

## FOREIGN DIRECT INVESTMENT INTENSITY EFFECTS ON TFP INTENSITY OF ASEAN 5 PLUS 2

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This study aims to investigate the role of foreign direct investment (FDI) intensity through decomposition of labour productivity growth into contributions of capital deepening, increased usage of foreign direct investment (FDI) intensity, and the simultaneous contribution of the quality of these factors. This has expressed as the contribution of total factor productivity (TFP) intensity growth in achieving productivity driven growth in ASEAN 5 (Malaysia, Indonesia, Philippines, Singapore and Thailand) plus 2 (China and South Korea). This study claims to fill in the gaps of previous studies by developing applications of intensive growth theory and introducing the TFP intensity (TFP per unit of labour). The results show that the productivity growth of ASEAN 5 plus China and South Korea is input driven, however, South Korean Model has constructed companies such as Daewoo, Samsung and LG that competed globally. The study also finds that the impact of FDI intensity is positive with slight contribution to TFP intensity growth.

*Keywords:* ASEAN 5 Plus 2, FDI Intensity, TFP Intensity, Input-Driven  
*JEL classification:* E23, C22, O11

### 1. INTRODUCTION

In Singapore and Malaysia cases, aggressive targeting and screening of Transnational Corporations (TNCs), direction into high value-added activities. While South Korea Foreign Direct Investment (FDI) kept out unless necessary for technology access or exports, joint venture and licensing encouraged. It sustained drive to create giant private conglomerates to internalize 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.

First and foremost many of these TNCs were seeking cheap labour, but progressively

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more, particularly in Association of Southeast Asian Nations (ASEAN), they found skilled human resources, large national and regional markets, the opportunities inherent in infrastructural development and other inducements. Even though, as a determinant of “globalisation”, FDI has generally grown more speedily than trade and most other international capital flows over the last decades, its expansion in Asia was even more rapid in 1980s, 1990s and up to now China is attracting most of FDI among Asian countries.

Oguchi *et al.* (2002) states 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 empirical studies on the effects of FDI on productivity are mixed. 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 Potterie (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, empirical results on the productivity effects of FDI are mixed.

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.

The growth of an economy is governed by two distinct sources of growth that is input-driven and productivity-driven. The input-driven growth is achieved through the increase in factors of production which is inevitably subjected to diminishing returns and is not sustainable in the long run (Young (1992), Krugman (1994), and Kim and Lau (1994)). The productivity-driven growth is the growth in output that cannot be explained by the growth in total inputs. It is normally attributed to the advance of knowledge or technological progress, efficient use of factors of production, improvement in organizational structure and human resources management, gains from specialization,

learning-by-doing, skill acquisition through human capital investment and enhancement of information technology. Thus the growth in productivity, which is also known as TFP growth, is the difference between actual growth of output and the growth of a composite of all factor inputs. It measures the overall efficiency with which products are produced and thus enable the economy to generate larger output from the same available resources. In other words, TFP growth would bring the economy to a higher production frontier, with more efficient use of factor inputs. Hence it is an important source of sustainable long-term economic growth.

TFP growth has long been identified as one of the important sources of economic growth in the western countries (Solow (1956, 1957), Abromovitz (1956), Denison (1962), Kim and Lau (1994)). In a study on sources of growth in nine western countries, Denison (1967) found that advanced knowledge, improved allocation of resources and economies of scale accounted for almost 60 to 90 percent of the growth in income per capita, with factor inputs (labour, capital and land) explaining a relatively small percentage of the overall economic growth. This implies that the growth of the western countries has been mainly driven by TFP growth rather than the growth in factor inputs. This finding is supported by another recent study conducted by Kim and Lau (1994). They found that almost 45 to 70 percent of the economic growth in five of the Organization for Economic Cooperation and Development (OECD) countries was contributed by productivity growth. This growth phenomenon is somewhat different from the growth pattern observed in the East Asia Newly Industrialized Countries. Studies indicated that the growth of these countries has been mainly input-driven through massive factor accumulation rather than productivity driven (Young (1992, 1995), Krugman (1994), Kim and Lau (1994)). Young (1992), for example, found that over the period of 1966-1990 productivity growth in the aggregate non-agriculture economy ranges from as low as 0.2 percent in Singapore to a high of only 2.3 percent in Hong Kong, whereas in manufacturing productivity ranges from a low of -1.0 percent in Singapore to a high of only 3.0 percent in South Korea.

