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On Exports And Economic Growth

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ABSTRACT

This paper focuses on a new estimate of Feder (1982)'s model on productivity and externality effect of exports in six Asian countries. Econometric issues are addressed with the use of cross-sectional analysis. The results show that the coefficients of the models reduce substantially when the analysis is adjusted for stationarity. The effect of exports on growth and productivity is found to be positively significant and the export sector is found to have a positive effect on non-export sector. However, the extent of externality effect will depend on several factors such as size, policy orientation of exports, concentration of export products and processing level of exports.

ABSTRAK

Kajian ini menumpukan kepada suatu anggaran baru model Feder (1982) keatas produktiviti dan kesan luaran sektor ekspot bagi enam buah negara Asia. Isu-isu ekonometrik dibincang apabila analisis silang rentas digunakan. Keputusan kajian ini menunjukkan bahawa pengkali bagi model Feder berkurangan apabila analisis dibuat setelah penyelarasan bagi kepegunan dibuat. Kesan ekspot keatas pertumbuhan dan produktiviti didapati signifikan secara positif dan sektor ekspot didapati mempunyai kesan luaran positif keatas sektor bukan ekspot. Walau bagaimapun, tahap kesan luaran tersebut bergantung kepada beberapa faktor saperti saiz, polisi orientasi ekspot, pemusatan produk ekspot dan tahap pemprosesan ekspot.

INTRODUCTION

Among numerous articles on the correlation between trade and growth, one finds little examination of the mechanisms in this relationship. [See van den Berg (1996), Schmidt and van den Berg (1994) and Edwards (1993) for recent surveys]. An exception is by Feder (1982), who focuses on one mechanism, where higher productivity in the export sector, positively affects growth in the non-export sector.

This paper estimates a time-series version of the model by Feder (1982) for six Asian developing economies defined by Chenery (1980) as semi-industrialized. When applied to the Asian countries, the time-series results strongly support the export growth connection. Several problems associated

with the cross-section analysis employed by Feder (1982) and many others have been raised. The results show that cross sectional analysis over-estimated the effect of trade on growth.

According to Feder (1982), exports contribute to economic growth in a variety of ways - greater capacity utilization, economies of scale, incentives for technological improvement and pressure of foreign competition, leading to more efficient management. Thus, marginal factor productivities are expected to be higher in export industries than in non-export industries. The cross-sectional analyses by Feder (1982) and Ram (1987) confirm this productivity differential for developing countries, although the differential coefficients in Feder (1982) for developed countries are insignificant.

Following Keesing (1967, 1979), Feder (1982) also posits the effects of export activities on the rest of the economy. Supposedly, the development of efficient and internationally competitive management, the introduction of improved production techniques, the training of higher quality labors, and the steadier flow of imported inputs are beneficial to the non-export sector. Since these benefits are not reflected in prices in the export sector, they are referred to as externalities. Feder (1982) estimates that a ten percent increase in exports without drawing resources from the non-export sector would increase productivity in the latter by 1.3 percent.

Edward (1993)'s survey cites a number of authors who believe that the effects of exports on growth depends on the stage of development, on the inward or outward orientation of policy and on the composition of exports. [For examples, see Dodaro (1991), Helleiner (1986), and Kohli and Singh (1989)]. However, the implication for the present study is that the notion of higher productivity in the export sector of outward-oriented economy is mixed. Furthermore, a wide array of manufactures produced in advanced developing countries would allow the establishment of linkages through which externalities could be transmitted.

Externalities receive support from Feder's (1982) estimates, which shows significant higher externalities in developed countries than in developing countries. Although Ram (1987) does not estimate the export externalities effect, he did find that exports contribute more to growth in middle-income developing countries than in low-income countries. The export-growth conditions surveyed by Edwards (1993) is used here to interprete the mixed results obtained for the sample of countries in this study. The remainder of this paper is divided into three sections. The next section discusses the methodology for the study. This is followed by analysis of data and the interpretation of the results. The paper ends with a brief summary and implications.

METHODOLOGY

THE FEDER MODEL

Feder (1982) starts with the typical neo-classical production function used in most studies in the sources of growth. However, he formulates separate production functions for the export and non-export sectors of the economy and he assumes that marginal productivities have not been equalized between the sectors. Moreover, he formulates a term for the external effect of the non-export sector.

