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Are trade spillover effects on East Asian economic growth productivity driven?

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Abstract

Purpose – The purpose of this paper is to incorporate the spillover effects of trade on East Asian productivity, namely China, Indonesia, Japan, Korea, Malaysia, Philippines, Singapore and Thailand.

Design/methodology/approach – This study attempts to fill in the gaps of previous studies by developing applications of extensive growth theory that shows the trade spillover effects on productivity growth of ASEAN 5 plus3. It further provides a meaningful statistical analysis in which, the first step of the estimation to get the coefficients of the explanatory variables that has been used by econometric approach. It can be restated 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 (total factor productivity – TFP) and GDP contributions being used by growth accounting approach. The TFP is considered be trade spillover effects indicator that is showed the technology transfer to domestic firms and human capital skills upgrading.

Findings – The paper finds that there was a little contribution of exports and imports to TFP growth in these countries during all the periods of study. It confirms that high physical capital input growth resulted in high gross domestic product (GDP) contribution and low TFP contribution with insignificant technological progress experiences by most of these countries, with the exception of Japan and to some extent, South Korea.

Originality/value – In this respect, the trade spillover effects had transferred technology and developed human capital skills to a greater extent in the cases of Japan and Republic of Korea and their economies considered to be productivity driven economies.

Keywords China, Indonesia, Japan, Korea, Malaysia, Philippines, Singapore, Thailand, Trade, Economic growth, Spillover effects, Productivity driven sustainable productivity growth, East Asian economies

Paper type Research paper

1. Introduction

Expansion of international trade and investment has triggered the mutual interdependencies of the world's economies, both within the developed economies and between developed and developing economies. The role that the developed economies would play in the sustainable development of the developing economies has never been as important as it is has been (Kawasaki, 2002). Furthermore, International Monetary Fund (IMF) identifies that even though there was no homogeneous model of development that had been applied throughout East Asia integral performance of the booming East Asian economies was an emphasis on stability-oriented macroeconomic policies. Among the plans of which were comparatively low inflation and the prevention of overvalued exchange rates; high rates of physical and human capital accumulation; and export-oriented production, which, among other things, significantly encouraged the adoption of advanced technology. Complimentary initial conditions also played a part of that process. More differentiated across

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countries, and more controversial in their effects, were industrial policies and government intervention (mainly in financial markets) aimed at mobilising and allocating savings (IMF, 1998).

IMF further affirms that empirical estimates of the contributions of factor inputs and total factor productivity (TFP) growth to East Asian economies' output growth had fallen in a wide range, with capital accumulation generally found to have made the largest contribution. Productivity growth was found to have made smaller but still significant contributions. Accordingly, recent study of the IMF found that during 1960-1994 in all four of the Asian newly industrialised economies and the three fast growing Association of South East Nations (ASEAN) economies, i.e. Indonesia, Malaysia and Thailand – the contribution of capital deepening (capital per worker) dominated growth in factor productivity in explaining growth in labour productivity (output per worker). Since the early 1980s, on the other hand, TFP growth appeared to have played a larger role. For example, in Singapore, TFP growth was approximately 1 per cent a year during the periods 1960-1973 and 1973-1984, correspondingly, but rose to more than 3 per cent a year during 1984-1994. Likewise, in Thailand, TFP growth was 1.25 per cent a year during 1960-1984, but rose to 3.25 per cent a year in the subsequent ten years. These results may be compared with the experience of the industrial countries during 1960-1994: although rates of growth in output per worker in the East Asian economies were significantly higher than in the industrial countries (the exception is the Philippines, where, according to most estimates and time periods, productivity growth made little, or even a negative, contribution to output growth). The contributions of TFP growth were markedly higher only in a few cases, such as, China, Taiwan and Thailand – despite the Asian economies' lower initial levels of technological development of the Asian economies. Compared with the TFP growth of European economies and Japan during their fast catch-up years in the 1950s and 1960s, however, TFP growth in the East Asian economies has been much less rapid. However, no other group of developing countries has done well as in the East Asian economies.

