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Export Instability, Investment and Economic Growth in Asian Countries: A Time Series Analysis

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ABSTRACT

In this study, we look at the relationship between export stability, investment and economic growth in nine Asian countries using time series data. The few previous time series studies in this area have not paid any attention to stationarity and cointegration issues. We find that in most cases, the variables are non-stationary in their levels and not cointegrated. These results raise serious doubts about the results of these studies. The results are not uniform across countries casting doubts about the validity of the numerous cross-section studies. For Japan, Malaysia, Philippines and Sri Lanka, we find a negative relationship between export instability and economic growth. For (South) Korea, Myanmar, Pakistan and Thailand, we find a positive relationship between the two variables. For India, we get mixed results. In most cases, economic growth is found to be positively associated with domestic investment.

JEL Categories: C22, F49, O11

Keywords: export instability, growth, stationarity, cointegration.

I. Introduction

A vast number of studies have explored the relationship between export instability and economic growth – a majority of them using data from developing countries. Almost all previous studies rely on cross section data. One general problem with cross section data is that the studies using cross section data estimate average relationships and does not provide much information on the specific countries. Only a handful of studies, such as Love[1] and Wilson[2] use time series data. But, all the available time series studies, including the recent ones, do not grapple with the issues of non-stationarity of data and may have estimated spurious regressions. As we will see later, most of the variables used in this study are non-stationary in their levels. The present study is the first attempt at using time series data exploiting the tools from recent research in time series econometrics. Specifically, it looks at the relationship between export instability, investment, population and economic growth in nine Asian countries for which data for a reasonable length of time is available. These countries are India, Japan, Malaysia, Myanmar, Pakistan, Philippines, (South) Korea, Sri Lanka and Thailand. The sample of countries thus includes a developed country (Japan) and eight developing countries. The purpose for including Japan is to compare the results from a developed country to that of developed countries. Japan has followed a successful policy of export during the post-War period and it will be interesting to see how the results

for Japan is different from that of other countries. The second distinguishing feature of this study is that it uses data for a longer period than any other previous studies. In studying the relationship between these variables, we will deal with the issues of nonstationarity and cointegration. Finally, the third distinguishing feature of the paper is that we use export data for both goods and services rather than for goods only. As Wilson correctly points out, "There is no inherent reason why export instability should be restricted to merchandise export earnings rather than exports of goods and services…..". (p. 400).

As previous studies have pointed out, it is important to study the effects of export instability. If it is found that export instability does have a negative impact on economic growth, the government has to follow a policy whereby such fluctuations can be smoothed out. In some cases, the diversification of export portfolio and liberalization of the flow of financial capital in and out of the country can be of help. Many Asian countries have moved towards that in recent years.

II. Previous Studies

In this section, we review a number of previous studies. These studies find all three possible kinds of results: some studies find a positive relationship between export instability and economic growth, some other studies find a negative relationship between export instability and economic growth while

some other studies find no relationship between export instability and economic growth.

Authors who find a positive relationship between the two variables opine that if we have assume risk-averse behavior, uncertainty about export earnings can lead to a reduction in consumption and in turn, an increase in saving and investment and thus economic growth. These studies have included McBean and Knudsen and Parnes[3] . Knudsen and Parnes use a transitory index to measure instability and find that marginal propensity to consume out of permanent income is negatively related to export instability using cross section (average data for 1958-68) data for 28 developing countries. Yotopoulos and Nugent[4] use two measures of export instability – (a) the squared deviations from an exponential trend index and (b) an index in the spirit of permanent income hypothesis – a transitory index. The cross section results from data for 38 developing countries find that when the transitory measure is used, the effect of uncertainty is to reduce the marginal propensity to consume out of permanent income, increase saving and higher growth. The conventional measure of export instability, on the other hand, leads to the opposite conclusion -- that export instability has a negative impact on economic growth. Yotopoulos and Nugent discard the results they get with the traditional measure and go with the results from the more unconventional measure.

