

THE EFFECT OF FOREIGN CAPITAL AND IMPORTS ON ECONOMIC GROWTH: FURTHER EVIDENCE FROM FOUR ASIAN COUNTRIES (1970-1998)

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1. *Introduction*

That openness of an economy helps economic growth is a widely accepted proposition. There are two dimensions of openness: free trade in goods and services and free international capital flow. Earlier research on the subject was focused on the free-trade dimension, especially on export-led growth.¹ The basic argument put forward was that whereas exports stimulate economic growth primarily from the demand side, they also produce efficiency gains, by a way of global competition, on the supply side. Lately, import-led growth has been more in focus, and faster growing developing countries have experienced much activity emerging from importing. Import-led growth emphasizes the process of modernization and transfer of advanced technology through acquisition of much needed sophisticated capital and material. Basically, this argument hinges on the growth of total factor productivity and is centered on the supply side. The burgeoning endogenous-growth trade literature has further fortified the argument in favor of openness and trade liberalization. For this literature suggests that trade contributes to economic growth largely by opening access to intermediate inputs; by expanding diffusion of knowledge; by amplifying a learning-by-doing process; and by expanding the global market size (Iskan, 1998).²

The other dimension of openness relates to the capital stock flowing freely across international borders, and here the focus of research has been on the foreign direct investment (FDI). Empirical evidence that FDI has made a positive contribution to the economic growth of developing countries (DCs) has accumulated fast. Some recent examples of case studies are Marwah and Klein (1998) for India, Sun (1998) and Li et al. (1998) for China, Ramirez (2000) for Mexico, and Djankov and Hoekman. (2000) for Czech Enterprises. There also exist multi-

¹ For earlier literature and survey of studies, see Edwards (1993), Brander (1992)

² Marwah and Klein (1996) show a strong impact of openness on growth through a trade-based entropy index. Harrison (1996) finds the relationship between openness and economic growth weak.

country studies based mostly on cross-section or panel data. Jackman (1982), Bloomstrom et al. (1994), Most and Van den Berg (1996), Balasubramanyan et al. (1996), Borensztién et al. (1998), de Mello (1999), Nair-Reichert and Weinhold (2001), and Teboul and Mouslier (2001) are a few examples. de Mello (1997) provides an annotated selective survey of earlier studies.

In his well cited study, Jeffrey Sachs (2000) examined a catching-up growth process as one important pattern of development for DCs. He linked the catching-up growth process to the openness of the economy. In this process “ an economy with a lower level of technology and income (the “follower”) narrows the income gap with the higher technology and richer countries (the “leader”) through a process of technological diffusion and capital flows from leader to follower” (p.581). Imports and liberalization of FDI are two important elements that act as conduit for absorption of foreign technology by the follower. Sachs examined 150 DCs and found that only 24 of these countries, all with successful export-promotion policies and attracting large FDI inflows, had won the race in absorbing technologies from abroad.³

In this paper we provide further evidence on how imports and FDI inflows have contributed to the growth and productivity of four individual countries. These four countries - namely Indonesia, Malaysia, the Philippines, and Thailand - are the founding members of the Association of Southeast Asian Nations (ASEAN) and they also made Sachs’s list of 24 successful DCs. Our choice of these four countries for individual country analysis is further underscored by an earlier finding of Marwah and Klein (1996) that the ASEAN region had surpassed during 1971-1989 the world’s average growth rate by 2.72 percentage points. This conclusion was based on their analysis of the relationship between the growth rate and a trade entropy construct.⁴ In this paper we estimate, for each country, a separate production function using imports and foreign capital as two distinct factors of production. The analysis is based on time series annual data from early 1970's to 1998.

In section 2 below, the economic patterns of the four selected countries are briefly

³ Through export-promoting policies a developing economy is able to earn the foreign exchange necessary to import technologies. The FDI inflows add to the foreign exchange resources as well as facilitating upgrading the country’s technologies.

⁴ The concept of entropy is borrowed from the information theory (see Theil,1971). It was used as a measure of openness of the economy.

highlighted. The methodological production function is specified in section 3, and the estimates are presented in section 4. The final section 5 contains some concluding remarks.

2. A Retrospect of Economic Patterns

The four Asian countries - Indonesia, Malaysia, the Philippines, and Thailand - selected for our analysis differ widely in size and availability of natural resources. Yet these four countries have exhibited a certain degree of similarity in their patterns of economic development and growth. All have export-oriented market-based economies; all reflect common economic aspirations with much emphasis on economic growth; and all have dualistic economies with more than 50 per cent of their populations living in an agricultural and rural sector (Tongzon, 1998, P.13). Moreover, they all have pursued economic development and growth through international trade and investment, and over the past three decades have changed their policies considerably. By and large, their export promotion policies were initiated in the 1970's, but these policies got launched on a full scale only during the late 1980s (Sakurai, 1995, P.175). In an attempt to attract more investment, they all made their rules and regulations of FDI less restrictive. The main sources of their FDI inflows are the United States, Japan, and the European Union (EU). In the first half of 1990's, nine East Asian countries, namely China, Hong Kong, Indonesia, (Republic of South) Korea, Malaysia, the Philippines, Singapore, Taiwan and Thailand, had attracted together a total of 206.4 billion US dollar in FDI flows, out of which 24.3 percent had gone to Indonesia, Malaysia, the Philippines, and Thailand.