As has been mentioned by Mahadevan (2007), there are various points of views in the literature for the quest of an export-oriented development strategy. First, trade expansion will bring about productivity through greater economies of scale in the export sector thereby leading to a reallocation of resources from the relatively inefficient non-trade sector to the highly productive export sector. Exports allow for specialisation based on comparative and competitive advantages allowing an increase in the gross domestic product (GDP). Second, an outward-oriented trade policy may give access to advanced technologies, "learning-by-doing" gains and better management practices that may result in further productivity gains. Third, increased export earnings will relieve constraints on growth by enhancing the capacity to import essential goods in the form of intermediate and capital goods. Therefore, export expansion promotes capital accumulation and consequently economic growth. Fourth, an export-oriented approach such as that in the East Asian countries has allowed rapid expansion of employment and real wages and leading to domestic spending as another source of GDP growth (Athukorala and Menon, 1996).

1.1 Trade spillover effects and sustainable economic growth nexus

Theoretically, the contribution of trade, in particular exports, to economic growth has many dimensions. First, trade, through exports, is about adding to financial resources.

No country can develop without them. Financial resources are required to invest in human capital development, infrastructure, health, etc., and to finance imports of essential goods and services. All of these are necessary for development and poverty reduction. While foreign direct investment (FDI) constitutes a direct inflow of finance capital to a country, exports are a major engine for generating finance for development. The enormous foreign exchange reserves accumulated by Asian countries such as China, which are recycled through sovereign wealth funds into finance capital for development, is largely the result of the export boom these countries have enjoyed over the last decade or two. The contribution of exports to financing for development was recognised in the Monterrey Consensus of the United Nations International Conference on Financing for Development, held in 2003. Second, export growth is based on increased economic production. Goods and services have to be produced before they can be exported. Increased production means increased employment. Gainful employment is an absolute prerequisite for poverty reduction. According to the International Labour Organization (ILO), employment in most sub regions in Asia and the Pacific has risen sharply in recent years until 2008 contributing to falls in poverty, to a large extent as a result of exports (ILO, 2009). As more people are gainfully employed, consumption increases and, hence, GDP also increases (Trade and Investment Division United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), 2009).

Third, exports also contribute to productivity increases as it allows for economies of scale and forces quality upgrading and gains in efficiency of production (i.e. called export spillover effects which are transferred technology to domestic firms and upgrade the human capital skills), as a result of international consumer demand and global competition (see e.g. Alcalá and Ciccone, 2004; Hallward-Driemeier *et al.*, 2005; WTO, 2008). In the case of the Asian "miracle", it has been argued that rapid growth emanated more from large capital expenditures than from increases in TFP which means that the spillover effects through TFP as its indicator were insignificant in most of the countries under study with the exception of Japan and Korea. However, increases in TFP would be necessary to sustain long-term economic growth (Krugman, 1994).

Meanwhile, imports spillover effects are also important for development. Developing countries can only access to capital goods and technologies through imports while many rely on imports to meet their food needs. And in many cases, the import content of exports is very high. Most exports of finished goods from China depend on the imports of intermediate parts and components. The export-oriented garments sectors in Bangladesh and Cambodia are also highly import dependent Asia-Pacific (Trade and Investment Division United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), 2009).

It should be recalled, that the sustainability of higher economic growth is likely to continue to be productivity driven through the enhancement of TFP as spillover effects indicator. Such enhancement needs to put an emphasis on the quality of workforce, demand intensity, economic restructuring, physical capital structure, technical progress and environmental standards (Elsadig, 2009).

It has been documented in empirical work on economic growth by Solow (1956, 1957), that after accounting for physical and human capital accumulation, "something else" accounts for the bulk of output growth in most countries. Both physical and human capital accumulations are certainly critical for economic growth, which is what so called spillover effects indicator (TFP) in this study. The process becomes

more complicated with the role of knowledge in the economic growth process. Knowledge obviously accounts for a part of the growth that is not accounted for by the other factors of production; namely capital and labour. In growth theory, the Solow residual is an unexplained residual of labour and capital it is attributable to the growth of TFP (spillover effects). The notion of TFP is interpreted as an "index of all those factors other than labour and capital not explicitly accounted for but which contribute to the generation of output". TFP refers to the additional output generated through enhancements in the efficiency accounted for by such things as advancement in human capital, skills and expertise, acquisition of efficient management techniques and know-how, improvements in an organisation, gains from specialisation, introduction of new technology, innovation or upgrading of present technology and enhancement in information and communication technology (ICT). TFP can explain the growth in a knowledge-based economy (K-economy) because it captures endogenous technical change (spillover effects of technology transfer through trade) and other characteristics of the K-economy, including diffusion of knowledge, organisation, restructuring, networking and new business models (spillover effects of human capital skills development) that would contribute to market efficiency and productivity. While intellectual capital can be gauged to some extent, and incorporated into capital, there are many factors that explain growth in the K-economy that are not measurable at present. The size and performance of the TFP provide a clue to the extent of the performance of the K-economy. When growth accounts fail to consider improvements in the quality of labour inputs due to education, these improvements would be assigned to TFP as spillover effects indicator. Unmeasured improvements in the stock of physical capital would also be assigned to TFP (Knowledge-Based Economy Master Plan, 2002).