The conventional, continuous, and twice-differentiable production functions for the two sectors are:

$$N = F(K_N, L_N, X) \tag{1}$$
$$X = G(K_X, L_X) \tag{2}$$

where N —output in the domestic non-export sector
X —output in the domestic export sector
K_i—capital stock in sector i, i = N(non-export sector), K(export sector)
L_j— labor force in sector j, j = N(non-export sector), K(export sector)

and F, G are conventional production functions describing the respective sector technologies.

Where the sector marginal products differ, their ratios differ from unity, and assuming that the technological differences are not embodied, one can denote this difference by a factor d. Specifically,

$$\frac{G_K}{F_K} = \frac{G_L}{F_L} = 1 + \delta \tag{3}$$

where the subscripts denote partial derivatives.

By assuming that F and G are homogenous of degree 1, differentiating (1) and (2) with respect to time, and employing Bruno (1968) statical state solution assumption, Feder (1982) sets the marginal sector products of labor equals to the average labor product for the economy as a whole. Then one would arrive at the fairly conventional growth equation:

$$\frac{\dot{Y}}{Y} = \alpha \frac{1}{Y} + \beta \frac{\dot{L}}{L} + \left(\frac{\delta}{1+\delta} + F_X\right)\frac{\dot{X}}{Y} \tag{4}$$

$$\frac{\dot{Y}}{Y} = \alpha \frac{1}{Y} + \beta \frac{\dot{L}}{L} + \gamma \frac{\dot{X}}{X} \frac{X}{Y} \qquad (4A)$$

where Y — output
I — investment
L — labor
I — investment
and the dots on every variables denote the change.

We use the formulation (4A) above to find the empirical relationship between the growth of output and each of the independent variables. A time-series analysis for each country will be employed. The coefficients in equation (4A) need careful interpretation. a is the marginal productivity of capital in the non-export sector, and b is the proportionality factor linking the marginal product of labor in the non-export sector to the average labor product, Y/L. The term $(\frac{\delta}{1+\delta} + F_X)$ measures the amount by which total marginal productivity in the export sector exceeds that in the whole economy.

Equation (4A) can be used to estimate the productivity differential $(\frac{\delta}{1+\delta} + F_X)$ which reflects both the differences in the sectoral productivities of the factors of production and the externality effect of exports, F_X. To analyze the productivity effect further, we constrain F_X, and assume that exports affect the output of non-exports at a constant exponential rate, θ.

$$N = F(K_N, L_N, X) = X^{\theta} \Psi(K_N, L_N) \qquad (5)$$

Differentiating (5) with respect to time, one obtains the following,

$$\dot{N} = X^{\theta} \psi_K \dot{K}_N + X^{\theta} \psi_L \dot{L}_N + \theta \frac{N}{X} \dot{X} \qquad (6)$$

where

$$F_K \equiv X^{\theta} \psi_K$$
$$F_L \equiv X^{\theta} \psi_L$$
$$F_K \equiv \theta \frac{N}{X}.$$

Substituting Y - X for N, one obtains,

$$F_X = \theta \frac{Y - X}{X} = \theta (\frac{1 - x}{x}), \qquad (7)$$

where x— share of export in GDP. After substituting F_x in equation (4) with (7), we will arrive at (8) below;

$$\frac{\dot{Y}}{Y} = \alpha \frac{1}{Y} + \beta \frac{\dot{L}}{L} + (\frac{\delta}{1+\delta} - \theta)\frac{\dot{X}}{Y} + \theta \frac{\dot{X}}{X} \tag{8}$$

$$\frac{\dot{Y}}{Y} = \alpha \frac{1}{Y} + \beta \frac{\dot{L}}{L} + \gamma \frac{\dot{X}}{Y}\frac{X}{Y} + \theta \frac{\dot{X}}{X} \tag{8A}$$

We estimate the coefficient q in the equation (8A) to find the externality effect of exports on the non-export sector.