None of these studies used labour productivity approach. Economists are more interested in intensive growth, which is expressed as growth in output per worker (labour productivity). Moreover, an economy's standard of living is not determined by its total output but by the amount of output available per person (Dollar and Sokoloff (1990), Elsadig (2006)). This study aims to investigate the role of FDI intensity through decomposition of labour productivity growth into contributions of capital deepening, increased usage of FDI intensity, and the simultaneous contribution of the quality of these factors. This has expressed as the contribution of TFP intensity growth in achieving productivity driven growth in these economies.

This paper unfolds 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.

## 2. METHODOLOGY AND ESTIMATION PROCEDURES

In this study, an attempt is made to apply the conventional growth accounting framework developed. These include results achieved by Solow (1956, 1957), which finally brought to fruition by Kendrick (1961) and further refined by Denison (1962), Denison and Edward (1979), Griliches and Jorgenson (1962), Jorgenson *et al.* (1987), Dollar and Sokoloff (1990), and Elsadig (2006, 2008).

The production function for economies can be represented as follows:

$$GDP_{it} = F(K_{it}, L_{it}, FDI_{it}, T_{it}), \quad (1)$$

where for Country  $i = (1, 2, \dots, 7)$  in Year  $t = (1965-2006)$ , the output is annual real GDP, and the inputs are real fixed physical capital  $K$ , number of persons employed  $L$ ,  $FDI$  and time  $T$ , that proxies for total factor productivity (TFP) as a technological progress of the countries.

The Divisia Index basically decomposes the aggregate output growth into the contribution of changes in inputs (such as aggregate capital, labour, FDI growth), and TFP growth. This calculates the productivity indicators to show the reliability of the results generated without considering statistical analysis (Mahadevan (2001)).

The study attempts to fill this gap by developing the model below into a parametric model and providing its statistical analysis in the first step as follows;

$$\ln GDP_{it} = a + \alpha \ln K_{it} + \beta \ln L_{it} + \lambda \ln FDI_{it} + \varepsilon_{it}, \quad (2)$$

$(t = 1965-2006)$

where

$\alpha$  is the output elasticity with respect to capital,

$\beta$  is the output elasticity with respect to labour,

$\lambda$  is the output elasticity with respect to FDI,

$a$  is the intercept or constant of the model<sup>1</sup>,

$\varepsilon$  is the residual term<sup>2</sup>,

$\ln$  is the logarithm to transform the variables.

Following Dollar and Sokoloff, (1990), Wong (1993), Felipe (2000), and Elsadig (2006, 2008); when constant returns to scale  $\beta = (1 - \alpha - \lambda)$  is imposed, Equation (2) becomes;

<sup>1</sup> The intercept term, as usual, gives the mean or average effect on dependent variable of all the variables excluded from the model.

<sup>2</sup> 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.

$$\ln GDP_{it} = a + \alpha \ln K_{it} + \lambda \ln FDI_{it} + (1 - \alpha - \lambda) \ln L_{it} + \varepsilon_{it}. \quad (3)$$

( $t = 1965-2006$ )

For the purposes of this study, Equation (3) is transformed by dividing each term by  $L$  (labour input) and then the output elasticity is calculated with respect to capital deepening  $\bar{\alpha}$  and FDI intensity  $\bar{\lambda}$  becomes;

$$\Delta \ln(GDP/L)_{it} = b + \bar{\alpha} \Delta \ln(\overline{K/L})_{it} + \bar{\lambda} \Delta \ln(\overline{FDI/L})_{it} + \Delta \ln(TFP/L)_{it}. \quad (4)$$

Then, it follows that

$\Delta \ln(GDP/L)_{it}$  is the contribution of labour productivity (output per worker),

$\bar{\alpha} \Delta \ln(\overline{K/L})_{it}$  is the contribution of Capital deepening,

$\bar{\lambda} \Delta \ln(\overline{FDI/L})_{it}$  is the contribution of the FDI intensity,

$\Delta \ln(TFP/L)_{it}$  is the residual term that proxies for TFP intensity growth,

$\Delta$  is the difference operator denoting proportionate change rate.

