the variables excluded from the model.

[2] The residual term proxies for the total factor productivity growth that accounts for the technological progress of the economy through the quality of input terms.