ANALYSIS OF DATA

ECONOMETRIC PROBLEMS

All the data in this study are obtained from World Bank (1995) and International Statistics CD-Rom version compiled by International Monetary Fund. Feder (1982) estimates equations (4A) and (8A) across 31 developing countries and obtained the expected positive and significant coefficients for all variables. Investment, labor-force growth, the export-productivity differential, and the export externalities all contribute to higher GDP growth rates. Cross-sectional regression of equation (4A) in Feder (1982) for the entire sample countries is reproduced in Table 1 together with replications for succeeding decades. The results show a decline in the overall explanatory power of the model in more recent years and a marked decline in the significance of exports as an independent variable. As Feder (1982) himself acknowledges, there are several econometric problems with estimations of

TABLE 1. Feder's cross-section regressions of equation (4a) and replications

Variable	Feder (1964-1973)	1974-1983	1984-1993
I/Y	0.178	0.071	0.236
	(3.542)	(1.742)	(4.554)
$\dot{L}/L$	0.747	0.873	-0.880
	(2.862)	(2.242)	(-2.103)
$(\dot{X}/X)(X/Y)$	0.422	0.200	0.037
	(5.454)	(1.580)	(0.370)
R^2	0.689	0.406	0.471
No. of observations	31	30	30

the model, some of which are particularly associated with cross-section analysis.

First, the variable I is measured by gross rather than net investment. L is based on the working-age population and ignores variations in unemployment or underemployment rates. If these errors vary more across countries than across time, then cross-section estimates are more likely to be biased than time-series estimates. Second, equations (4A) and (8A) undoubtedly ignore many other variables of importance to growth. For instance, imports may influence growth through provision of capital goods and through increased competition. Other social and political characteristics could be added to the list of omitted variables, and because the variables probably change more across countries than across time, these neglected factors may particularly bias cross-section results. Third, variables such as investment and exports are components of GDP and this creates the possibility of simultaneity bias. There is concern that the influence of exports on GDP is exaggerated by the contemporaneous influence of GDP on exports (Greenaway and Sapsford, 1995). However, no simultaneity problem was encountered for the countries in the sample. Fourth, cross-section analysis involves the implicit assumption that parameters are similar across countries. That is, different countries supposedly operate not only with identical production functions but also with the same productivity differentials between export and non-export sectors. Since these conditions are unlikely, the estimated coefficients are not applicable to any specific countries. This short-coming is resolved by the time-series analyses conducted separately for each country, although time-series analysis itself involves the doubtful assumption that the parameters remain constant through the years. Fifth, many variables are non-stationary, exhibiting stochastic or deterministic trends that generate spurious regression results. Non-stationarity affects cross-section analyses whenever the data sets contain period averages, because the mean of a non-stationary series is always changing. In van den Berg's (1996) words, "it is not clear exactly what the results from regression model with 'average' values of non-stationary variables tell us."

The incidence of non-stationarity among variables in this study is illustrated in Table 2. Only the Philippines' growth rates are non-stationarity according to either the Phillips- Perron (PP) (1988) test or the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) (1992) test. All other variables, except the export externality (X^{Y}/X) series, are non-stationary according to either the PP, KPSS or both tests.

SINGLE EQUATION MODEL

To illustrate the effect of non-stationarity, the results are reported based on unadjusted time-series regressions in the appendix (Equations (4A) in Table

TABLE 2. Non-stationary variables according to PP and KPSS (1974-1993)

Country	$(\dot{Y}/Y)$	(I/Y)	$(\dot{L}/L)$	
Hong Kong		PP	KPSS	KPSS
Korea		PP, KPSS	PP, KPSS	
Malaysia		PP, KPSS	PP	KPSS
Philippines	PP	PP	PP	
Singapore		PP	PP	KPSS
Thailand		PP, KPSS	PP	KPSS

A1 and (8A) in Table A2). Those results are compared with regressions that have been adjusted by first-differencing and using error correction model when necessary, to handle non-stationarity of variables. The results are reported in Tables A3 through A6. These results are summarized in Tables 3 and 4 below where it can be seen that the export variables, $(\dot{X}/X)$ in (8A),

TABLE 3. Summary for six Asian countries unadjusted for non-stationarity (Number of countries with significant coefficients)

Variables	(I/Y)	$\dot{L}/L$	$(\dot{X}/X)(X/Y)$	$(\dot{X}/X)$
Equation 4A Positive	4	3	6	NA
Equation 4A Negative	0	0	0	NA
Equation 8A Positive	3	3	2	1
Equation 8A Negative	0	0	1	1

Source: Tables A1 and A2.

