EXPORT AND ECONOMIC GROWTH: EVIDENCE FROM THE ASEAN COUNTRIES

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ABSTRACT

The relationship between exports and economic growth occupies a central place in the literature on economic development and thereby quite often draws the attention of government planners and policy makers. Though widely held idea suggests that exports growth contributes positively to economic growth, the recent empirical studies do not confirm such a straight forward conclusion even in the context of many High Performing, export oriented, Asian Economies (HPAEs). This paper examines such a relationship in the context of the ASEAN countries with the aid of improved cointegration and error correction models. The data from the period 1960-61 to 1995-96 are used. The Augmented Dickey-Fuller (ADF), Phillips-Perron (PP) and KPSS unit root tests show that the exports and income variables in the sample countries are non-stationary of order one. The multiple cointegration tests, by and large, confirm the long run relationship. The study suggests a feed-back causality between exports and economic growth.

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I INTRODUCTION

The relationship between export and economic growth occupies a central place in the literature on economic development and is a issue of major policy concern for government planners and policy makers. The considerable empirical research in the area have generally shown that developing countries with a favourable export growth record tend to enjoy higher rates of growth of national income. In particular, the rapid growth of the export oriented East Asian countries has helped produce the popular belief that export promotes growth. Several reasons have been proposed to explain why export-oriented policies lead to better growth performance than policies favouring import substitution. An increase in exports helps to finance the import of necessary capital goods which, in turn, gives rise to more rapid rate of capital formation and hence higher rate of economic growth. Furthermore, export growth leads to the exposure of countries to increased competition as well as to international new ideas, new methods of production and technology. This, may lead to improved scale economies, efficient resource re-allocation, improved factor productivities, expansion of domestic market etc. Thus, not surprisingly, in countries where growth rate has been sluggish, inward looking policies have been blamed as a major causative factor. These issues are well documented in McKinnan (1964); Chenery and Strout(1966); Keesing (1967); Michaely (1977); Bhagawati (1978); Heller and Porter (1978); Krueger (1978); Bagchi (1979); Bhagwati and Srinivasan (1979); Krueger (1980); Dutta-Choudhuri (1981); Tyler (1981); Balassa (1978, 1981, 1982, 1985); Feder (1982); Kavoussi(1984); Helpman and Krugman (1985); Grossman and Helpman (1991); Ito and Krueger (1995) and others[1].

The initial empirical works on the relationship between export growth and income growth were confined to measuring the correlation between them [see Emery (1967), Maizels (1968), Kravis (1970), Balassa (1978), Heller and Porter (1978)]. Since export is a component of aggregate output,

[1] The recent literature on the 'endogenous growth' theory also supplements the arguments that have already been put forward especially in the fonm of return to scale and the dynamic spill over effects of the export sector's growth.

one would expect a positive correlation between the two. But several empirical studies argued that exports contribute to GDP growth by a factor greater than the change in the volume of exports. Subsequent research adopted the production function framework, in which the exports variable was assumed to be an explanatory variable along with other variables for explaining changes in income [Tyler(1981), Feder (1982), Moschos (1989), Salvatore and Hatcher (1991)]. Recent research has been focussed on the causality tests using the Granger framework [see Jung and Marshall (1985), Darrat (1986), Chow (1987), Hsiao (1987), Bahmani-Oskooee et al. (1991), Dadaro(1993)]. However, a growing awareness of the problem of unit root(s) in major macro aggregates [Nelson and Plosser (1982)] along with the work of Engle and Granger (1987) on the development of cointegration techniques, have regenerated interest among the researchers examining the cause and effect relationship between exports and growth. Afxentious and Serletis (1989, 1991), Serletis (1992), Marin (1992), Bahmani-Oskooee and Alse (1993), Bahmani-Oskooee and Domac (1995) Thornton (1996), Ahmad and Harnhirun (1996), Doraisami (1996), Dutt and Ghosh (1996), Xu (1996,1998), Ahmad et al. (1997) and Al-Yousif (1997) examined the export-income nexus under this framework. However, this Engle-Granger two-stage procedure has subsequently been subjected to many criticisms. But, most studies examining the hypothesis have made use of this residual based cointegration technique.