In this regard, Anderson and Babula (2008) recommend of what to accomplish in order to be capable to boost productivity growth through trade liberalisation are to be open to the elements in microstudies. More cross-national evidence of the exact channels through which openness may affect productivity growth is needed. First, trade may enhance productivity growth through the diffusion of technology, but it may also affect productivity through a positive effect on the efficiency in production (trade (Trefler, 2001; Dollar and Collier, 2001) that is the trade spillover effects which are explained by this study. Second, and related to the first point, is the potential relationship among trade, institutions and growth. A prerequisite for research and development of new product varieties to take place in the innovation-based growth theory is the existence of institutions that can enforce patent protection. Institutions that secure property rights may also be essential for profit-seeking firms to spend resources on adoption and imitation activity. So, a necessary condition for countries to gain productivity growth through international trade may very well be the existence of institutions of a certain quality. A number of empirical analyses find evidence of a positive relationship between the quality of institutions and economic growth (Hall and Jones, 1999; Acemoglu *et al.*, 2001). There exists, however, many different types of institutions (different types of social arrangements, laws, regulations, enforcement of property rights, etc.) and we know little about what specific types of institutions are important for countries to benefit from openness. Acemoglu *et al.* (2007) analyse the link between contracting institutions and technology but more work needs to be done on this topic. There may also be a link from openness to the quality of institutions. So, empirical analyses of the partial effects are needed (Dollar and Kray, 2003; Alcalá and Ciccone, 2004).

This paper proposes to look at the spillover effects of exports and imports (trade) on productivity contribution in ASEAN 5 + 3. Section 2 contains descriptions on the estimation methods employed in this study, Section 3 demonstrates details of the data. Results of the empirical analysis have been explained in Section 4. Finally, Section 5 presents the conclusion.

2. Methodology and estimation procedures

In this study, Cobb-Douglas production function econometric estimation and the Solow's residual of growth accounting non-parametric analysis have been used as a modified model to fill the gaps of both estimations which had previously caste doubts on the results generated.

The modified production function in this research has followed the conventional growth accounting framework utilised by Stigler (1947), Abramovitz (1956) and Kendrick (1956). This approach was initially developed by Solow (1956, 1957), 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), Dewan and Kraemer (2000), used by Lee and Khatri (2003) and modified by Elsadig (2006a). This approach provides wider space for decomposition of contributions of factor inputs and technological change to economic growth. This study; thus develops combined Cobb-Douglas production function and growth accounting framework in two steps. It provides empirical evidence on the contributions of aggregate physical capital, human capital, exports and imports to GDP growth and their quality combined contribution as spillover effects indictor (TFP) for a group of developed and developing countries, including the ASEAN 5 + 3 countries.

Production function is given as follows:

$$GDP_{it} = F(K_{it}, HC_{it}, X_{it}, M_{it}, T_{it}) \tag{1}$$

where for country $i = 1, 2, \ldots, 8$ in year $t = 1965\text{-}2006$, the output GDP_{it} is real annual GDP, and the inputs are: real aggregate physical capital K_{it}, human capital (number of persons employed) L_{it}, exports X_{it}, imports M_{it} and time T_{it}, that proxies for TFP as a technological progress of these countries.

The Cobb-Douglas production function for country i $(i = 1, 2, \ldots, 8)$ in year t $(t = 1965\text{-}2006)$ is given as follows:

$$\Delta \ln GDP_{it} = a + \alpha \Delta \ln K_{it} + \beta \Delta \ln HC_{it} + \lambda \Delta \ln X_{it} + \theta \Delta \ln M_{it} + \varepsilon_{it} \tag{2}$$

where α is the output elasticity with respect to aggregate physical capital; β is the output elasticity with respect to human capital; λ is the output elasticity with respect to exports; θ is the output elasticity with respect to imports; a is the intercept or constant of the model[1]; ε_{it} is the residual term[2]; ln is the log 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, which is considered to be a trade spillover effects in this study.