TABLE 4. Summary for six Asian countries adjusted for non-stationarity by KPSS or PP (Number of countries with significant coefficients)

Variables	(I/Y)	$\dot{L}/L$	$(\dot{X}/X)(X/Y)$	$(\dot{X}/X)$
Equation 4A Positive	6	2	6	NA
Equation 4A Negative	0	0	0	NA
Equation 8A Positive	6	1	0	5
Equation 8A Negative	0	0	3	0

Source: Tables A3 – A6.

become positive and significant for more countries after the data have been adjusted for stationarity.

In Table 4, where the regressions have been adjusted for non-stationarity, one sees the expected results for the investment variable in all the six countries, after adjusting for stationarity by either method. The crude proxy for the labor force fares worse where only one country has significant coefficient. Because of the need to focus on the effects of exports, the investment and labor force results will not be discussed further. Table 4 reveals a significant positive productivity differential in the export sector export (coefficient for $(\dot{X}/X)(X/Y)$ in (4A)) for all the countries. It also shows five of the six countries with positive externalities (coefficient for $(\dot{X}/X)$ in (8A)).

TABLE 5. Mean of positive, significant export coefficients

Variable	$(\dot{X}/X)(X/Y)$	$(\dot{X}/X)$
Equation (4A)		
Unadj. for nonstationary	0.6600	NA
Adj. for PP test	0.4270	NA
Adj. for KPSS test	0.5376	NA
Equation (8A)		
Unadj. for nonstationary.	1.5231	0.6871
Adj. for PP test	0	0.3215
Adj. for KPSS test	0	0.2830

Source: Tables A1 – A6

As shown in Table 5, the sizes of the export coefficients also change. The means of export productivity differential and the export externality effect become substantially smaller after adjustment for non-stationarity. On the other hand, the export productivity differential net of the externalities estimated by equation (8A) becomes insignificant after adjustment for non-stationarity.

Interpretation of the Export Productivity Differential Estimates. Individual country results for equation (4A) are summarized in Table 6. All the 6 countries have significant, positive export productivity differentials after adjustment for either the PP or KPSS tests, but only 4 have the positive differential after adjustment for both tests. As suggested by the literature on the national characteristics of countries that benefit from exports, there are similarities among the countries with positive differentials and among those without, and we review them below.

Size. All the six countries have significant positive coefficients for the variables $(\dot{X}/X)(X/Y)$, indicating that productivity is higher in the export sectors. This implies that there is gain from transferring resources from the non-export sector. Since these countries have relatively small populations and GDP's, the present estimates suggest that smaller economies have an array of domestic industries that are more productive than their non-export sectors. These results are consistent with Schmidt and van den Berg (1994) who find no significant relationship between the growth rates of exports and GDP for large economies.

TABLE 6. Summary of countries with significant coefficients for equation (4A)*.

Country	(I/Y)			$(\dot{L}/L)$			$(\dot{X}/X)(X/Y)$		
	Level	PP	KPSS	Level	PP	KPSS	Level	PP	KPSS
Hong Kong		+	+		+		+	+	
Korea	+	+	+	+			+	+	+
Malaysia	+	+	+	+			+	+	+
Philippines	+	+	+				+	+	+
Singapore		+					+	+	
Thailand	+	+	+	+	+		+	+	+

* Level indicates all variables are assumed stationary
PP indicates specifications are dictated by PP unit root test
KPSS indicates specifications are dictated by KPSS unit root test
\+ Positive and significant coefficient
\- Negative and significant coefficient
Source: Table A1, A3, A4.

Policy Orientation: Inward vs. Outward. According to the World Bank (1987), trade orientation for Korea, Hong Kong and Singapore is strongly outward; for Malaysia and Thailand it is moderately outward; and for the Philippines moderately inward. A country's own policies play a crucial role in affecting export expansion and the prospect for economic growth (Balassa, 1989 and Kravis 1970, 1973). This idea receives support from Love (1984) whose results are consistent with the hypothesis that export success is related to favorable internal factors influencing countries' abilities to compete and diversify.