Imbued by the well acknowledged economic success of the Asian NICs, countries in the region have pursued aggressive export promotion strategies. Specifically, countries such as Singapore, Indonesia, Malaysia, the Philippines and Thailand have shown significant improvement in growth rates of GDP as well as exports over the last three decades. Hence, a close examination of these ASEAN (Association of South East Asian Nations) economies in the context of the export-growth nexus is worth pursuing. Moreover, in two recent studies on these five ASEAN countries, Ahmad and Harnhirun, and Ahmad *et al*. have reported no relationship between exports and economic growth while a bi-directional relationship is reported by Bahmani-Oskooee and Alse, Dutt and Ghosh, and Doraisami in some of the countries. These conflicting results need to be addressed. The main purpose of this study is to examine the causal relationship between exports and economic growth in the ASEAN context and contrast them with previous findings with the help of up to date and robust statistical methods.

The rest of the paper is structured as follows. Section II describes the theoretical framework. Section III provides a brief review of some recent studies. The methodological issues are discussed in section IV. Section V presents empirical results followed by section VI with summery and concluding remarks.

II THE THEORETICAL FRAMEWORK

The importance of exports for economic growth has been extensively discussed in the development literature. The most popular way to link them is through the extended production function, which could be written as:

$$Y = Y(L, K, G, X) \tag{1}$$

Where Y is the real aggregate output, L and K are respectively labour and capital inputs, G is government expenditure and X is national exports[2].

By taking total differentiation, we get,

$$dY = Y_L\, dL + Y_K\, dK + Y_G\, dG + Y_X\, dX \tag{2}$$

With some further modifications, we can get the following growth equation.

$$\dot{Y} = \eta_L \dot{L} + \eta_K \dot{K} + \eta_G \dot{G} + \eta_X \dot{X} \tag{3}$$

where $\dot{Y}$, $\dot{L}$, $\dot{K}$, $\dot{G}$ and $\dot{X}$ are the respective growth rates of output, labour, capital, government expenditure and the exports; η_L, η_K, η_G, η_X represent the respective elasticities of output.

It is argued that exports create an externality in the overall production process in the economy. Following Feder (1982), the formal rationalization could be extended as follows. Assume

[2] One might incorporate imports as an additional argument in the production function, but unlike exports, imports are not produced domestically. Hence, we can ignore it and moreover imports are likely to be extremely dependent on Y. Similarly, terms of trade, as Prebisch-Singer thesis suggests, is an important factor in determining the growth rates. However, there is no readily apparent relationship between terms of trade changes and economic growth performance.

that the economy consists of two sectors, export sector (X) and non export sector (N), with the respective production functions:

$$X = H (L_X, K_X, G_X) \quad (4)$$

$$N = F (L_N, K_N, G_N, X) \quad (5)$$

where L_X, L_N are respective sector labour forces and K_X, K_N are respective sector capital stocks and G_X, G_N are respective sectoral government expenditure.

Differentiating the above two equations and some further calculation yields the following equation:

$$\dot{Y} = F_K \dot{K} + F_L \dot{L} + F_G \dot{G} + (\delta/(1+\delta) + F_X) \dot{X} \quad (6)$$

where δ is the inter-sectoral relative factor productivity differential and F_X is the externality generated by exports. If marginal productivities are equalized across sectors (δ=0), then equation (6) resembles equation (3).

III REVIEW OF RECENT STUDIES

It is helpful to review some of the recent studies dealing with exports and economic growth as a background to the present study. Jung and Marshall (1985) for the first time questioned the traditional way of examining the relationship that was based on simple correlation and regression analysis. They explored the direction of causation between exports and income using the Granger causality test, and found evidence in favour of export-led growth (ELG) hypothesis only in 4 out of 37 cases. The findings cast considerable doubt on the validity of the export promotion hypothesis which was supported by a number of previous works. Such doubt was further extended by Darrat (1986), Chow (1987), Hsiao (1987), Afxentiou and Serletis (1991), Bahmani-Oskooee et al.(1991) and Dodaro (1993).