Other earlier studies such as Glezakos, Voivodas and Ozler and Harrigan[5] regress GDP growth rates on an export instability index using cross section data. All three studies find a negative correlation between export instability and economic growth. Gyimah-Brempong[6] uses average data for 1960-86 for 34 sub-Saharan African countries. His cross section study using the production function framework finds that no matter how export instability is measured, export instability has a negative effect on economic growth. He uses three different measures of export instability, namely, (a) the coefficient of variation of export earnings, (b) the mean of the absolute difference between actual export earnings and its trend value, normalized around the trend value of export earnings and (c) average of the squares of the ratio of actual export earnings to trend earnings.

Moran[7] uses cross-section data for 30 countries (18 of them in Latin America) to study the relationship between export fluctuations and economic growth. Data used are for a single year, 1974-75. Using several measures of export instability, he finds that the results are very sensitive to the period under consideration and no general conclusions can be reached.

Mullor-Sebastian[8] uses a different approach to studying the relationship between export instability and economic growth. She argues that studies, which lump exports of all goods, are misleading because export instability of a given product is influenced by the characteristics of the individual product and the degree of development of the exporting

country. Thus, export instability of a particular product will vary depending upon whether the country is a developed country or a developing country. Thus, she confines her study to synthetic fiber (a growth product) and natural fiber (a mature product) exports. She finds that export instability of synthetic fiber is higher for the LDCs than for the DCs. However, there are no significant differences between the LDCs when it comes to the natural fiber.

Love is one of the few studies which looks at the causal relationship between measures of export instability and of income instability. His time series analysis uses data for developing countries which rely on primary goods export which are subject to more fluctuations than the industrial goods export. The measure of instability that Love uses is absolute deviations from a five-year moving average. His results show that for all 20 countries in his sample, export instability causes income instability. However, whereas Love does not test for stationarity of the variables before estimation, we do so.

The results from previous studies on export instability and economic growth are far from conclusive. As Mullor-Sebastian remarks, "Three decades of research on export instability have resulted in a consensus on only one of the main areas of study, namely, that export instability is higher for LDCs than for developed countries (DCs). Consensus has not been achieved on the other areas," (p. 217)

III. The Present Study

In this study, we study export instability in a neoclassical production function in the tradition of Feder[9]. A number of studies have since followed Feder in studying the relationship between exports and economic growth in which GDP of a country is made a function of the growth rates of different inputs such as labor, capital and exports. We augment this production function by adding a measure of export instability. We follow Love and use the absolute value of the deviations of actual exports from a five-year moving average of exports[10]. The estimation of this production function is preceded by extensive stationarity tests so that we do not estimate spurious regressions.

Data used for this study come from the *International Financial Statistics*[11] of the International Monetary Fund. All data are expressed in real terms. Annual data are used as follows: India (1950-94), Japan (1955-96), (South) Korea (1953-97), Malaysia (1955-97), Myanmar (1950-97), Pakistan (1960-97), Philippines (1948-97), Sri Lanka (1950-97) and Thailand (1951-97). The values of GDP, exports and investment are in the national currency of the countries. The following variables are used in the study: LRGDP (log of real GDP), LREXP (log of real exports of goods and services), LRDMREX (log of the absolute value of the deviations of export from its five-year moving average – this is used as the measure of export

instability), LRGFCF (log of real gross fixed capital formation – a measure of investment) and LPOP (log of population) . Since all variables are in log form, the first differences give us the growth rates of these variables – these are denoted by GLRGDP, GLREXP, GLRDMREX, GLRGFCF and GLPOP.

We use the Augmented Dickey-Fuller[12] for stationarity. This test estimates the following equation:

$$\Delta y_t = c_1 + \omega y_{t-1} + c_2\, t + \sum_{i=1}^{r} d_i\, \Delta y_{t-i} + \nu_t \qquad (1)$$