The present study supports these views for the Asian countries in the sample. Korea, Malaysia, Philippines and Thailand have positive significant coefficients for $(X/X)(X/Y)$ under both PP and KPSS adjusted model with Hong Kong and Singapore positive and significant only under the PP-adjusted

model. Hong Kong and Singapore share a common characteristic; they are both port cities and act as transshipment locations for the world. They are ranked, respectively, third and fourth among 80 (developed and developing) countries in the change in per capita GDP over 1960-85 (Summers and Heston, 1988).

Manufactures vs. Primary Products. The export-non-export productivity differential estimated in equation (4A) also seems to be strong in the sample countries that export manufactured products as opposed to primary goods. The high-performing Asian economies generally have positive and significant coefficients for $(\dot{X}/X)(X/Y)$ and the percentage of their exports consisting of machinery, transport equipment, and other manufactures ranged from 60 to 96 percent (World Bank, 1987). The productivity differential in favor of manufactured exports gives a possible explanation for Dodaro's (1991) finding of a strong correlation between economic growth and the proportion of exports consisting of manufacturing.

Interpretation of the Export Externality Estimates. A summary of countries with significant coefficients for the regression (8A) is given in Table 7. Here, the focus is on the coefficients for $(\dot{X}/X)$ which isolates the export externality effect on growth. Table 7 shows that except for the Philippines whose policy is moderately inward, all other countries in the sample have significant positive coefficients under one or both PP and KPSS specifications. Dodaro (1991) suggests that the effectiveness of exports or export promotion policies depends on the level of development and the structure of exports.

TABLE 7. Summary of countries with significant coefficients in equation (8A).

Country	(I/Y)	$(\dot{L}/L)$	$(\dot{X}/X)(X/Y)$	$(\dot{X}/X)$
	Level PP KPSS	Level PP KPSS	Level PP KPSS	Level PP KPSS
Hong Kong	+ +		– –	+ + +
Korea	+ + +	+		+ +
Malaysia	+ + +	+	+	+
Philippines	+ + +			
Singapore	+ +		–	+
Thailand	+ + +	+ +	+ –	– + +

* Level indicates all variables are assumed stationary
PP indicates specifications are dictated by PP unit root test
KPSS indicates specifications are dictated by KPSS unit root test
\+ Positive and significant coefficient
\- Negative and significant coefficient
Source: Table A2, A5, A6.

These two factors may be complementary in the sense that a more advanced country can export a wider variety of goods that are competitive in international markets. In turn, this diversification may enable the export sector to have linkages with the non-export sector. The existence for more linkages in the form of ancillary industries that supply and service export industries provides a mechanism by which the export externality effect can operate. Table A7 in the appendix shows the extent of diversification among the six countries in the sample by listing the share of exports accounted for by the most important products.

CONCLUSION

This paper provides updated estimates of the relationship between GDP growth and exports, using the model developed by Feder (1982). It also demonstrates the impact of non-stationarity variables on time-series estimates by estimating the model with and without adjustment for non-stationarity. After adjustment, the estimates show that there is a positive export productivity differential in all six countries in the sample, and positive export externalities in all except the Philippines. A system of simultaneous equation is used to determine that simultaneity is not a problem for the sample countries. Evaluation of the results for individual countries suggests that higher productivity in the export sector is associated with the size and trade orientation of a country, as well as the extent of manufacturing. The structure of exports, including product concentration, the percentage of primary and manufactured exports, and the type of products for export also seem to be associated with externality effect. Strongly- or moderately-outward orientation, a well diversified export structure and highly processed export products generally characterize countries with export sectors that generate positive externalities for the non-export sector.

REFERENCES

Balassa, B. 1989. Outward orientation. In *Handbook of development economics,* eds. H. Chenery, H. & T.N. Srinivasan, vol 2, 1645-1690. North Holland: Elsevier Science Publishers B. V.

Bruno, M. 1968. Estimation of factors contribution to growth under structural disequilibrium. *International Economic Review* 9 (1), February: 49-62.

Chenery, H. B. 1980. The semi-industrial countries. New York: Oxford University Press.

Dodaro, S. 1991. Comparative advantage, trade and growth: Export-led growth revisited. *World Development* 19 (9): 1153-1165.