Since the late 1970's, the foreign economic policy has changed moderately in Thailand but significantly in Indonesia, Malaysia, and the Philippines. In Indonesia, restrictions and barriers to foreign investments were either modified or removed with trade liberalization in 1986; in the Philippines, the rules and regulations on FDI were relaxed by the Foreign Investment Act of 1991. In Malaysia, since 1986 the role of government intervention has gradually declined and many new incentives to attract FDI have been initiated (Tongzon, 1998, P.151).

Overall, changes in investment and foreign trade policies of the four countries seem to have been conditioned by how well their economies did perform. Growth rates from the early 1970's in selected key macroeconomic variables and the associated entities of each of the four

countries are portrayed in Table 1.

Table 1: Some Comparative Macro-statistics (Ratios & Growth rates)
(Percentages)

Variables	Period	Indonesia	Malaysia	Philippines	Thailand
		Growth Rates			
GDP	1972-98	6.0	6.7	2.7	7.2
	1981-98	5.7	7.0	2.2	7.7
Investment (I)	1972-98	10.1	9.0	3.4	8.7
FDI	1972-98	**	9.8	**	8.7
	1981-98	23.8	14.3	22.1*	13.9
Imports (M)	1972-98	9.1	10.8	6.3	9.8
Employment	1976-98	2.9	3.2	3.0	2.5
K_d	1972-98	13.5	12.8	7.1	11.6
K_f	1973-98	15.1	13.1	15.3	13.8
GDP/Labor	1976-98	5.2	3.3	0.2	5.6
K_d /Labor	1976-98	9.4	8.7	2.0	8.7
K_f /Labor	1976-98	12.4	8.9	10.5	11.9
Imports/Labor	1976-98	8.6	12.0	5.7	8.8
Exchange Rate	1970-98	9.3	- 0.3	7.1	1.5
Inflation Rate	1970-98	10.8	4.1	12.0	6.1
		Ratios			
I/GDP	1970-98	23.4	30.2	21.6	29.7
FDI/GDP	1970-98	0.8	4.3	0.8	1.1
M/GDP	1970-98	22.9	60.4	29.9	31.3

Source: Calculated in the study. All variables have been defined in the appendix. * For period 1981-97. ** For some years, FDI net flows were negative.

Indonesia: Indonesia has a rich endowment of natural resources and a relatively large

domestic market. It is an oil exporter. In 1998, its population was about 204 million people. Prior to early the 1980's Indonesia pursued chiefly an import-substitution policy, keeping in view a large enough size of its domestic market,. An export-promotion policy initiated at the beginning of the 1980's by measures such as deregulation of local content restrictions was pursued more aggressively in the late 1980's. FDI was gradually liberalized in the 1980's when the restrictions on foreign investors were slowly relaxed (Sakurai, 1995, P.188).

As shown in Table 1, the ratios of Indonesia's imports to GDP (22.9%) and net FDI inflows to GDP (0.8%) are relatively low. However, both imports and foreign capital intensities of labor seem to have accelerated fast over time, by annual rates of 8.6 percent and 9.4 percent respectively. The growth rate of labor productivity of Indonesia (5.2%) is somewhat lower in comparison to the rate of Thailand (5.6%), but it is substantially higher than the rate of Malaysia (3.3%). Among the four countries, Indonesia ranks third by the GDP growth rate and by the investment/GDP ratio, but it ranks first by the growth rate of real domestic investment (10.1%).

On inflation rate, Indonesia experienced an annual rate of 10.8 percent during 1970-98, which is much higher than the rates experienced by Malaysia and Thailand. Furthermore, in this period, the value of Indonesia's rupiah depreciated the most in comparisons with Malaysia's ringgit, Philippines's pesos and Thailand's baht. It fell almost by 9.3 percent per annum.

Malaysia: Overall, the Malaysian economy has performed much better than the other three economies. It showed somewhat superior growth rates of GDP and employment, lower rate of inflation and a relatively less fluctuating exchange rate. Even though Malaysia, with a population of 22 million in 1998, is considered small in size, it enjoys a high income level because of its rich endowment of natural resources. It, too, is an oil exporter like Indonesia. From Table 1, its real GDP has grown quite fast, at a rate of 6.7 percent per annum, over 1972-98. The growth rate of its domestic investment was 9 percent. The domestic investment has constituted on an average 30 percent of GDP, the highest rate among the four countries.