In (1), $\{y_t\}$ is the relevant time series, Δ is a first-difference operator, t is a linear trend and ν_t is the error term. The above equation can also be estimated without including a trend term (by deleting the term c_2 t in the above equation). The null hypothesis of the existence of a unit root is H_0: $\omega = 0$. The results of the ADF tests for India, Japan, (South) Korea, Malaysia, Myanmar, Pakistan, Philippines, Sri Lanka and Thailand are in tables 1 to 9 respectively. The results indicate that for India, Korea and Sri Lanka, all the variables are non-stationary in their levels but stationary in their first differences. This means that we can proceed with the Johansen cointegration tests for these countries. For Japan, the first difference of LPOP (which is GLPOP) is non-stationary. All other variables are non-stationary in their levels but stationary in their first differences. Thus, we

can still perform the cointegration tests by excluding the population variable. For Malaysia, all variables except LRGFCF are non-stationary in their levels but stationary in their first differences. LRGFCF is stationary in its level. Again, we can also perform the cointegration tests even where LRGFCF can be included in the cointegration tests as an exogenous variable. Similarly, for Pakistan, both LRGFCF and LREXP are stationary in their level forms and can be included in the cointegration tests as exogenous variables. All other variables for Pakistan are non-stationary in their levels but stationary in their first differences. For Philippines and Thailand, LRGDP (the right hand side variable) is stationary and thus, the cointegration tests are not permissible. Similarly, for Myanmar, the variable measuring the export instability (LRDMREX) is stationary in its level form and thus, we also do not perform the cointegration tests in that case. To summarize, the unit root tests indicate that we can perform cointegration tests in one form or another for the following countries: India, Japan, Korea, Malaysia, Pakistan and Sri Lanka.

[Tables 1-9, about here]

We use the generalized Johansen[13] framework of cointegration tests (see Pesaran and Smith[14] for details of the tests). The general form of the vector error correction model is given by:

$$\Delta y_t = a_{oy} + a_{1y}\, t - \Pi_y\, z_{t-1} + \sum_{i=1}^{p-1} \Gamma_{iy} \Delta z_{t-i} + \Psi_y w_t + e_t, \quad t=1,2,.....n \qquad (2)$$

where $z_t = (y'_t, x_t')'$, y_t is an m_y x 1 vector of endogenous variables I(1) variables, x_t is an m_x x 1 vector of exogenous I(1) variables

$$\Delta x_t = a_{ox} + \sum_{i=1}^{p-1} \Gamma_{ix}\Delta z_{t-i} + \Psi_x w_t + v_t \qquad (3)$$

and w_t is a q x 1 vector of exogenous/deterministic variables I(0) variables. In this model, the disturbance vectors of e_t and w_t satisfy the assumptions (a) and (b) below:

(a) $u_t = (e_t\ w_t)' \sim$ iid $(0, \Sigma)$ (4)

where Σ is a symmetric positive-definite matrix.

(b) u_t (the disturbances in the combined model) are distributed independently of w_t i.e., $E(u_t | w_t) = 0$ (5)

a_{0y} and a_{1y} (the intercept and the trend coefficients respectively) are m_y x 1 vectors; Π_y is the long run multiplier matrix of order $m_y + m$, where $m=m_x +m_y$; $\Gamma_{1y}, \Gamma_{2y},\ldots\ldots\Gamma_{p-1,y}$ coefficient matrices capture the short run dynamic effects and are of order m_y x m; and Ψ_y is the my x m matrix of coefficients on the I(0) exogenous variables.

The results of the trace tests for India, Japan (we exclude LPOP in the tests), Korea, Malaysia (we exclude LRGFCF in the tests), Pakistan (we exclude LREXP and LRGFCF in the tests) and Sri Lanka are given in table 10. The Schwarz Bayesian Criterion (SBC) was used to determine the number of lags for the cointegration tests. In each case, the lag turned out to be one. Following Reimers[15], we use the finite sample correction, i.e.,

we multiply it by (T-pk)/T where T is the sample size, p is the number of variables and k is the lag order in the vector autoregressive system. The trace tests indicate two cointegrating vectors for India, two cointegrating vectors for Japan, one cointegrating vector for Korea and two cointegrating vectors for Sri Lanka. For Malaysia and Pakistan, the trace tests do not show any cointegrating vector. The coefficients of these vectors are given in table 11[16]. For India, the first vector shows that LRGDP is positively related to all the variables including the export instability variable, LRDMREX. The second vector shows a negative relationship between LRGDP and LRDMREX (but it also shows a negative relationship between LRGDP and LRGFCF as well). For Japan, two vectors show that LRGDP is negatively associated with LRDMREX. For Korea, the vector shows a positive relationship between LRGDP and LRDMREX. For Sri Lanka, both the vectors show a negative relationship between LRGDP and LRDMREX. For other countries, the regression results (with GLRGDP as the dependent variable) are in table 12. A variety of methods are adopted in these cases depending upon the unit root properties and the error structures. For Philippines, the model is estimated with the second differences of the variables (whereas for other countries, the model is estimated in the first differences of the variables). The results show that the growth rates of LRGDP and LRDMREX are negatively related for Malaysia and Philippines. However, the coefficient on the growth rate of