Edward, S. 1993. Openness, trade liberalization, and growth in developing countries. *Journal of Economic Literature,* vol. XXXI (Sept): 1358-1393.

Feder, G. 1982. On export and economic growth. *Journal of Development Economics* 12: 59-73.

Greenaway, D. & Sapsford, D. 1995. Exports, growth and liberalization: An evaluation. *Journal of Policy Modeling* April: 2

Helleiner, G. K. 1986. Outward orientation, import instability and African economic growth: an empirical investigation. In *Theory and reality in development: Essays in honor of Paul Streeten,* eds. S. Lall, S. & F. Stewart, 139-153. London: Macmillan.

Keesing, D. B. 1967. Outward-looking policies and economic development. *Economic Journal* 77 (306): 303-320.

Keesing, D. B. 1979. Trade policy for developing countries. *World Bank Staff Working Paper* 353, August

Kohli, I. and N. Singh. 1989. Export and growth: critical minimum effort and diminishing returns. *Journal of Development Economics* 30(2): 391-400.

Kravis, I. B. 1970. Trade as a handmaiden of growth: Similarities between the nineteenth and twentieth centuries. *Economic Journal* 80 (Dec.): 851-872.

Kravis, I. B. 1973. A reply to Mr. Crafts' note. Economic Journal 83: 212-217. Kwiatkwoski, D., Philips, C.B., Schmidtand, P. & Shin, Y. 1992. Testing the null hypothesis of stationarity against the alternative of unit root. *Journal of Econometrics* 54: 159-78.

Love, J. 1984. External market conditions, competitiveness, diversification and LDCs' exports. *Journal of Development Economics* 16: 279-291.

Phillips, P.C.B. & Perron, P. 1988. Testing of a unit root in time series regression. *Biometrika* 75: 335-346.

Ram, R. 1987. Exports and economic growth: evidence from time series and cross-sectional data. *Economic Development and Cultural Changes* 36 Oct.: 51-72.

Schmidt, J. R. & van den Berg, H. 1994. Foreign trade and economic growth: time series evidence from Latin America. *The Journal of International Trade and Economic Development:* 249-268.

Summers, R. & Heston, A. 1988. A new set of international comparisons of real product and prices: Estimates for 130 countries. *Review of Income and Wealth* 34(1): 1-25.

van den Berg, H. 1996. Trade as the engine of growth in Asia: What the empirical evidence reveals. *Journal of Development Economics* 9: 121-130.

World Bank. 1987. *World Development Report* 1987 New York: Oxford University Press.

World Bank. 1995. *World Tables 1995* Baltimore & London: The World Bank & The John Hopkins University Press.

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APPENDIX

TABLE A1. Coefficients in equation (4A) assuming all variables stationary

Country	(I/Y)	$(\dot{L}/L)$	$(\dot{X}/X)(X/Y)$	R-square
Hong Kong[a]	0.5909	0.2407	0.3684**	0.4536
	(1.2590)	(0.9150)	(4.3620)	
Korea[a]	0.9433**	13.7430**	1.2823**	0.4905
	(2.7820)	(2.7550)	(4.5610)	
Malaysia	0.2065*	4.2614**	0.6095**	0.5584
	(1.6880)	(3.0660)	(4.3450)	
Philippines[a]	0.4689**	0.7291	0.5936**	0.5823
	(2.0930)	(0.2106)	(2.8120)	
Singapore	0.1534	0.3979	0.1991**	0.5414
	(1.0590)	(1.0200)	(4.1840)	
Thailand	0.2901**	3.4332**	0.9070**	0.4778
	(2.0650)	(1.7910)	(3.2620)	

Note: Figures in parentheses are t-statistics.
[a] Allowance for serial correlation in model estimation.
** Significant at 95 percent level.
* Significant at 90 percent level.