Kovacic and Djukic (1991) examined the relationship in case of Yugoslavia (1952-1987). Though the study found an unidirectional causative relation from exports to aggregate output, in case

of manufacturing output the causal relationship is found to be the other way around. On the contrary, Oxley (1993) rejected the export led growth hypothesis in the context of Portugal spanning the period from 1865 to 1985. However, in case of Turkey (from 1923 to 1990), a stable long run relationship between exports and domestic production is empirically supported by Bahmani-Oskooee and Domac (1995). They also found bi-directional causality between the two variables with the help of error-correction modelling. In the Canadian context, while examining long term trends in economic development and its major determinants, Afxentiou and Serletis (1989) confirmed the long run contribution of exports (in addition to government expenditure, investment etc) to GNP. Different sub periods were considered in accordance with the historical development and it was observed that the role of export declined gradually, despite an increase in the export share.

The limitation of standard causality test is addresses at length by Bahmani-Oskooee and Alse (1993) while examining the relationship between export growth and economic growth in the context of a group of developing countries viz., Colombia, Greece, Korea, Malaysia, Pakistan, Philippines, Singapore, South Africa and Thailand. After generating quarterly data for the period 1973:I to 1988:IV the study established cointegration in almost all the sample countries except in Malaysia. Bidirectional relationship received strong empirical support in all these cases. Following the same spirit, Dutt and Ghosh(1996) examined the nexus with annual data for a large sample of 26 low, middle and high income countries including 4 NICs over the sample period from 1953 to 1991. This study rightly focused on the distinction between unit root and near unit root. It should be noted that the KPSS test was extremely helpful in drawing some important conclusions regarding the time series properties. The Engle-Granger two-stage cointegration tests fail to establish long run relationship for half of the sample countries. The ECMs for the countries with cointegrating variables reveal mixed evidence in terms of causal directions.

Recently, Ahmed and Harnhirun (1996) and Ahmed et al.(1997) investigated the cointegration and causality between exports and economic growth in the context of five member countries of the ASEAN viz., Indonesia, Malaysia, Philippines, Singapore and Thailand for the period from 1966 to 1988 and 1987 to 1993 respectively. They used DF and ADF unit root tests and found all the variables were nonstationary of order one except the income variable of Thailand. The two-stage cointegration procedure could not reveal any long run relationship and hence they used

standard Granger causality test for detecting a possible relationship. However, no causality is reported, though the study acknowledged the fact that the economic success of the Asian NICs has promoted all these countries in the region to pursue aggressive export promotion strategies and some of them have indeed achieved rapid economic growth. Doraisami (1996) examined the Malaysian economy over the period 1963-1993 and found that the related variables were cointegrated and caused each other. Yet in another study Ghatak *et. al.* (1997) examined the hypothesis with both aggregate (1955-1990) and disaggregate (1966-90) exports data viz., manufacturing, fuel and non-fuel primary products to see the separate effects of each of them on the real GDP and non-export real GDP. The study supports the long run relationship in general and export-led growth in particular. However, the growth was due to manufactured exports rather than traditional exports.

The foregoing review reveals that there is no general consensus regarding the relationship. This lack of unanimity could be attributed to the various methodologies used in examining the relationship and also to the different sample countries studied. It is evident that those studies made use of either DF/ ADF or PP unit root tests before they apply the usual Engle Gragner two-step cointegration procedure. Later it is understood that those unit root tests have relatively poor power in distinguishing a unit root and a near unit root time series. Hence, additional care needs to be taken. In addition, Xu (1996,98) also highlighted how causality test results were sensitive to lag length selection. Moreover, the residual based simple cointegration technique is also being subjected to many inbuilt limitations. For searching long run relationship, multiple cointegration techniques become an obvious choice.