LRDMREX is not significant in either case. For Myanmar, Pakistan and Thailand, the coefficient on the growth rate of LRDMREX is positive signifying that the growth rate of the instability of real exports is positively related to the growth of GDP. However, the coefficients are not significant in all three cases. The difference in the results for Japan and Korea is contrary to expectations because in many ways, Korea's export strategies were heavily influenced by Japan. GLREXP is positively related to GLRGDP for all countries except Philippines. The only general story from these regressions is that the growth rate of investment (GLRGFCF) is positively related to the growth rate of GDP. In all cases, the coefficient is significant at least at the 5% level.

[Tables 10-12, about here]

IV. Conclusion

This paper is a first attempt at studying the effects of export instability on economic growth using recent time series econometric techniques. In this paper, we use time series data to study the relationship between export instability and economic growth for the following nine Asian countries: India, Japan, (South) Korea, Malaysia, Myanmar, Pakistan, Philippines, Sri Lanka and Thailand. We get a variety of results between export instability and economic growth. For India, the results are mixed. For Japan, Malaysia, Malaysia, Philippines and Sri Lanka, the evidence suggests a negative relationship between export instability and economic growth. For

Korea, Myanmar, Pakistan and Thailand, the results show a positive relationship between export instability. These results show that cross-section studies which lump all countries together may lead to misleading conclusions because results differ among the countries. In most cases, the investment variable is found to be positively associated with economic growth.

Notes

1. James Love, "Export Instability and the Domestic Economy: Questions of Causality," *Journal of Development Studies* 28 (July, 1992): 735-42.

2. Peter Wilson, "Export Earnings Instability of Singapore, 1957-1988: A Time Series Analysis," *Journal of Asian Economics* 5 (Fall, 1994): 399-412.

3. Alasdair I. MacBean, (1966) *Export Instability and Economic Development* (Cambridge, Mass: Harvard University Press, 1966); O. Knudsen and A. Parnes (1975) *Trade Instability and Economic Development* (London: D. C. Heath, 1975).

4. Pan Yotopoulos and Jeffrey B. Nugent, *Economics of Development* (New York: Harper and Row, 1976).

5. Constantine Glezakos "Export Instability and Economic Growth: A Statistical Verification," *Economic Development and Cultural Change* 21(July, 1973): 670-78; Sule Ozler James Harrigan (1988) "Export Instability and Growth," Department of Economics Working Paper No. 486 (University of California, Los Angeles, 1988); Constantine S. Voivodas (1974) "The Effect of Foreign Exchange Instability on Economic Growth," *Review of Economics and Statistics* 56 (August, 1974): 410-12.

6. Kwabena Gyimah-Brempong, "Export Instability and Economic Growth in Sub-Saharan Africa," *Economic-Development-and-Cultural-Change* 39 (July, 1991): 815-28.

7. Cristian Moran "Export Fluctuations and Economic Growth: An Empirical Analysis," *Journal of Development Economics* 12 (February-April, 1983): 195-18.

8. Alicia Mullor-Sebastian "A New Approach to the Relationship between Export Instability and Economic Development," *Economic Development and Cultural Change* 36 (January, 1988): 217-36.

9. Gershon Feder (1983) "On Exports and Economic Growth," *Journal of Development Economics* 12(February/April, 1983): 59-73.

10. It must be noted that while cross section measures of export instability are easy to construct, it is much more difficult to have time series measures of export instability. Cross section studies typically use average data for each country and thus for each country, only one number has to be constructed for export instability. In contrast, time series studies have to have a measure for each year.