Initially, in the 1960's and the early 1970's, Malaysia followed an import-substitution policy. Import liberalization and export-promotion policies were adopted later in the 1970's. Free trade zones played an important role in promoting Malaysian exports (Sakurai, 1995, P.189). The FDI inflows limited by the size of its domestic market stagnated till the mid-1980's, but then started to expand steadily once the new incentives were put into place.

As a result of foreign trade and investment liberalization policies, the average ratio of net FDI inflows to GDP rose significantly during 1970-98. Its value of 4.3 percent is a high value compared to corresponding ratios in Indonesia (0.8%), the Philippines (0.8%), and Thailand (1.1%). In Indonesia and the Philippines, FDI was probably discouraged by dictatorship and insurgencies. The Malaysian share of FDI net inflows of DCs has also increased dramatically. Since 1970, Malaysia has remained as one of the top twelve recipients of FDI among DCs (*IFC*, 1997). Its real imports have also grown fast at a 10.8 percent rate per annum and its import intensity has gone up even faster at an annual rate of 12 percent. The share of its imports in GDP on an average was 60 percent during 1970-98 (Table 1). When compared with the corresponding rates of the other three countries these rates turn out to be the highest.

The inflation rate in Malaysia has been significantly lower compared to other countries. The consumer price index (CPI) went up at a rate of 4.1 percent annually during 1970-98. The CPI registered a growth rate of 3.1 percent for the last two decades, but it changed even at a slower (2.7%) rate during the 1980's. At the same time, during the 1970's, the value of its currency appreciated by a rate of 3.3 percent annually, whereas in the previous two decades it had depreciated by 1.5 percent annually. Overall, the Malaysian ringgit appreciated over the entire period by 0.3 percent. It fluctuated more moderately than the currencies of other three countries.

The Philippines: An import-substitution policy implemented in the early 1950's in the Philippines continued until the 1970's. At the same time, the Philippines devalued its peso, repeatedly, and also imposed restrictions and high tariffs on imports until the late 1970's (Sakurai, 1995, P.189). It was only after the adoption of economic reforms in the 1990's that import restrictions were largely lifted and tariff rates were reduced. However, FDI inflows to the Philippines continued to decline so long as the country failed to abandon its restrictive import-substitution policies.

Overall performance of the Philippines economy has been rather poor compared to the other three countries. Its per capita GNP, US\$770, in 1998 remained almost at the same low level that was achieved nearly two decades earlier. At the same time, during 1970-98, its CPI rose annually by 12 percent (Table 1); that was the fastest among the four countries. While both the monetary growth rate and the inflation rate fluctuated widely in 1983-86, the interest rate

rose steeply. It is believed that the high interest rate squeezed out the private investment and consequently widened the gap between the ratios of private investment to GDP of the Philippines and Thailand (Mutoh, 1995, P.89). The GNP growth rate of the Philippines declined continuously during the first half of the 1980's, so much so that it became negative in 1984 and 1985.

The Philippines' peso depreciated annually on an average rate of 7.1 per cent during 1970-98. It was devalued on two occasions, in 1970 and 1984. But these devaluations seemed to help neither in expanding exports nor in stimulating capital inflows. Apparently, both devalued currency and the double digit inflation had a damaging effect on the Philippines' economy which was already struggling to catch up with the other three countries. Nor did the Philippines have good infrastructure for FDI. The Philippines' growth rate of real GDP and of average labor productivity has been low. The domestic capital intensity has grown more slowly than in the other three countries. In short, the Philippines' economic performance has lagged far behind its neighbors, and consequently, the economic gap between the Philippines' economy and the other three has been widening over time. Indeed Ferdinand Marcos, "crony capitalism," and uprising that the country had to deal with have left their marks.

Thailand: Before the late 1960's, Thailand's economy was a poor agricultural economy, very much in line with (or even lagging behind) the Philippines' economy (Kawapoe and Sekiguchi, 1995, P.14). But as indicated above, there has now emerged a big gap between the two economies. After the late 1960's, and until the recent financial crises of mid-1997, Thailand had a stable economic growth, low inflation rate and a manageable level of external debt. Its import-substitution policy was initiated in the 1960's and it continued until the mid-1970's; its export-promotion policy was adopted in the late 1970's and the early 1980's (Sakurai, 1995, P.190). Thailand's import- substitution strategy was seriously affected by two oil crises in the 1970's. Since the end of the 1980's, Thailand has achieved a high rate of economic growth, a boom in FDI and expanded exports of manufactured goods.

On comparison with the other three countries, Thailand's economic performance ranks next to Malaysia. Its 5.6 percent growth rate of average labor productivity and 7.2 percent growth rate of GDP were highest among the four countries. High ratios of its domestic investment, net FDI, and imports to GDP rank this country in the second position (Table 1).