IV METHODOLOGICAL ISSUES

(A) Unit Root Tests:

In order to examine any long run relationship, it becomes necessary to start with examining the time series properties of each underlying series by conducting unit root tests. This study will make use of augmented Dickey Fuller (ADF), Phillips-Perron (PP) and the KPSS tests. Since the detailed account of ADF and PP tests are widely available in the literature, it is avoided here.[3]

[3] For detailed discussion, refer to Dickey and Fuller (1979, 1981), Phillips (1987), Perron (1987) and Phillips and Perron (1988).

However, it is argued in the literature, that those two unit root tests are not very powerful against the alternative hypothesis of stationarity in distinguishing between unit root and near unit root process. Kwiatkowski, Phillips, Schmidt and Shin (1992) have highlighted this issue and proposed an alternative test (known as KPSS test). It solves the problem by providing a plausible representation of both stationary and nonstationary variables and leads naturally to a test of the hypothesis of stationarity. The KPSS procedure assumes that a particular time series may be decomposed into a deterministic trend, a random walk and a stationary error:

$$Y_t = \xi t + \eta_t + \nu_t \tag{7}$$

$$\eta_t = \eta_{t-1} + \varepsilon_t \tag{8}$$

where α is a constant and $\varepsilon_t \sim$ i.i.d.$(0, \lambda\sigma_\varepsilon^2)$ errors for some $\lambda > 0$ and ν_t is a stationary process with variance σ_ν^2. Here ν_t is I(0) and η_t is I(1) process. When $\lambda = 0$, Y_t is trend stationary. Thus, for the test procedure the null and the alternative hypothesis are as follows:

$$H_0 : \lambda = 0 \text{ and } H_1 : \lambda \neq 0$$

We can also consider the special case when $\xi = 0$, in which case under the null hypothesis Y_t is stationary around an initial value of η (say η_0), rather than around a trend. The test procedure is

$$LM = T^{-1} \sum_{i=1}^{T} S_t^2 / \hat{\sigma}_\nu^2 \tag{9}$$

based on a Lagrange multiplier score testing principle:

where S_t is the sum of the residuals from the regression of Y_t on an intercept and time trend and $\hat{\sigma}_\nu^2$ be the estimate of the error variance from the regression.

(B) Cointegration and Error Correction Models:

Johansen (1988, 1991), Johansen and Jeselius (1990,1992) proposed an alternative cointegration test procedure which uses maximum likelihood estimation (MLE) method in a vector auto regressive (VAR) set up. Any p-dimensional vector (X_t) which follows a VAR (k) process with a constant μ can always be written as:

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + ... + \Gamma_{k-1} \Delta X_{t-k+1} + \Pi X_{t-k} + \mu + \varepsilon_t \quad (10)$$

where Δ is a difference operator, X_t is a sequence of I(1) variables. $\varepsilon_1 ... \varepsilon_T$ are independent normal error terms with zero mean and covariance matrix Λ.

The matrix Π contains all the possible long run information among the variables. When Π has rank $0<r<p$, then there are r cointegrating vectors existing among the variables. The cointegrating rank, r, can be tested with two alternative procedures. The first is the maximum eigen value test which is given by:

$$\lambda_{max} = -T \ln(1-\lambda_{r+1}) \quad (11)$$

where the null is r=g cointegrating vectors against the alternative $r \leq g+1$. The second procedure is the trace test and is formulated as:

$$Trace = -T \sum_{i=r+1}^{n} \ln(1 - \lambda_i) \quad (12)$$

where the null being tested is r=g, against the more general alternative $r \leq n$.

Once cointegration is confirmed between X_t and Y_t, following Granger (1983), there should be valid error correction models (ECMs) which takes the following form:

$$\Delta X_t = \alpha + A(L)\, \Delta X_t + B(L)\, \Delta Y_t + \rho_1 \varepsilon_{t-1} + \xi_{t1} \quad (13)$$

$$\Delta Y_t = \beta + C(L)\, \Delta Y_t + D(L)\, \Delta X_t + \rho_2 \varepsilon_{t-1} + \xi_{t2} \quad (14)$$

where ε_{t-1} is the lagged error term obtained from the cointegrating regression and ρ_1 or $\rho_2 \neq 0$. In this model there are two possible sources of causation. For example, X_t can be caused by Y_t either through ε_{t-1} (which is a function of Y_{t-1}) if $\rho_1 \neq 0$ or through lagged Y_t if $B(L) \neq 0$. Similarly, Y_t is caused by X_t if either $\rho_2 \neq 0$ or $D(L) \neq 0$. The above ECMs reduce to standard Granger causality test equations if $\rho_1 = \rho_2 = 0$.