Equation (2) is based on econometric estimation which had gap of being based on the coefficients of the estimated explanatory variables (those considered as homogenous measures of the explanatory variables). The major drawback in this model is that it is not providing the contributions of productivity indicators of these

explanatory variables to explain the productivity performance as done by growth accounting, which is itself has a gap of being not showing the parameters of the explanatory variables and statistical test to show the reliability of results generated. According to Mahadevan (2007), the TFP growth studies on the Malaysian-manufacturing sector have used the non-parametric translog-divisia index approach developed by Jorgenson *et al.* (1987). She has mentioned this approach does not require the explicit specification of a production function, but the major drawback is that it is not based on statistical theory and, hence, statistical methods cannot be applied to evaluate their reliabilities, thus casting doubts on their results.

In this respect, this study effectively attempts to fill up the gap of the divisia translog index approach that was developed by Jorgenson *et al.* (1987). Therefore, the current study provides a statistical analysis for estimating the coefficients of the explanatory variables that have been used by 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 that is named TFP growth (trade spillover effects pointer) and the output growth that were used by growth accounting approach.

The paper endeavours is to apply the conventional growth accounting framework as modified by Elsadig (2006a) and Elsadig (2008b). This approach provides wider space for decomposition of contributions of factor inputs and technological change to economic growth. This study thus, develops a combined model of both parametric and non-parametric analysis to fill the gaps in both models.

The intercept (a) in Equation (2) has no place in the calculation of the productivity growth indicators. That is not considered in the second step, which calculates the growth rates of productivity indicators transforming Equation (2) as an extension of the basic growth accounting framework, the production function is specified in the parametric form of the above equation as follows:

$$\Delta \ln TFP_{it} = \Delta \ln GDP_{it} - [\alpha \Delta \ln K_{it} + \beta \Delta \ln HC_{it} + \lambda \Delta \ln X_{it} + \theta \Delta \ln M_{it}] \qquad (3)$$

where the weights are given by the average value shares as follows: $\Delta \ln GDP_{it}$ is the contribution rate of output; $\alpha \Delta \ln K_{it}$ is the contribution rate of the aggregate physical capital; $\beta \Delta \ln L_{it}$ is the contribution rate of the human capital; $\lambda \Delta \ln X_{it}$ is the contribution rate of the exports; $\theta \Delta \ln X_{it}$ is the contribution rate of the imports; $\Delta \ln TFP_{it}$ is the TFP growth contribution.

The framework decomposes the share of GDP into the contributions of the rates of growth of the aggregate physical capital, human capital, exports and imports, plus a residual term typically referred to as the contribution of TFP (trade spillover effects indicator).

3. Sources of data

The data used in this study consists of real GDP, real aggregate fixed physical capital, real exports and imports those transformed to real data based on 2000 as the base year, and number of employment were collected mainly from international financial statistics of IMF, online database and the world development indictors of the World Bank. The missing data are validated with the data from the individual countries databases, Asian Development Bank: key indicators of developing Asia and Pacific countries, Statistical and Data Systems Division and the ILO for the period

of 1965-2006. Due to lack of data on man-hours of work, the labour input index is constructed based on the number of persons employed that is considered as a good measure of human capital. Moreover, following Mahadevan (2007) GDP is adjusted to exclude the components of trade, both exports and imports shares are found to have an outstanding influence on GDP growth. These feedback links are further strengthened by two-way relationship between the growth of imports and exports (Mahadevan, 2007). It has documented in literature (Mahadevan, 2007), that a high level of intra-industry trade is associated with imports and exports moving together (Bernard and Jensen, 2004)

4. 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 AEASN-5 plus 3. An annual time series data over the period of 1965-2006 for real GDP, aggregate psychical capital, number of employment, real exports real import have been employed for the individual countries.

In view of the fact that the model used in this study is specified in first differences and the calculated growth rates are used in the discussion of results and findings of the study, the model is found to be stationary. In addition (Table I) 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 variables are usually stationary even if the original variables are not.

Analysis of the data using Equation (2) has shown that the estimated coefficients of the explanatory variables of the model are significant at 5 and 10 per cent levels. According to Durbin-Watson values the model has no problem of autocorrelation (Table II).