To calculate the average annual contribution growth rate of the TFP intensity and labour productivity as well as the contribution of the capital deepening and FDI intensity, as the intercept ( $b$ ) has no position in the calculation of the productivity growth rate Equation (4) becomes

$$\Delta \ln(TFP/L)_{it} = \Delta \ln(GDP/L)_{it} - \left[ \bar{\alpha} \Delta \ln(\overline{K/L})_{it} + \bar{\lambda} \Delta \ln(\overline{FDI/L})_{it} \right]. \quad (5)$$

Thus, Equation (5) expresses the decomposition of labour productivity growth into the contributions of capital deepening, increasing usage of FDI intensity, and the simultaneous contribution of the quality of these factors. This is expressed as the TFP intensity growth.

### 3. SOURCES OF DATA

The data for this paper were collected from various sources. Real Gross Domestic Product (GDP) in US dollars millions, real gross fixed physical capital in US dollars millions, number of employment, was 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 and World Development Indicators online database system. Due to lack of data on man-hours of work, the labour input index is constructed based on the number of persons employed. Data of real Foreign Direct Investment (FDI) were found to match with the time series

data of the other variables of the study for the period of 1965-2006 at World Development Indicators online database.

#### 4. RESULTS AND DISCUSSION

Autoregressive estimator has been applied to Equation (4) 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 1965-2006 for GDP, aggregate physical capital, number of employment and foreign direct investment have been employed for the individual countries.

Analysis of the data using Equation (4) has shown that the estimated coefficients of the explanatory variables of the model mainly are significant at 5% level. According to Durbin-H values the model has no problem of autocorrelation Table 1. In addition, the adjusted  $R^2$  and  $t$ -values do not indicate multicollinearity in the model Table 1. Since the model used in our study is specified in first differences and the calculated growth rates are used in the discussions of results and findings of the study, the model is found to be stationary. 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 variables are usually stationary even if the original variables are not.

**Table 1.** Estimated Coefficients of ASEAN 5 Plus 2, 1965-2006

Country	Intercept	Capital Deepening	FDI Intensity	Adjusted R <sup>2</sup>	D-H
1. China	0.10 (1.22)	0.88** (7.64)	0.12** (2.65)	0.95	0.87
2. Indonesia	0.05 (0.91)	0.78** (8.88)	0.22** (2.20)	0.94	0.83
3. Korea	0.19** (7.04)	0.77** (8.17)	0.23** (1.99)	0.96	-0.90
4. Malaysia	0.29** (2.96)	0.85** (7.86)	0.15** (3.69)	0.93	0.53
5. Philippines	0.19* (1.94)	0.82** (7.07)	0.18** (2.30)	0.96	0.30
6. Singapore	0.18** (2.22)	0.73** (7.19)	0.27* (1.72)	0.94	0.52
7. Thailand	0.15** (6.14)	0.75** (6.26)	0.25* (1.68)	0.93	0.37

*Notes:* Figures in parentheses are  $t$ -values. \*\* Significant at 5% level, \* Significant at 10% level. Figures in Table 1 were estimated using Equation (4).

#### 4.1. Empirical Analysis

Analysis was carried out to compare the productivity indicators between the ASEAN 5 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 and the birth of new era of export-oriented economies. The decades of 1980s, 1990s and 2000s saw a further diversification of the economies of these countries into more advanced industries through investment driven policies and trade liberalisation that had attracted foreign direct investment (FDI) which brought to these countries through Transnational Corporations (TNCs), investment. As a result of these policies the range of economic activities and sources of growth had become more diversified. 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, it includes the period of 1988-2006, i.e., was the period of pre and post the Asian financial crisis of 1997.

The use of TFP overcomes the problems of single productivity indicators such as labour productivity and capital deepening by measuring the relationship between output and its total inputs (a weighted sum of all inputs), thereby giving the residual output changes not accounted for by total factor input changes. Being a residual, changes in TFP are not influenced by changes in the various factors which affect technological progress such as the quality of factors of production, flexibility of resource use, capacity utilisation, quality of management, economies of scale, and so on so forth (Rao and Preston (1984)).

However, the contribution of TFP intensity growth to the economies of these countries in terms of average annual productivity growth was low Table 2. The highest contribution of labour productivity by including FDI intensity in the model to the productivity growth of the ASEAN 5 plus 2 was the contribution of the sub period of 1988-2006 in most countries under study Table 2. In addition to the contribution of labour productivity to the productivity growth of the economies of these countries was high also during the sub-period of 1965-1987 Table 2. The sub-period of 1965-1987 was found to be a combined period of labour and investment driven policies. On the other hand, 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 intensity growth contributed very low and the labour productivity was not the highest one to contribute to the economy's productivity growth. The reasons behind that were the economic recession of 1973, 1985 and the financial crisis of 1997 and the quality of human capital and the technology involved in the production of these economies.