11. International Monetary Fund *International Financial Statistics*, CD-ROM version, November, 1998.

12. David A. Dickey and Wayne A. Fuller "Distributions of the Estimators for Autoregressive Time Series with a Unit Root", *Journal of the American Statistical Association* 74(Part I, 1979), 427-31; David A. Dickey and

Wayne A. Fuller "Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root", *Econometrica* 49(June, 1981): 1057-72.

13. Johansen, Soren "Estimation and Hypothesis Testing of Cointegrating Vectors in Gaussian Vector Autoregressive Models," *Econometrica* 59 (November, 1991): 1551-80.

14. M. Hashem Pesaran and Ron Smith "Structural Analysis of Cointegrating VARs," *Journal of Economic Surveys* 12 (December, 1998): 471-506.

15. H. E. Reimers, "Comparisons of Tests for Multivariate Cointegration," *Statistical Papers* 33 (1992): 335-59.

16. One alternative is to use Phillips-Hansen fully modified OLS for the countries for which we find evidence of cointegration. See Peter C. B. Phillips. B and Bruce E. Hansen, "Statistical Inference in Instrumental Variables Regression with I(1) Processes," *Review of Economic Studies* 57 (January, 1990): 99-125. However, Phillips-Hansen fully modified OLS procedure requires that the right hand side variables are not cointegrated among themselves and that the number of cointegrating vectors is equal to one. However, in our case, in all cases, the right hand side variables are found to be cointegrated among themselves. Moreover, in a number of cases, the number of cointegrating vectors is greater than one in three cases: India, Japan and Sri Lanka.

TABLE 1
UNIT ROOT TESTS FOR INDIA

	Level		First Difference	
	Test Statistic	Critical Value	Test Statistic	Critical Value
LRGDP	-3.0338(0)	-3.5247	-9.6437(0)[(a)]	-2.9378
LREXP	-1.4064(0)	-3.5247	-6.6051(0)	-3.5279
LRDMREX	-2.1261(0)	-3.5386	-6.5122(0)[(a)]	=2.9472
LRGFCF	-2.6339(2)	-3.5247	-6.9522(1)[(a)]	-2.9378
LPOP	-1.6082(1)	-3.5247	-4.6447(0) [(a)]	-2.9378

[(a)]Indicates no trend.

Note: Lags were determined using Schwarz Bayesian Criterion (SBC) and are given in parentheses. The critical values are for 5% level.

TABLE 2
UNIT ROOT TESTS FOR JAPAN

	Level		First Difference	
	Test Statistic	Critical Value	Test Statistic	Critical Value
LRGDP	-2.4800(1)	-3.5348	-4.1436(0)	-3.5386
LREXP	-1.0290(0)	-3.5348	-5.5437(0)	-3.5386
LRDMREX	-1.6383(3)	-3.5514	-9.1130(2)[(a)]	-2.9558
LRGFCF	-3.2366(1)	-3.5348	-4.0327(0)	-3.5386
LPOP	-2.4288(1)	-3.5348	-2.0926(0)	-3.5386

[(a)]Indicates no trend.

Note: Lags were determined using Schwarz Bayesian Criterion (SBC) and are given in parentheses. The critical values are for 5% level.

TABLE 3
UNIT ROOT TESTS FOR SOUTH KOREA

	Level		First Difference	
	Test Statistic	Critical Value	Test Statistic	Critical Value
LRGDP	-2.9484(0)	-3.5247	-5.0168(0)[(a)]	-2.9378
LREXP	-1.8714(0)	-3.5247	-4.7894(0)[(a)]	-2.9378
LRDMREX	-1.8014(0)	-2.9446	-6.5549(0)[(a)]	-2.9472
LRGFCF	-2.3532(1)	-3.5247	-5.0983(1)[(a)]	-2.9378
LPOP	-2.5673(0)	-3.5247	-4.8158(0)	-3.5279

[(a)]Indicates no trend.

Note: Lags were determined using Schwarz Bayesian Criterion (SBC) and are given in parentheses. The critical values are for 5% level.