V EMPIRICAL EVIDENCE

The main objective of this study is to investigate the long run relationship between exports and economic growth. The required data of exports and income (proxied by GDP) for the 5 member of the ASEAN countries (viz., Malaysia, Singapore, Indonesia, Philippines and Thailand) have been collected from the International Financial Statictics CD-ROM. All the collected data have been converted into a common unit (US$) for the required consistency and comparability and then evaluated in real terms by deflating with the U.S. consumer price index (1990=100). The study refers to the period, by and large, from 1960-61 to 1995-96.[4]

The empirical investigation starts with looking into the growth profiles of exports and DGP for all the sample countries. The estimated growth rates are presented in Table 1. Growth rates at per capita level are also estimated. There is a broad similarity in the overall pattern in all these ASEAN countries. For example, the growth rates of exports are always higher than that of income. Singapore registered the highest growth rates of 8.69% and 9.56% in income and exports respectively over the entire sample period. The Philippines appears to be weaker in terms of growth rates. The other three countries are closely similar in terms of growth rates registering between 5.71% and 7.50% in income and 7.36% and 9.40% in exports. The break down of growth rates in different sub-periods will provide an understanding regarding their comparative performance in different time spans. Remarkable growth rates are achieved in the 70s. However, the 80s was experienced as a bad decade in terms of economic growth and export performance. Despite a lackluster performance especially in the second half of the 80s, spectacular growth rates are evident between 1990 and 1995 in all these five countries. From the above calculated growth profiles, it is

4 The use of annual data instead of quarterly data (which could have been generated as Bahmani-Oskooee and Alse(1993) did) is prefered for the reasons well described by Campbell and Perron(1991): "...It turns out that for tests of the unit root hypothesis versus stationary alternatives the power depends very little on the number of observations per se but is rather influenced in an important way by the span of the data. For a given number of observations, the power is largest when the span is longest. For a given span, additional observations obtained using data sampled more frequency lead only to a marginal increase in power, the increase becoming negligible as the sampling interval is decreased.... In most applications of interest, a data set containing fewer annual data over a long time period will lead to tests having higher power than if use was made of a data set containing more observations over a short time period. These results show that, whenever possible, tests of the unit root hypothesis should be performed using annual data over a long time period. This conclusion is reinforced by the fact that seasonal adjustment procedures often create a bias toward nonrejection of the unit root hypothesis..." (p. 153).

evident that, in all the sample countries, there are significant fluctuations in exports as well as in income with an overall significant positive trend. Moreover, the pattern of the above said fluctuations is also very similar among the countries. Hence, a comparative study of a long run relationship between exports and income becomes an attractive proposition.

To capture the time series properties of all these income and exports variables, the study uses ADF, PP and KPSS unit root tests. The purpose of using all these three unit root tests, as stated earlier, is to make sure that we reach to a proper conclusion especially in case of near unit root. The test statistics are reported in Table 2. The log values of the variables are considered here. It is observed that when the variables are measured at level, the ADF and PP test statistics are far away to reject the null hypothesis of non stationarity except in case of per capita DGP in the Philippines where the estimated test statistics, -3.129 and -2.785, are significant at less than 10% level. Moreover, these evidences are completely supported by the KPSS test where the null hypothesis of stationarity is tested against the alternative of non stationarity. For KPSS, two different lag trancations (l = 1 and l=4) are considered. The results are very much in accord. In all the cases (except in per capita GDP in the Philippines), estimated results are able to reject the null hypothesis. Hence, except for that particular series, all are non stationary. However, to estimate the exact order, the same procedure is carried out with the first differenced values of the variables. In case of ADF and PP tests all are statistically significant at less than 5% level, but the KPSS test statistics are unable to reject the corresponding null. Precisely, the rejection of ADF and PP and non-rejection of KPSS is a clear evidence of first order non stationary. Hence, it can be concluded that all the variables are I(1) except for per capita GDP in the Philippines which is I(0).