Since 1970, along with Malaysia, Thailand has been one of the top twelve recipients of FDI among DCs (IFC, 1997). Moreover, Thailand's factor intensity of domestic capital, that is domestic capital-labor ratio, has grown in parallel with Malaysia's but its factor intensity of foreign capital has been expanding even faster. In fact, an extensive program of economic deregulation in its international transactions has been put in place since 1990. "The restrictions on external payments related to current account transactions were almost completely liberalized in May 1991, and the restrictions on external capital accounts were greatly relaxed enabling Thailand to accept the Article (8) obligations under the IMF" (Mutoh, 1995, P.73). The inflation rate (CPI) of 6.1 percent in Thailand, on an average during 1970-98, has been higher than the corresponding rate of 4.1 percent in Malaysia.

Overall, in 1979 and the early 1980's, DCs were faced with different international crises. "The oil price increase of 1979, the rise in the international interest rates that started in 1979, the recession in the major world economies in the early 1980's, and the international debt crisis that erupted in 1982, they all created a very unfavorable international climate for these countries" (Jansen, 1995, P.194). Indonesia, Malaysia, the Philippines, and Thailand were all affected deeply and directly during this period. Especially, their currencies were tied too closely to the US dollar. Consequently, during the appreciation period of the dollar, they priced themselves out of world markets and the worsening balance-of-payment situation generated crisis.

The Asian financial crisis of 1997-98 exacted a heavy toll of the economies of these countries. In order to cope with the crisis, Indonesia and Thailand were forced to embark on the IMF mandated program by committing to float the exchange rate and tighten both monetary and fiscal policies. Malaysia reponse to the crisis was different. It didn't call in IMF. Instead it followed an independent route. It imposed sweeping controls on capital flows out of the country, lowered the interest rate, and revalued the ringgit upward. Kaplan and Rodrik (2001) examined the question, "Did the Malaysian gamble pay off?" They found some evidence that Malaysian capital controls did "allow a speedier recovery than would have been possible via the orthodox/IMF route."

3. Model Specification

Most available empirical studies aimed at measuring an impact of FDI and imports on a developing economy are based on some version of a neo-classical growth model. In these

studies either a homogenous Cobb-Douglas production function, or its parallel growth rate accounting equation derived from the production function is estimated directly. In this paper, using a relatively long period annual data, we estimate and test a basic multifactor Cobb-Douglas production function and its two generalized versions for Indonesia, Malaysia, the Philippines and Thailand. That is, in each case, we test three alternative, but closely related, specifications. These specifications are Cobb-Douglas (CD) production function, transcendental (TR) production function and the CES generalized Cobb-Douglas (CES:CD) function. Our final choice, individually for each case, reported in the paper, is determined by statistical results. We estimate the production functions by using capital stock, labor and imports as factors of production. There are also some auxiliary variables such as time trend and structural dummies. But we make a distinction between domestic and foreign capital stocks as two separate factors. Since we include imports as a factor of production, on the left-hand side, we use gross output (GX), that is GDP plus imports as the dependent variable. The use of gross output has been suggested strongly by Klein (1992) for consistency with an adding-up or product-exhausting theorem. That is, if every factor is paid according to its marginal productivity, then the payments to factors must equal output inclusive of profit. (Also, see Marwah and Klein, 1998.) If we assume the functional relationship between output and factor inputs as,

$$(1) \quad GX = F (K_d, K_f, L, M, D, \mu),$$

where K_d = domestic capital stock, K_f = foreign direct capital stock, L = labor, M = imports, D = surrogate for any auxiliary variable(s) and μ = stochastic random error, then an accounting growth equation for analyzing output and productivity over time is,

$$(2) \quad \frac{d \ln GX}{dt} = \frac{\ln F}{\ln K_d} \frac{d \ln K_d}{dt} \% + \frac{\ln F}{\ln K_f} \frac{d \ln K_f}{dt} \% + \frac{\ln F}{\ln L} \frac{d \ln L}{dt} \% + \frac{\ln F}{\ln M} \frac{d \ln M}{dt} \% + \frac{\ln F}{\ln D} \frac{d \ln D}{dt}$$

By (2), the rate of growth of output is expressed as a weighted sum of the rates of growth of factor inputs, where the factor-weights are their respective production elasticities. Thus the first term on the right hand side measures the contribution to growth of domestic capital, the second of foreign capital, the third of labor and the fourth of imports. We estimate the

production elasticities by experimenting with following three functional forms of the production function, but finally we choose for each country the one which yields the best statistical results.