The highest contribution of capital deepening to labour productivity in terms of

average annual productivity growth of the ASEAN 5 plus 2 was during the sub-period of 1988-2006 for most of the countries under study. Similarly, the contribution of FDI intensity to labour productivity in terms of average annual productivity growth of these countries was fair during all the periods of the study Table 2.

**Table 2.** ASEAN 5+2 Productivity Indicators (in percentage)

Country	Labour Productivity	Capital Deepening	FDI Intensity	TFP Intensity
1. China				
1965-2006	5.51	4.62	5.94	1.05
1965-1987	4.68	3.72	4.65	1.06
1988-2006	6.52	5.70	7.51	1.03
2. Indonesia				
1965-2006	5.25	3.35	5.22	0.90
1965-1987	6.14	4.18	4.35	0.54
1988-2006	5.47	5.11	6.29	1.33
3. Korea				
1965-2006	6.33	6.17	7.04	1.71
1965-1987	6.36	6.16	6.39	2.10
1988-2006	7.30	6.18	7.82	1.22
4. Malaysia				
1965-2006	4.49	4.12	6.90	2.61
1965-1987	6.12	4.49	9.64	3.64
1988-2006	5.37	5.37	7.80	1.36
5. Philippines				
1965-2006	4.82	4.95	6.08	1.86
1965-1987	5.19	4.09	5.54	2.08
1988-2006	4.75	6.00	6.73	1.58
6. Singapore				
1965-2006	5.82	4.95	9.26	1.69
1965-1987	5.19	4.98	6.91	1.75
1988-2006	6.23	5.40	11.3	1.62
7. Thailand				
1965-2006	4.47	4.74	6.65	1.45
1965-1987	5.70	5.31	5.73	1.72
1988-2006	6.28	5.68	7.78	1.11

Note: Figures in Table 2 were calculated using Equation 5.

Finally, the contribution of the FDI intensity was the highest one among the input terms during all periods of the study, apart from the entire period. By examining the role of FDI intensity to achieve productivity driven economy through TFP per unit of labour



growth, it was found from the results that there was a positive contribution of FDI intensity to TFP per unit of labour growth in the ASEAN 5 plus 2 economies.

This reflects the role of comparative advantage in unskilled labour intensive that eventually helped to attract FDI in the latter half of the 1980s. These countries have accelerated trade liberalisation policies and drastically eased restrictions with respect to capital ownership of foreign companies. That fostered the significant increase of global capital. In addition, FDI is the source of technology transfer to these countries through TNCs investment.

The results of this study indicate that the productivity growth of ASEAN 5+2 economies is input-driven rather than productivity growth-driven and being based on FDI when the results of TFP per unit of labour growth were compared. Nevertheless, South Korea FDI kept out unless necessary for technology access or exports, joint venture and licensing encouraged. It continued drive to create giant private conglomerates to internalize 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. As a result South Korean has constructed companies such as Daewoo, Samsung and LG that competed globally.

## 5. CONCLUSIONS

This study claims to fill in the gaps of previous studies by developing applications of intensive growth theory and introducing the TFP intensity (TFP per unit of labour). As well as 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 contribution rates of productivity indicators including the calculation of the residual of the model (TFP intensity) and labour productivity contributions being used by growth accounting approach.

This study also uses an intensive growth model instead of using an extensive growth model which was used in previous studies, in order to decompose labour productivity growth into contributions of capital deepening and FDI intensity. In addition to the simultaneous contribution of the quality of these factors expressed as the TFP per unit of worker (intensity) growth instead of TFP growth that is generated through extensive growth theory as a combined contribution of the quality of capital, labour and FDI.

The results show that the productivity growth of ASEAN 5 plus China and South Korea is input driven. The study also finds that the impact of FDI intensity is positive with little contribution to TFP intensity 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 confirm that FDI intensity had a very significant role in achieving light labour productivity contribution that is produced by these economies through using huge input to produce output. Thanks to FDI that is 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. South Korean Model has constructed companies such as Daewoo, Samsung and LG that competed globally.

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