The next stage of this empirical investigation involves in searching for a common stochastic trend between exports and income variables. For this, Johansen and Jeselius maximum likelihood method for estimating cointegrating vectors is employed which calls for an estimation of a proper VAR model. Cheung and Lai (1993), by using Monte Carlo methods, examined the small sample properties of Johansen's λ_{max} and trace statistics. It was strongly suggested that proper lag lengths be specified with the help of information criterion such as Akaike's (1974) AIC or Schwarz's (1978) BIC as test results are very much sensitive to lag lengths of the estimated VAR models. In this study both the criterion are considered and the lag lengths of 1, 1, 2, 2, 1 are determined for Malaysia,

Singapore, Indonesia, the Philippines and Thailand respectively.

The calculated values of λ_{max} and λ_{trace} for the various possible numbers of the cointegrating vectors for both the pair of variables, are presented in Table 3. The respective critical values obtained from Osterwald-Lenum(1992) are also reported in the same table. If the estimated value is greater than the critical value, the null hypothesis is rejected. In Malaysia, the presence of no single cointegrating vector between per capita exports and GDP is supported. For the other set of variables, one cointegrating vector is detected by Trace test at 2.5% level of significance, but the evidence was not supported by λ_{max} test even at 5% level. However, in the case of Singapore, Indonesia and Thailand the estimated results reject the null of no cointegration in both the variants. The rejection of no cointegration implies that there is a long run relationship between exports and economic growth. These statistical evidences are supported by both test procedures. In the case of the Philippines, the cointegration between per capita income and exports was not checked as they did not satisfy the necessary condition. However, for the other pair the presence of common trend is strongly supported by both the tests.

Although long run relationship between exports and income are established, one also needs to examine whether the economic growth is export-led or the export performances are basically growth driven. The ECMs are estimated under VAR setup with the lagged error term obtained from the cointegration regression. The cause and effect relationship is established by examining both F-statistic (testing the null that the sum of lagged dependent variable = 0) and the t-statistic of the lagged error term. All the estimated results are reported in Table 4. Interestingly, in all the sample countries, bi-directional causality is quite clear. This feed back relationship is an indication of simultaneous relationship and hence both the mechanisms seem to be effective.

VI SUMMARY AND CONCLUDING REMARKS

Though widely held idea suggests that growth of exports stimulates economic growth, many recent empirical studies do not support such a straight forward relationship. Therefore, the basic purpose of this study is to examine the empirical validity of the export led growth hypothesis in the context of the ASEAN economies, namely, Malaysia, Singapore, Indonesia, the Philippines and

Thailand. From their growth profiles, it is observed that all the sample countries enjoyed a significant growth in both income and exports during the period from 1960-61 to 1995-96. In such a situation an empirical investigation of the export promotion hypothesis has immense policy importance.

The empirical evidence shows that all the underlying variables are non stationary of order one except the per capita income of the Philippines. The long run relationship between exports and income are evident in all the sample countries except in Malaysia. Hence, ECMs are estimated for those four countries to draw causal reference between the variables. However, for Malaysia, the Granger causality test is estimated. The present study overwhelmingly supports a feed-back relationship between exports and economic growth.

Such a relationship is also discussed theoretically by many. For example, Bhagwati (1988) highlights this type of relationship where increased trade generates more income (GDP) and more income facilitates more trade - a kind of 'virtuous circle'. This kind of economic scenario is also being noted in 'North-South' trade models [Grossman and Helpman (1991)]. However, the present study contradicts the evidences extended by Ahmed and Harnhirn (1996) and Ahmed at al (1997) in the context of all these five ASEAN economies. It should be noted that proper care needs to be taken to determine whether the variables share common stochastic trend. If they do so, a simple causality test may miss one potential source of causal interaction.