A. Cobb-Douglas Production Function (CD)

$$(3) \quad \frac{GX}{L} = A \left(\frac{K_d}{L} \right)^{\alpha_1} \left(\frac{K_f}{L} \right)^{\alpha_2} \left(\frac{M}{L} \right)^{\beta} e^{\left[\sum_i \delta_i D_i \right]} \mu_1.$$

B. Transcendental Production Function (TR)

$$(4) \quad \frac{GX}{L} = A \left(\frac{K_d}{L} \right)^{\alpha_1} \left(\frac{K_f}{L} \right)^{\alpha_2} \left(\frac{M}{L} \right)^{\beta} e^{\left[\gamma_1 \left(\frac{K_d}{L} \right)^{\gamma_1} + \gamma_2 \left(\frac{K_f}{L} \right)^{\gamma_2} + \gamma_3 \left(\frac{M}{L} \right)^{\gamma_3} + \sum_i \delta_i D_i \right]} \mu_2.$$

C. CES Generalization of Cobb-Douglas Production Function (CES:CD)

$$(5) \quad \frac{GX}{L} = A \left(\frac{K_d}{L} \right)^{\alpha_1} \left(\frac{K_f}{L} \right)^{\alpha_2} \left(\frac{M}{L} \right)^{\beta} e^{\left[\gamma_1 (\ln K_d + \ln L)^2 + \gamma_2 (\ln K_f + \ln L)^2 + \gamma_3 (\ln M + \ln L)^2 + \sum_i \delta_i D_i \right]} \mu_3.$$

In (3) - (5), α_1 , α_2 and β are >0 , γ_i and δ_i may be positive or negative, and D_i s are dummy variables. Furthermore, if all γ_i s are equal to zero in (4) and (5), both specifications converge to Cobb-Douglas function (3). An assumption of constant returns to scale is subsumed in the above functional forms. Whereas the Cobb-Douglas function yields constant values of production elasticities and unitary value of elasticity of substitution, the underlying production technologies of (4) and (5) allow for both non-unitary elasticities of substitution and variable elasticities of production. (See, for example, Intriligator et al. (1996), chapter 8, pp. 293-297.)

Defining production elasticity (η) of GX with respect to factor input (.) as $\eta_{(.)} = \frac{MGX}{M(.)} \frac{(.)}{GX}$, the production-elasticity functions from these specifications as shown in Marwah and Klein (1998) are:

From A, eq (3),

$$\eta_{(K_d)} = \alpha_1, \quad \eta_{(K_f)} = \alpha_2, \quad \eta_{(M)} = \beta, \quad \eta_{(L)} = 1 + \eta_{(K_d)} + \eta_{(K_f)} + \eta_{(M)}.$$

From B, eq (4),

$$\eta_{(K_d)} = \alpha_1 \gamma_1 \left(\frac{K_d}{L}\right), \quad \eta_{(K_f)} = \alpha_2 \gamma_2 \left(\frac{K_f}{L}\right), \quad \eta_{(M)} = \beta \gamma_3 \left(\frac{M}{L}\right), \quad \eta_{(L)} = 1 + \eta_{(K_d)} + \eta_{(K_f)} + \eta_{(M)}.$$

From C, eq (5),

$$\eta_{(K_d)} = \alpha_1 \gamma_1 \ln\left(\frac{K_d}{L}\right), \quad \eta_{(K_f)} = \alpha_2 \gamma_2 \ln\left(\frac{K_f}{L}\right), \quad \eta_{(M)} = \beta \gamma_3 \ln\left(\frac{M}{L}\right), \quad \eta_{(L)} = 1 + \eta_{(K_d)} + \eta_{(K_f)} + \eta_{(M)}.$$

4. The Estimates

Our estimates are based on annual data for the sample period 1970-98. Data are drawn from two main sources: (a) the International Monetary Fund (IMF) and the Asian Development Bank (ADB). All value entities, unless specified otherwise, are defined in terms of national currencies, and are measured in real terms by using 1995 prices. For Indonesia, the values are expressed in billions of Rupiah, for Malaysia, in millions of Ringgit, for the Philippines, in billions of Peso, and for Thailand, in billions of Baht. (For detailed information on the definition and construction variables, see the Appendix.)

The best estimates of the production functions, in logarithmic transformation, for the four countries are presented below. The estimates are obtained by ordinary least squares (OLS). The numbers within parentheses below the coefficients are t-ratios. The coefficient of determination adjusted for degrees of freedom (\bar{R}^2), Durbin-Watson ratio (d), the mean of the dependent variable, and the standard error of estimate (SE) have been listed with each equation. Three dummy variables denote structural shifts over three distinct time periods. These are:

$$\begin{aligned} D_1 &= 1 \text{ for } 1970-83, 0 \text{ elsewhere,} \\ D_2 &= 1 \text{ for } 1984-88, 0 \text{ elsewhere,} \\ D_3 &= 1 \text{ for } 1989-98, 0 \text{ elsewhere, and} \\ T &= \text{time trend.} \end{aligned}$$