TABLE A2. Coefficients in Feder model (8A) assuming all stationary

Country	(I/Y)	$(\dot{L}/L)$	$(\dot{X}/X)(X/Y)$	$\dot{X}/X$	R-square
Hong Kong	0.2215	0.3501	-0.3231**	0.6871**	0.7371
	(0.9375)	(1.2840)	-(2.5170)	(4.6910)	
Koreaa	1.0439**	12.7220**	0.6650	0.1568	0.5268
	(3.0890)	(2.6200)	(1.2020)	(1.2760)	
Malaysia	0.2064*	4.4271**	0.6852*	-0.0469	0.5591
	(1.6390)	(2.5140)	(1.4500)	-(0.1683)	
Philippinesa	0.4617**	0.3465	0.8650	-0.0591	0.5837
	(2.0300)	(0.0925)	(0.7064)	-(0.2274)	
Singapore	0.1567	0.6698	0.3115	-0.1815	0.5486
	(1.0520)	(0.9551)	(1.2820)	-(0.4723)	
Thailand	0.1735	5.6967**	2.3627**	-0.3447*	0.5303
	(1.0670)	(2.2560)	(2.1070)	-(1.3380)	

Note: Figures in parentheses are t-statistics.
[a] Allowance for serial correlation in model estimation.
** Significant at 95 percent level.
* Significant at 90 percent level.

TABLE A3. Coefficients in equation (4A) dictated by PP test

Country	(I / Y)	$(\dot{L} / L)$	$(\dot{X} / X)(X / Y)$	R-square
Category 1: All variables stationary except I/Y				
Hong Kong	0.8617*	0.6509*	0.1451*	0.3614
	(1.3670)	(1.6250)	(1.4880)	
Category 2: $\dot{Y} / Y$, $(\dot{X} / X)(X / Y)$ stationary; I / Y, $\dot{L} / L$ nonstationary				
Korea	1.1234**	-1.5088	0.8476**	0.8452
	(7.8030)	-(0.4901)	(5.8360)	
Malaysia	0.6007**	0.8219	0.2168*	0.6426
	(3.8130)	(0.2641)	(1.5550)	
Singapore	0.4086**	-0.6023	0.1504**	0.6507
	(2.6670)	-(0.6777)	(3.8600)	
Thailand	0.6287**	3.5142**	0.6693**	0.8337
	(6.7390)	(1.7750)	(5.9090)	
Category 3: All variables nonstationary except $(\dot{X} / X)(X / Y)$				
Philippines	0.5542**	-1.0971	0.5328**	0.4327
	(2.2070)	-(0.2881)	(2.5410)	

Note: Figures in parentheses are t-statistics.
** Significant at 95 percent level, * Significant at 90 percent level.

TABLE A4. Coefficients in equation (4A) dictated by KPSS test

Country	(I / Y)	$(\dot{L} / L)$	$(\dot{X} / X)(X / Y)$	R-square
Category 1: All variables stationary				
Philippines	0.4689**	0.7291	0.5936**	0.5823
	(2.0930)	(0.2106)	(2.8120)	
Category 2: All variables stationary except $(\dot{X} / X)(X / Y)$				
Singapore	-0.0541	-0.0319	0.0414	0.0453
	-(0.2764)	-(0.0585)	(0.7825)	
Category 3: $\dot{Y} / Y$, I / Y Sationary; $\dot{L} / L$, $(\dot{X} / X)(X / Y)$ nonstationary				
Hong Kong	0.5475*	0.0041	0.2229	0.3603
	(1.6450)	(0.0155)	(0.2554)	
Category 4: $\dot{Y} / Y$, $\dot{L} / L$ stationary; I / Y, $(\dot{X} / X)(X / Y)$ nonstationary				
Malaysia	0.6421**	0.7828	0.1716**	0.6525
	(4.6470)	(0.7788)	(1.8700)	
Thailand	0.5993**	-0.3379	0.3179**	0.6763
	(4.7980)	-(0.2457)	(2.4080)	
Category 5: $\dot{Y} / Y$, $(\dot{X} / X)(X / Y)$ stationary; I / Y, $\dot{L} / L$ nonstationary				
Korea	1.1234**	-1.5088	0.8476**	0.8452
	(7.8030)	-(0.4901)	(5.8360)	

Note: Figures in parentheses are t-statistics.
** Significant at 95 percent level, * Significant at 90 percent level.