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Table 1
Growth Rates

Country	Variables	Total Period	1970-1979	1980-1989	1990-1995/6
	GDP	5.71	11.33	0.03	10.99
Malaysia	PGDP	3.04	8.55	-2.59	8.04
(1960-'95)	EXPO	7.36	14.32	3.16	15.11
	PEXPO	4.69	11.54	0.54	12.16
	GDP	8.69	10.22	4.73	13.00
Singapore	PGDP	7.18	8.67	3.76	11.06
(1960-1996)	EXPO	9.56	17.48	4.19	12.77
	PEXPO	8.05	15.93	3.21	10.83
	GDP	7.50	15.47	-2.89	8.25
Indonesia	PGDP	5.47	13.59	-5.04	8.68
(1966-1995)	EXPO	8.49	24.11	-6.66	8.10
	PEXPO	6.46	22.23	-8.80	6.53
	GDP	2.30	9.19	-2.84	7.37
The Philippines	PGDP	-0.37	6.49	-5.27	4.76
(1960-1995)	EXPO	4.29	9.41	-1.20	12.00
	PEXPO	1.62	6.71	-3.63	9.38
	GDP	6.42	8.84	3.84	10.32
Thailand	PGDP	4.18	6.19	1.99	9.08
(1963-1995)	EXPO	9.40	15.29	7.74	14.09
	PEXPO	7.16	12.64	5.89	12.86

Note: GDP = Gross Domestic Product; EXPO = Exports; PGDP = Per capita GDP;
PEXPO = Per capita Exports. All the variables are measured at constant prices (1990=100)

Table 2
Unit Root Tests

Country: Malaysia

Variables	In level (Log values)				First difference (log values)			
	ADF (k)	PP	KPSS		ADF (k)	PP	KPSS	
			l=1	l=4			l=1	l=4
GDP	-0.275 (3)	0.059	1.795	0.802	-4.797 (1)	-4.026	0.086	0.099
PGDP	-0.436 (2)	-0.348	1.603	0.731	-4.849 (1)	-4.05	0.084	0.098
EXPO	1.091 (2)	1.241	1.795	0.803	-5.275 (1)	-5.126	0.241	0.289
PEXPO	0.816 (2)	0.828	1.684	0.767	-5.339 (1)	-5.109	0.233	0.286
Country: Singapore								
GDP	0.185 (1)	0.343	1.878	0.836	-3.600 (1)	-3.288	0.112	0.1
PGDP	0.184 (1)	0.503	1.87	0.832	-3.809 (1)	-3.342	0.127	0.118
EXPO	0.039 (1)	0.536	1.864	0.818	-4.269 (1)	-4.224	0.188	0.181
PEXPO	-0.037 (1)	0.458	1.836	0.804	-4.285 (1)	-4.219	0.218	0.206
Country: Indonesia								
GDP	-1.538 (1)	-5.404	1.206	0.61	-5.344 (0)	-5.816	0.544	0.456
PGDP	-1.753 (1)	-5.668	1.021	0.537	-5.331 (0)	-5.751	0.527	0.444
EXPO	-2.165 (1)	-1.709	1.128	0.533	-3.438 (0)	-3.494	0.292	0.207
PEXPO	-2.198 (1)	-1.707	0.965	0.641	-3.493 (0)	-3.564	0.279	0.195
Country: The Philippines								
GDP	-0.704 (1)	-0.733	1.338	0.641	-5.479 (0)	-5.478	0.109	0.117
PGDP	-3.129 (1)	-2.785	0.213	0.133	-5.451 (0)	-5.446	0.118	0.127
EXPO	-0.231 (3)	-0.056	1.629	0.756	-2.947 (3)	-5.448	0.092	0.115
PEXPO	-1.133 (3)	-1.103	0.952	0.498	-2.973 (3)	-5.413	0.098	0.123
Country: Thailand								
GDP	0.079 (1)	0.042	1.652	0.761	-3.693 (0)	-3.632	0.135	0.118