Indonesia (1976-98, N=23)

$$\begin{aligned} (6) \quad \ln\left\|\frac{GX}{L}\right\| &= 0.203 \ln\left\|\frac{K_d}{L}\right\| + 0.066 \ln\left\|\frac{K_f}{L}\right\| + 0.226 \ln\left\|\frac{M}{L}\right\| \\ &\quad (3.5) \quad (3.0) \quad (4.8) \\ &\quad + 1.53 D_1 + 1.42 D_2 + 1.43 D_3. \\ &\quad (20.3) \quad (14.5) \quad (12.6) \end{aligned}$$

$$\text{Mean} = 1.608$$

$$\bar{R}^2 = 0.976$$

$$SE = 0.01528$$

$$d = 1.6 [- AR(2)]$$

Note: AR (2) denotes auto-regressive error of order 2, corrected using ML (Gauss-Newton) method.

Malaysia (1970-98, N=29)

$$(7) \quad \ln\left(\frac{GX}{L}\right) \cdot \begin{matrix} 0.247 \\ (9.1) \end{matrix} \ln\left(\frac{K_d}{L}\right) \& \begin{matrix} 0.061 \\ (4.5) \end{matrix} \ln\left(\frac{K_f}{L}\right) \begin{matrix} \% 0.251 \\ (5.3) \end{matrix} D_3 \ln\left(\frac{K_f}{L}\right) \begin{matrix} \% 0.385 \\ (21.5) \end{matrix} \ln\left(\frac{M}{L}\right) \\ \& \begin{matrix} 0.02 \\ (4.7) \end{matrix} \left(\frac{K_f}{L}\right) \begin{matrix} \% 0.005 \\ (3.4) \end{matrix} \left(\frac{M}{L}\right) \begin{matrix} \% 1.72 \\ (31.4) \end{matrix} D_1 \begin{matrix} \% 1.71 \\ (29.5) \end{matrix} D_2 \begin{matrix} \% 1.29 \\ (10.1) \end{matrix} D_3 .$$

$$\begin{aligned} Mean &= 3.3307 \\ SE &= 0.00105 \end{aligned}$$

$$\begin{aligned} \bar{R}^2 &= 0.999 \\ d &= 2.0 \end{aligned}$$

The Philippines (1973-98, N=26)

$$(8) \quad \ln\left(\frac{GX}{L}\right) \cdot \begin{matrix} \& 1.12 \\ (2.4) \end{matrix} \begin{matrix} \% 1.125 \\ (3.7) \end{matrix} \ln\left(\frac{K_d}{L}\right) \begin{matrix} \% 0.066 \\ (2.6) \end{matrix} \ln\left(\frac{K_f}{L}\right) \begin{matrix} \% 0.287 \\ (9.3) \end{matrix} \ln\left(\frac{M}{L}\right) \\ \begin{matrix} \% 0.184 \\ (3.3) \end{matrix} [\ln K_d \& \ln L]^2 \& \begin{matrix} 0.02 T \\ (7.2) \end{matrix} .$$

$$\begin{aligned} Mean &= -2.3237 \\ SE &= 0.01419 \end{aligned}$$

$$\begin{aligned} \bar{R}^2 &= 0.927 \\ d &= 2.0 \end{aligned}$$

Thailand (1972-98, N=27)

$$(9) \quad \ln\left(\frac{GX}{L}\right) \cdot \begin{matrix} \& 0.84 \\ (5.6) \end{matrix} \begin{matrix} \% 0.145 \\ (6.3) \end{matrix} \ln\left(\frac{K_d}{L}\right) \begin{matrix} \% 0.044 \\ (2.4) \end{matrix} \ln\left(\frac{K_f}{L}\right) \begin{matrix} \% 0.295 \\ (6.2) \end{matrix} \ln\left(\frac{M}{L}\right) \\ \begin{matrix} \% 0.17 \\ (0.9) \end{matrix} \left(\frac{K_d}{L}\right) \begin{matrix} \% 5.026 \\ (2.9) \end{matrix} \left(\frac{M}{L}\right) .$$

$$\begin{aligned} Mean &= -2.3442 \\ SE &= 0.0050 \end{aligned}$$

$$\begin{aligned} \bar{R}^2 &= 0.999 \\ d &= 2.1 \end{aligned}$$

It may be noted that the CD production function describes best the production technology in Indonesia, TR, in Malaysia and Thailand, and truncated CES:CD, augmented by time trend, in the Philippines. Except for one single coefficient in eq. (9), all other coefficients of eqs. (6)-(9), are statistically significant and are robust with *a priori* expected signs. The estimated values

of β , $\hat{\beta}$, underscore a positive and strong contribution of imports to average labor productivity in each country. Furthermore, the estimated (non-zero) value of γ_3 appears only in equations for Malaysia and Thailand. Its positive values, in both cases, imply increasing marginal returns to imports. Evidently, this result is consistent with the fact that the ratio of imports to GDP is high for both countries.