Country	GDP	Capital	Labour	Exports	Imports
1. China	−6.26*	−6.13*	−6.32*	−3.90*	−4.42*
	−6.25**	−6.15**	−6.24**	−4.06**	−4.43**
2. Indonesia	−3.34*	−4.00*	−7.17*	−3.24*	−3.01*
	−3.89**	−4.59**	−7.07**	−3.48**	−2.45**
3. Japan	−1.53*	−2.42*	−4.75*	−4.66*	−4.56*
	−3.67**	−3.72**	−6.01**	−4.19**	−4.54**
4. Korea	−2.30*	−3.65*	−6.14*	−3.59*	−3.89*
	−3.90**	−4.81**	−6.06**	−4.44*	−5.13**
5. Malaysia	−5.16*	−4.08*	−6.34*	−2.96*	−2.96*
	−5.11**	−4.13**	−6.26**	−2.89**	−3.13**
6. Philippines	−4.91*	−4.37*	−6.26*	−2.51*	−2.17*
	−5.50**	−4.82**	−6.19**	−2.88**	−2.87**
7. Singapore	−3.46*	−2.92*	−6.07*	−2.51*	−2.47*
	−4.31**	−3.78**	−6.29**	−2.94**	−3.04**
8. Thailand	−3.51*	−3.48*	−6.27*	−2.36*	−2.37*
	−3.67**	−3.55**	−6.25**	−3.11**	−3.05**

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

Notes: Figures are *t*-test values showing significance at 1, 5 and 10%. *Constant without trend; **constant with trend

Country	Intercept	Capital	Labour	Exports	Imports	Adjusted R^2	D-W
1. China	0.13	0.82	0.10	0.15	−0.08	0.91	1.99
	(0.46)	(17.3)**	(1.42)	(1.80)*	(−1.35)		
2. Indonesia	1.35	0.22	0.13	0.21	0.24	0.94	1.97
	(0.20)	(1.96)**	(1.11)	(1.78)*	(2.80)**		
3. Japan	0.57	0.75	0.11	0.29	−0.17	0.95	1.96
	(0.11)	(13.1)**	(1.39)	(5.55)**	(−0.79)**		
4. Korea	1.33	0.32	0.10	−0.08	0.65	0.92	1.93
	(10.9)**	(3.34)**	(5.11)**	(−1.01)**	(4.56)**		
5. Malaysia	0.83	0.36	0.01	0.74	−0.12*	0.90	1.96
	(1.55)	(4.90)**	(1.14)**	(7.16)**	(−1.84)		
6. Philippines	1.12	0.73	0.11	0.42	−0.28	0.95	1.92
	(3.95)**	(3.87)**	(3.10)**	(2.81)**	(−1.18)		
7. Singapore	1.43	0.36	0.31	0.29	0.03	0.93	1.95
	(1.28)	(6.39)**	(1.54)	(2.61)**			
8. Thailand	1.11	0.60	0.04	0.60	−0.25	0.94	1.88
	(3.10)**	(5.90)**	(1.70)*	(6.46)**	(−1.83)*		

Notes: Figures in parentheses are *t*-values. Figures were estimated using Equation (2). **Significant at 5% level; *significant at 10% level

Table II.
Estimated coefficients of ASEAN 5 + 3 1965-2006

4.1 Empirical analysis

This section tells a constructive analysis to compare the productivity indicators between the ASEAN 5 + 3 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 FDI which brought to these countries through transnational corporations (TNCs), investment. As a result of these polices 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.

However, the contribution of TFP growth (as a trade spillover effects indicator) by including the exports and the imports in the model to the economies of these countries in terms of average annual productivity growth was little (Table III). Comparing the Japanese and Korean Models of economic development with other Asian countries; the TFP contribution of this study has shown there is no significant difference between these countries when exports and imports were included. Japan and to some extent, Korea had developed productivity-driven economies with technological progress. Other Asians countries gained the chance to develop their economies through input-driven process without making significant technological progress. Korea has developed significant knowledge stoke that enabled the development of such companies as Daewoo, Samsung and LG that compete globally. This means that Japan