PGDP	0.306 (1)	0.556	1.566	0.738	-3.644 (0)	-3.613	0.199	0.168
EXPO	0.421 (2)	0.486	1.645	0.745	-4.471 (0)	-4.542	0.15	0.129
PEXPO	0.386 (2)	0.648	1.576	0.722	-4.318 (0)	-4.402	0.211	0.174

Table 3
Cointegration Test Results

Country: Malaysia

Test Statistic	Null Hypothesis	Alternative Hypothesis	GDP & EXPO	PGDP & PEXPO	95% Critical Value	97.5% Critical Value
λ-Trace	r = 0	r > 0	21.48	10.82	17.95	20.08
λ-Trace	r □ 1	r > 1	8.35	4.07	8.18	9.72
λ-Max	r = 0	r = 1	13.13	6.75	14.9	17.07
λ-Max	r = 1	r = 2	8.53	4.07	8.18	9.72

Country: Singapore

λ-Trace	r = 0	r > 0	48.61	40.57	17.95	20.08
λ-Trace	r □ 1	r > 1	9.9	9.67	8.18	9.72
λ-Max	r = 0	r = 1	38.72	30.89	14.9	17.07
λ-Max	r = 1	r = 2	9.9	9.67	8.18	9.72

Country: Indonesia

λ-Trace	r = 0	r > 0	28.2	39.06	17.95	20.08
λ-Trace	r □ 1	r > 1	8.57	8.36	8.18	9.72
λ-Max	r = 0	r = 1	19.62	30.69	14.9	17.07
λ-Max	r = 1	r = 2	8.57	8.36	8.18	9.72

Country: The Philippines

λ-Trace	r = 0	r > 0	62.15	--	17.95	20.08
λ-Trace	r □ 1	r > 1	3.67	--	8.18	9.72
λ-Max	r = 0	r = 1	22.48	--	14.9	17.07
λ-Max	r = 1	r = 2	3.67	--	8.18	9.72

Country: Thailand

λ-Trace	r = 0	r > 0	37.62	25.38	17.95	20.08
λ-Trace	r □ 1	r > 1	5.48	4.48	8.18	9.72
λ-Max	r = 0	r = 1	32.14	20.9	14.9	17.07

λ-Max	r = 1	r = 2	5.48	4.48	8.18	9.72

Table 4
Error Correction and Causality

Countries	Dept. Variable	F-statistic	(Sig. Level)	t-statistic	(Sig. Level)	Inference
	DGDP	6.5976	(0.0152)	--	--	
Malaysia	DEXPO	3.7900	(0.0607)	--	--	Feed-back
	DPGDP	5.7725	(0.0225)	--	--	
	DPEXPO	3.5209	(0.0700)	--	--	
	DGDP	0.0391	(0.8445)	1.9337	(0.062?)	
Singapore	DEXPO	0.7108	(0.4056)	2.8035	(0.0086)	Feed-back
	DPGDP	0.0131	(0.9097)	1.8972	(0.0672)	
	DPEXPO	0.6014	(0.4439)	2.7962	(0.0088)	
	DGDP	3.2551	(0.0587)	0.2971	(0.7693)	
Indonesia	DEXPO	0.8367	(0.4471)	2.2665	(0.0341)	Feed-back
	DPGDP	2.6825	(0.0917)	0.1232	(0.9031)	
	DPEXPO	1.0081	(0.3819)	2.2822	(0.0330)	
	DGDP	1.2627	(0.2991)	3.9400	(0.0005)	
The Philippines	DEXPO	3.5436	(0.0429)	2.2488	(0.0329)	Feed-back
	DPGDP	--	--	--	--	
	DPEXPO	--	--	--	--	
	DGDP	2.3642	(0.0924)	1.1739	(0.2519)	
Thailand	DEXPO	3.6854	(0.0402)	1.9346	(0.0649)	Feed-back
	DPGDP	2.4960	(0.1035)	1.0350	(0.3109)	
	DPEXPO	3.8915	(0.0344)	1.6925	(0.1034)	