Importantly, a clear distinction emerges between the impact of domestic and FDI capital stock for each country. Both $\hat{\alpha}_1$ and $\hat{\alpha}_2$ are positive and statistically significant. Specifically, with an exception of Malaysia, $\hat{\alpha}_2$ is very similar across the other three countries. For Malaysia, the direction of effect seem to have shifted in the 1990's, from negative to positive. It is shown by the coefficient of multiplicative dummy variable. In other words, the effect of K_f on labor productivity has been varying over time, but the positive effect since 1989 dominates the negative effect of the earlier years. For other three countries, the effect is normal.

The dummy variables seem to capture some shifts over time in total factor productivity. Apparently, these shifts are caused by changes in trade and investment policies in Indonesia and Malaysia; however, a negative time trend is revealed in total factor productivity in the Philippines.

Parenthetically, it may be mentioned that statistical properties of the residuals, namely normality, heteroscedasticity and serial correlation were tested and the residuals were found to be stationary except for Indonesia, where Durbin-Watson d statistic was weak. The estimates were then obtained after correcting for autocorrelation as indicated above. The estimated equations also passed the functional form test.

For Indonesia, partial production elasticities are given by the coefficient of each respective factor in eq. (6) and are thus constant, but for the other three countries, they vary from point to point. For easy comparison, the variable elasticities have been evaluated at mean functional points of respective eqs. (7)-(9). The elasticity coefficients are summarized below in Table 2.

Table 2: Implied (Partial) Production Elasticities: $\eta_{(.)}$

$\eta_{(.)}$	Indonesia	Malaysia	The Philippines	Thailand
$\eta_{(K_d)}$	0.203	0.247	0.242	0.173
$\eta_{(K_f)}$	0.066	0.086 ^a	0.066	0.044
$\eta_{(L)}$	0.505	0.224	0.405	0.355
$\eta_{(M)}$	0.226	0.443	0.287	0.428

Note: All variable (partial) production elasticities are computed at mean points. ^a For period 1989-98.

The closeness of production elasticities of both domestic and FDI capital stock across four countries is quite striking. For domestic capital, it varies from 0.173 to 0.247, and for FDI, from 0.044 to 0.086. With respect to labor and imports, the production elasticities are very similar in Indonesia and the Philippines on the one hand, and of Malaysia and Thailand on the other. In Indonesia and the Philippines, the production elasticity of labor is higher than of imports, and the opposite is true for Malaysia and Thailand.

Finally, and parenthetically, it may be noted that we did test the super consistent (robustness) properties of OLS estimators by applying the cointegration test for the relationship among the main variables in a specified model (Verbeek, 2000, p. 282; Zhang, 2001). Two steps are followed. First, the augmented Dickey-Fuller (ADF) test is applied to confirm that all variables, used in the main equation are rendered stationary in second differences (\hat{I}^2) at a 5% level of significance, or they are integrated of order two, I(2) as shown below in Table 3. Since *nearly* all basic variables used in the model are integrated of the same order, the error term in the equation is integrated of zero order, I(0). Second, the cointegration property of each equation was checked by applying Johansen's LR test, which included a constant term and no time trend with the VAR lag lengths set at two. This test showed that the equation is cointegrated for each country at 5% critical level. A priori expected signs for each individual coefficient were also confirmed. Overall, and importantly, it is legitimate to interpret our regressions as structural equations.

Table 3. Test-Results for the Unit Root of Variables

Variable $\hat{\tau}^2(\cdot)$	Indonesia 1976-98	Malaysia 1972-98	Philippines 1972-98	Thailand 1973-98
$\hat{\tau}^2 \ln(GX/L)$	- 4.22 (- 4.13)	- 4.00 (- 4.06)	- 3.96 (- 3.86)	- 4.26 (- 4.60)
$\hat{\tau}^2 \ln(K_d/L)$	- 3.05 (E)	- 4.24 (- 3.77)	- 5.69 (-5.65)	- 3.03 (E)
$\hat{\tau}^2 \ln(K_f/L)$	- 4.48 (- 5.61)	- 7.92 (8.70)	- 3.61 (- 3.94)	E
$\hat{\tau}^2 \ln(M/L)$	- 5.86 (- 5.61)	- 4.90 (- 4.96)	- 6.81 (- 6.55)	- 4.74 (-4.87)
ADF critical value (5%)	- 3.0294 (- 3.6746)	- 2.9850 (- 3.60271)	- 2.9907 (- 3.6119)	- 2.9970 (- 3.219)

Note: statistics are based on ‘with intercept and no trend’, and within parentheses, ‘with trend and intercept’. When the absolute value of statistic listed in Table 3. is greater than the absolute value of ADF statistic (the last row), the unit root for the corresponding variable is rejected. The letter E denotes “not possible to reject the unit root”.