Country	GDP	Capital	Labour	Exports	Imports	TFP
1. China						
1965-2006	7.34	6.17	13.2	10.4	10.4	1.40
1965-1987	6.12	4.87	13.0	9.05	9.05	1.07
1988-2006	8.76	7.66	13.4	12.09	12.01	1.78
2. Indonesia						
1965-2006	11.3	10.3	11.0	9.94	9.91	1.35
1965-1987	9.56	8.90	10.8	7.92	7.95	1.36
1988-2006	13.4	12.1	11.36	12.2	12.2	1.34
3. Japan						
1965-2006	12.4	11.2	17.9	10.2	10.1	1.57
1965-1987	11.9	10.7	17.8	9.78	9.65	1.46
1988-2006	13.0	11.7	17.9	10.8	10.7	1.70
4. Korea						
1965-2006	11.0	9.85	8.32	9.82	9.93	1.33
1965-1987	9.49	8.11	6.94	8.07	8.31	1.34
1988-2006	12.9	11.8	9.91	11.8	11.8	1.31
5. Malaysia						
1965-2006	11.2	9.91	6.56	10.8	10.7	0.79
1965-1987	10.2	8.83	4.45	9.56	9.48	1.04
1988-2006	12.4	11.2	9.01	12.3	12.3	0.49
6. Philippines						
1965-2006	6.22	4.60	8.89	4.91	5.02	1.09
1965-1987	4.90	3.30	7.78	3.25	3.37	1.11
1988-2006	7.75	6.12	10.1	6.84	6.94	1.07
7. Singapore						
1965-2006	10.5	9.43	7.11	10.7	10.9	1.42
1965-1987	9.57	8.51	6.79	9.68	9.96	1.22
1988-2006	11.7	10.5	7.48	12.1	12.1	1.64
8. Thailand						
1965-2006	7.01	5.72	9.29	5.83	5.91	1.12
1965-1987	5.90	4.51	8.34	4.32	4.46	1.33
1988-2006	8.29	7.12	10.4	7.59	7.58	0.87

Note: Figures were calculated using Equation (3)

Table III.
ASEAN 5 + 3 productivity indicators (in percentage)

and Korea had significant trade spillover effects and the rest of ASEAN countries their trade spillover effects were insignificant by considering the TFP contributions.

Highest contribution of GDP by including exports and imports in the model to the productivity growth of the ASAN5 plus 3 is observed during the sub-periods of 1987-2006 and 1988-2006 (Table III). The sub-period of 1965-1987 is found to be a combined period of labour and investment-driven policies. On the other hand, the sub-period of 1988-2006 is the perceived period of investment driven with particular focus on ICT and human capital development. 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 had been supported by FDI. The TFP growth contribution was low and not remarkable one to contribute to the economy's productivity growth. The reasons behind that were the economic recession of 1973, 1985, the financial crisis of 1997, the quality of human capital and the technology involved in the production of these economies except Japan and Korea.

The highest contribution of aggregate physical capital to GDP in terms of average annual productivity growth of the ASEAN 5 + 3 was made during the sub-period of 1987-2006. Likewise, the contribution of aggregate labour to GDP in terms of average annual productivity growth of these countries was found to be fair during all the periods of the study (Table III). This reflects the fact of the comparative advantage in unskilled labour intensive that eventually helped these countries 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 inflow of global capital.

Finally, the contribution of exports and imports to the economies of ASEAN 5 + 3 is robustly significant among the input terms during most of the periods of the study. By examining the role of exports and imports to achieve productivity driven economies through TFP growth, it was found from the results that there was a little contribution of exports and imports to TFP growth of the economies of these countries during all the periods of study (Table III).

Unlike, the Athukorala and Menon (1996), statement that is cited by Mahadevan (2007), trade expansion will bring about productivity through greater economies of scale in the export sector thereby leading to a to a higher productive export sector. This study finds that exports and imports have no significant effect on productivity as presented in the TFP results when exports and imports are included in the model (Table III). The fact is that TNCs invested in these countries are importing their inputs and exporting their products; these countries are collecting the taxes and employed their people in these TNCs. Meanwhile, FDI is considered to be the source of technology transfer to these countries through TNCs, investment, but there is no evidence of productivity driven efforts in most of these countries. However, Japan and Korea had been considered to be productivity driven economies among these countries, this is supported by the fact that these two countries have their own TNCs invested both in the home and abroad. In this regards, the trade spillover effects is insignificantly affecting the ASEAN countries in terms of technology transfer and human capital skills upgrading.

These findings are in line with Mahadevan (2007), and Robert and David (1999) findings; both find that TFP growth has no significant effect on exports or imports growth in some of these countries such as (Japan, Korea and Malaysia). However, their findings should be put in the particular concept that exports and imports have no significant contribution to the TFP of these countries, is not the TFP has no significant effect on exports or imports growth. TFP is measuring the relationship between output and its total inputs (a weighted sum of all inputs), by this means giving the residual output changes not accounted by total factor inputs 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 the like (Rao and Preston, 1984). These characteristics of TFP had qualified it to be considered as the trade spillover effects indicator, that is transfer technology to local firms and to help in upgrading the local human capital skills.