TABLE 4
UNIT ROOT TESTS FOR MALAYSIA

	Level		First Difference	
	Test Statistic	Critical Value	Test Statistic	Critical Value
LRGDP	-2.5594(0)	-.35313	-6.3531(1)	-3.5348
LREXP	-1.9651(0)	-3.5313	-6.8987(1)[(a)]	-2.9422
LRDMREX	-0.1564(0)	-2.9499	-5.5133(0)[(a)]	-2.9528
LRGFCF	-3.7229(1)	-3.5313	-3.5454(0)[(a)]	-2.9422
LPOP	-2.8099(0)	-3.5313	-7.8816(0)[(a)]	-2.9422

[(a)]Indicates no trend.

Note: Lags were determined using Schwarz Bayesian Criterion (SBC) and are given in parentheses. The critical values are for 5% level.

Table 5
UNIT ROOT TESTS FOR MYANMAR

	Level		First Difference	
	Test Statistic	Critical Value	Test Statistic	Critical Value
LRGDP	-2.6593(1)	-3.5162	-5.3352(0)[(a)]	-2.9320
LREXP	-1.1517(0)	-3.5162	-5.0014(0)[(a)]	-2.9320
LRDMREX	-3.9048(0)	-3.5279	-8.3778(0)[(a)]	-2.9400
LRGFCF	-2.5694(1)	-3.5162	-4.7560(0)[(a)]	-2.9320
LPOP	-1.1099(0)	-3.5162	-5.1409(0)[(a)]	-2.9320

[(a)]Indicates no trend.

Note: Lags were determined using Schwarz Bayesian Criterion (SBC) and are given in parentheses. The critical values are for 5% level.

TABLE 6
UNIT ROOT TESTS FOR PAKISTAN

	Level		First Difference	
	Test Statistic	Critical Value	Test Statistic	Critical Value
LRGDP	-1.8288(0)	-3.5514	-5.0924(0)	-3.5514
LREXP	-3.5734(0)	-3.5514	-6.3337(0)[(a)]	-2.9558
LRDMREX	-2.0005(0)	-3.5731	-6.3590(0)[(a)]	-2.9706
LRGFCF	-3.5727(1)	-3.5514	-4.0158(0)[(a)]	-2.9558
LPOP	-1.6146(0)	-3.5514	-5.6735(0)[(a)]	-2.9558

[(a)]Indicates no trend.

Note: Lags were determined using Schwarz Bayesian Criterion (SBC) and are given in parentheses. The critical values are for 5% level.

TABLE 7
UNIT ROOT TESTS FOR PHILIPPINES

	Level		First Difference	
	Test Statistic	Critical Value	Test Statistic	Critical Value
LRGDP	-2.2541(1)	-3.5112	-3.1850(0)	-3.5136
LREXP	-3.8221(0)	-3.5112	-8.6077(0)[(a)]	-2.9287
LRDMREX	-2.0733(1)	-3.5217	-3.9377(1)[(a)]	-2.9358
LRGFCF	-2.4240(1)	-3.5112	-5.0391(0)[(a)]	-2.9287
LPOP	-0.6250(0)	-3.5112	-7.1051(0)	-3.5136

[(a)]Indicates no trend.

Note: Lags were determined using Schwarz Bayesian Criterion (SBC) and are given in parentheses. The critical values are for 5% level.

TABLE 8
UNIT ROOT TESTS FOR SRI LANKA

	Level		First Difference	
	Test Statistic	Critical Value	Test Statistic	Critical Value
LRGDP	-1.3076(0)	-3.5162	-6.1088(0)[(a)]	-2.9320
LREXP	-2.1266(0)	-3.5162	-6.4363(0)[(a)]	-2.9320
LRDMREX	-2.5186(2)	-3.5279	-4.2618(0)[(a)]	-2.9400
LRGFCF	-2.4202(1)	-3.5162	-4.3326(0)[(a)]	-2.9320
LPOP	-1.4010(0)	-3.5162	-5.8350(0)	-3.5189

[(a)]Indicates no trend.

Note: Lags were determined using Schwarz Bayesian Criterion (SBC) and are given in parentheses. The critical values are for 5% level.