TABLE A5. Coefficients in equation (8A) dictated by PP test

Country	(I / Y)	$(\dot{L} / L)$	$(\dot{X} / X)(X / Y)$		R-square
Category 1: All variables stationary except I / Y					
Hong Kong	0.5883*	0.3241	-0.3708**	0.6971**	0.7548
	(1.4480)	(1.2290)	-(3.1060)	(5.0660)	
Category 2: $\dot{Y} / Y$, $(\dot{X} / X)$, $\dot{X} / X$ stationary; I / Y, $\dot{L} / L$ nonstationary					
Korea	1.0992**	-2.2413	0.2694	0.1379**	0.8889
	(8.7190)	-(0.8289)	(1.0240)	(2.5090)	
Malaysia	0.5736**	0.2043	-0.0813	0.2175	0.6684
	(3.6230)	(0.0651)	-(0.2701)	(1.1150)	
Singapore	0.4127**	-0.5831	0.0806	0.1196	0.6603
	(2.6370)	-(0.6424)	(0.6855)	(0.6299)	
Thailand	0.6967**	3.0320*	0.2411	0.1295*	0.8557
	(6.9960)	(1.5750)	(0.8175)	(1.5620)	
Category 3: All variables nonstationary except, $(\dot{X} / X)(X / Y)$, $\dot{X} / X$					
Philippines	0.5193**	-2.2593	1.3479	-0.1758	0.4457
	(1.9810)	-(0.5229)	(0.9983)	-(0.6113)	

Note: Figures in parentheses are t-statistics.
** Significant at 95 percent level, * Significant at 90 percent level.

TABLE A6. Coefficients in equation (8A) dictated by KPSS test

Country	(I / Y)	$(\dot{L} / L)$	$(\dot{X} / X)(X / Y)$	$\dot{X} / X$	R-square
Category 1: All variables stationary					
Philippines[a]	0.4617**	0.3465	0.8650	-0.0591	0.5837
	(2.0300)	(0.0925)	(0.7064)	-(0.2274)	
Category 2: All variables stationary except $(\dot{X} / X)(X / Y)$					
Singapore	0.1981*	-0.0499	-0.0929**	0.4252**	0.6094
	(1.4030)	-(0.1378)	-(2.0200)	(4.4960)	
Category 3: $\dot{Y} / Y$, I/Y, $\dot{X} / X$ stationary; $(\dot{L} / L)$, $(\dot{X} / X)(X / Y)$ nonstationary					
Hong Kong[a]	0.4920**	0.0875	-0.0433	0.4414**	0.6375
	(1.4340)	(0.6606)	-(0.5299)	(4.0470)	
Category 4: $\dot{Y} / Y$, $\dot{L} / L$, $\dot{X} / X$ stationary; I/Y, $(\dot{X} / X)(X / Y)$ nonstationary					
Malaysia	0.5451**	1.1106	0.0170	0.1800*	0.6918
	(3.6260)	(1.1080)	(0.1216)	(1.4280)	
Thailand	0.6449**	0.8044	-0.3974**	0.2306**	0.8719
	(6.3390)	(1.1800)	-(2.1560)	(5.7430)	
Category 5: $\dot{Y} / Y$, $(\dot{X} / X)(X / Y)$, $\dot{X} / X$ stationary; I/Y, $\dot{L} / L$, nonstationary					
Korea	1.0992**	-2.2413	0.2694	0.1379**	0.8889
	(8.7190)	-(0.8289)	(1.0240)	(2.5090)	

Note: Figures in parentheses are t-statistics.
a Allowance for serial correlation in model estimation.
** Significant at 95 percent level, * Significant at 90 percent level.

TABLE A7. Structure of merchandise exports

Country	Percentage share of merchandise exports									
	Fuels minerals and metals		Other primary commodities		Machinery and transport equipment		Other manufactures		Textiles and clothing	
	1970	1991	1970	1991	1970	1991	1970	1991	1970	1991
Hong Kong	1	2	3	3	12	24	84	72	44	40
India	13	8	35	19	5	7	47	66	25	25
Korea	7	2	17	4	7	38	69	55	36	21
Malaysia	30	17	63	22	2	38	6	23	1	6
Philippines	23	9	70	20	0	14	8	57	1	9
Singapore	25	18	45	8	11	48	20	26	5	5
Thailand	15	2	77	32	0	22	8	45	1	17

Source: World Development Report 1993, World Bank, p. 268.