5. Conclusions

In this paper, the impact of foreign direct investment and imports is analyzed for four ASEAN countries: Indonesia, Malaysia, the Philippines and Thailand. Based on the production elasticities evaluated at their functional mean points over a relatively long period of 1970-98, results are best summarized, individually for each country, by its growth-accounting equation (2) transformed in statistical form. That is,

Indonesia

$$10) \quad \frac{d \ln GX}{dt} = 0.203 \frac{d \ln K_d}{dt} \% 0.066 \frac{d \ln K_f}{dt} \% 0.505 \frac{d \ln L}{dt} \% 0.226 \frac{d \ln M}{dt} .$$

Malaysia

$$(11) \quad \frac{d \ln G X}{d t} = 0.247 \frac{d \ln K_d}{d t} + 0.086 \frac{d \ln K_f}{d t} + 0.224 \frac{d \ln L}{d t} + 0.443 \frac{d \ln M}{d t} .$$

The Philippines

$$(12) \quad \frac{d \ln G X}{d t} = 0.242 \frac{d \ln K_d}{d t} + 0.066 \frac{d \ln K_f}{d t} + 0.405 \frac{d \ln L}{d t} + 0.287 \frac{d \ln M}{d t} .$$

Thailand

$$(13) \quad \frac{d \ln G X}{d t} = 0.173 \frac{d \ln K_d}{d t} + 0.044 \frac{d \ln K_f}{d t} + 0.355 \frac{d \ln L}{d t} + 0.428 \frac{d \ln M}{d t} .$$

Evidently, both foreign capital and imports have marked effect on economic growth of Indonesia, Malaysia, the Philippines and Thailand. The message that emerges is clear: for every one percentage growth point, growth of domestic and foreign capital stock generates 0.269 in Indonesia, 0.333 in Malaysia, 0.308 in the Philippines and 0.217 in Thailand. Furthermore, of every one percentage growth point generated by the growth of total capital stock, growth in foreign capital stock accounts for 24.5 percent in Indonesia, 25.8 percent in Malaysia, 21.4 percent in the Philippines, and 20.3 percent in Thailand.⁵ Although, the production elasticities of foreign capital stock range from 0.044 for Thailand to 0.082 for Malaysia, the closeness of relative contribution of growth in foreign capital to growth in domestic capital in a range of 20-25 percent is a powerful finding. That one-fifth to one-fourth of the productivity of total capital stock is generated by growth in FDI is not an insignificant contribution. At the same time, every one percent growth in imports generates 0.226 of each growth point in Indonesia, 0.443 in Malaysia, 0.287 in the Philippines, and 0.428 in Thailand. That openness has contributed substantially to the productivity and economic growth of ASEAN countries is clear by our results.

To sum up, openness to big industries, measured by FDI net- inflows and total imports, generates 0.292 of each growth point in Indonesia, 0.529 in Malaysia, 0.353 in the Philippines, and 0.472 in Thailand.

⁵ $\eta_{(K_f)} / (\eta_{(K_d)} + \eta_{(K_f)})$

Appendix:

Definitions of Variables

Note: The national currencies are: *Rupiah* in Indonesia, *Ringgit* in Malaysia, *Peso* in the Philippines, and *Baht* in Thailand. All values for Indonesia, the Philippines and Thailand are expressed in billion, but for Malaysia in million, of national currency units.

Exchange rate is defined as national currency per US\$ at the end of the period (IMF series, rf).

GDP: gross domestic product (X) in 1995 national currency units. Nominal values are converted to real values by using GDP implicit deflator, 1995=1.00.

GX: gross domestic product plus imports (GDP+M)

K_d = domestic capital stock in 1995 national currency units. Domestic capital stock is calculated by accumulating gross domestic investment (gross fixed capital formation), using 5 % depreciation rate and 1969 as the base year. That is, $(K_d)_t = (1 - 0.05) (K_d)_{t-1} + (I_d)_t$, where I_d is gross fixed domestic capital formation. $(K_d)_0 = (I_d)_{1969}$. Nominal values of gross domestic investment are converted to real values by using domestic investment implicit deflator, 1995=1.00.

K_f = foreign capital stock in 1995 national currency units. It is calculated by accumulating net-FDI flows and using 5% depreciation rate. The base year is 1970, except for Philippines, which is 1973.

Net-inflows of Foreign Direct Investment (FDI), defined as FDI inflows minus FDI outflows, are obtained in US dollars. The values are converted appropriately in national currency units, and in 1995 values, by using a proper exchange rate and implicit investment price deflator.

For the Philippines, the data are available for 1973-98.

M = imports in 1995 national currency units. The implicit import price deflator is used to convert the nominal values to real terms.

L = employment, thousands of persons. For Indonesia, total employment is available only from 1976.

T = chronological time.

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