TABLE 9
UNIT ROOT TESTS FOR THAILAND

	Level		First Difference	
	Test Statistic	Critical Value	Test Statistic	Critical Value
LRGDP	-4.3307(3)	-3.5189	-3.4147(0)[(a)]	-2.9339
LREXP	-2.1266(0)	-3.5189	-6.6225(0)	-3.5217
LRDMREX	-2.4839(0)	-2.9400	-7.5020(0)[(a)]	-2.9422
LRGFCF	-3.3347(3)	-3.5189	-3.7896(1)[(a)]	-2.9339
LPOP	1.8279(0)	-3.5189	-5.4260(0)	-3.5217

[(a)]Indicates no trend.

Note: Lags were determined using Schwarz Bayesian Criterion (SBC) and are given in parentheses. The critical values are for 5% level.

TABLE 10
COINTEGRATION TRACE TESTS

Null	r=0	r≤1	r≤2	r≤3	r≤4
Alternative	r≥1	r≥2	r≥3	r≥4	r=5
India	74.4514*	48.9539*	24.9900	13.5615	4.2172
	(70.4900)	(48.8800)	(31.5400)	(17.8600)	(8.0700)
Japan	84.3314*	46.1779*	19.6195	7.0680	NA
	(48.8800)	(31.5400)	(17.8600)	(8.0700)	
Korea	124.1234*	45.0166	26.7061	14.1241	3.2234
	(70.4900)	(48.8800)	(31.5400)	(17.8600)	(8.0700)
Malaysia	36.0144	16.9669	7.4452	1.7181	NA
	(48.8800)	(31.5400)	(17.8600)	(8.0700)	
Pakistan	16.3171	6.8927	0.2668	NA	NA
	(31.5400)	(17.8600)	(8.0700)		
Sri Lanka	101.5122*	50.2056*	28.5348	10.5039	4.2325
	(70.4900)	(48.8800)	(31.5400)	(17.8600)	(8.0700)

Note: Test statistics are corrected for finite sample bias. Critical values at the 95% level are in parentheses. Lags were determined using the Schwarz Bayesian Criterion (SBC). In each case, SBC chose a lag of one.
*Indicates that the test statistic is significant at the 5% level.

TABLE 11
LONG RUN COINTEGRATING VECTORS

	LRGDP	LREXP	LRDMREX	LRGFCF	LPOP
India(1)	-1.0000	0.0026	0.0205	0.6426	0.1813
India(2)	-1.0000	0.6776	-0.1490	-0.6732	1.5761
Japan(1)	-1.0000	0.3060	-0.0990	1.6461	NA
Japan(2)	-1.0000	0.0322	-0.0500	0.8299	NA
Korea(1)	-1.0000	-0.7792	0.1241	0.6624	1.0889
Sri Lanka(1)	-1.0000	0.7647	-0.1915	-0.3528	4.3142
Sri Lanka(2)	-1.0000	-0.5472	-0.1361	1.0826	0.0589

Note: The vectors are normalized on LRGDP. NA stands for Not Applicable. For Japan, LPOP is not included in the tests for cointegration because it is nonstationary in its first difference.

TABLE 12
REGRESSION RESULTS WITH GLRGDP AS THE DEPENDENT VARIABLE

	GLREXP	GLRDMREX	GLRGFCF	GLPOP	$\overline{R}^2$
Malaysia[(a)]	0.4087**	-0.0021	0.1342*	0.9209	0.78
	(8.4644)	(-0.2171)	(2.5463)	(1.0983)	
Myanmar	0.1576*	0.0127	0.1683**	-1.4193	0.30
	(2.4384)	(1.4723)	(3.1073)	(-0.7733)	
Pakistan	0.0909	0.0053	0.1899**	0.0022	0.15
	(0.2332)	(0.8452)	(2.6980)	(.0402)	
Philippines[(b)]	-0.0202	-0.0039	0.1398**	1.2075	0.47
	(-1.5189)	(-0.4440)	(6.2707)	(1.2730)	
Thailand	0.0245	0.0001	0.2471**	0.6927	0.41
	(0.6077)	(0.0250)	(5.2488)	(0.9622)	

[(a)] Autoregressive Cochrane-Orcutt procedure of order 1 is used.
[(b)]The estimates are for the second differences of the variables since the dependent variable GLRGDP is non-stationary.
**Significant at the 1% level
*Significant at the 5% level