In addition, as has been mentioned earlier, it has been documented in empirical work on economic growth by Solow (1956, 1957), that after accounting for physical and human capital accumulation, "something else" accounts for the bulk of output growth in most countries. Both physical and human capital accumulations are certainly critical for economic growth. In this regard, a vital question arises as, is the quality of exports

and imports that makes the deference and determines the TFP contribution? Or what so called learning by doing and in this case, is the learning by exporting and importing? The answer for this question is that the trade spillover effects that make the deference in Japan and Korea to be productivity driven economies and the ASAEN are input driven economies.

5. Cointegration relationship

The estimated long-run equilibrium relationship normalised on the coefficient of GDP for East Asian countries is given in Table IV.

It can be inferred from the cointegrating relationship by using Johansen and Juselius cointegration test that the Japanese GDP has negative long-term relationships with capital, labour and export variables. On the other hand, the Japanese GDP is positively related to the import variable in the long run. In this regard, the Indonesian GDP has negative long-term relationships with capital and export variables and positively related to labour and import variables in the long run. Moreover, the Malaysian GDP has negative long-term relationships with capital and export variables and positively related to labour and import variables in the long run. Further it has confirmed that the Korean GDP has positive long-term relationships with capital and export variables and negatively related to labour and import variables in the long run. China's GDP has positive long-term relationships with just the export variable. Thailand's GDP has negative relationships with all the variables except for the import variable. The Singaporean GDP has negative long-term relationships with capital, labour and export variables and positively related to the import variable in the long run. Finally, the Philippines's GDP has positive long-term relationships with the export variable merely.

6. Conclusion

This study attempts to fill in the gaps of previous studies by developing applications of extensive growth theory that shows the trade spillover effects on productivity growth of ASEAN 5 + 3. It further provides a meaningful statistical analysis in which, the first step of the estimation to get the coefficients of the explanatory variables that has been used by econometric approach. It can be restated 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) and GDP contributions being used by growth accounting approach. The TFP is considered be trade spillover effects indicator that is showed the technology transfer to domestic firms and human capital skills upgrading.

Table IV.
The estimated long-run equilibrium relationship normalised on the coefficient of GDP for ASEAN 5 + 3 1965-2006

Country	Capital	Labour	Exports	Imports
1. China	−2.78	−0.01	0.05	−0.01
2. Indonesia	−7.82	0.320 L	–9.22	13.5
3. Japan	−1.69	–0.06	–7.29	4.88
4. Korea	0.07	−0.01	0.03	−0.06
5. Malaysia	−4.94	2.31	–4.05	5.29
6. Philippines	−0.25	−0.01	1.44	−2.91
7. Singapore	−1.05	−25.1	−1.44	1.25
8. Thailand	−1.17	−0.01	−2.89	2.36

The study finds that the impact of exports and imports is positive with insignificant contribution to TFP growth. These findings are in line with the findings of the studies undertaken by Mahadevan (2007) and Robert and David (1999), both state that TFP growth has no significant effect on imports or exports growth in some of these countries such as (Japan, Korea and Malaysia). Conversely, their findings should be placed in the accurate concept that exports and imports have no significant contribution to the TFP of these countries, and further it is not the TFP that has no significant effect on exports or imports growth either. In fact, it is the quality of exports and imports that creates the deference and determines the TFP contribution. Or what is so called learning by doing and in this study, is the learning by exporting and importing. At this point, is the trade spillover effects concept that should be considered?

These results also confirm that exports and imports had a very significant role in achieving higher GDP contribution that is produced by these economies through using huge inputs 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, with the exception of Japan that whose economic structural transformation was occurred in 1970s. Nevertheless, Japan and Korea had been considered to be productivity driven economies among these countries, this is supported by the reality, these two countries have their own TNCs invested both at the home and abroad.

Finally, the cointegration results show that there is a along run relationship between GDP and imports in the cases of Japan, Indonesia, Malaysia, Thailand, Singapore and there is no long-run relationship between GDP and the exports in these countries. On the other hand, there is a long-run relationship between exports and GDP in the cases of China, the republic of Korea and the Philippines, and the long-run relationship has not exit between GDP and imports in these three countries.

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.

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