Dynamics of Real Exports and Real Economic Growths in 13 Selected Asian Countries

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This paper is an exploration of the dynamics between real exports and real economic growths in 13 selected Asian countries. It applies the cointegration and error-correction procedures. The unit root test reveals that both the time series are nonstationary in each country and individually they depict I(1) behavior. The evidence of cointegration and short-run as well as long-run Granger causality including the directions thereof vary from one country to another.

I. Introduction

Controversies surround the uneasy causal nexus between exports and economic growth in the context of both developed and developing countries. The hypothesis of export-driven economic growth lacks economic consensus. As a result, the empirical studies on this issue are voluminous and expansive. Dollar (1992) examined the experience of 95 less developed countries (LDCs) for the period 1976-85 and found that outward-oriented countries do grow faster than more inward-oriented countries. Bahmani-Oskooee et al. (1991) provide results in support of export promotion hypothesis. Dutt and Ghosh (1994) also find exports and economic growth are cointegrated for a majority of their sample countries, but fail to test the question of direction of causality. Dodaro (1993) demonstrates that export growth and GDP growth display weak bidirectional causality. Levine and Renelt (1992), and Levine and Zervos (1993), using sensitive and extreme bounds analyses respectively, demonstrate that the relationship between economic growth and some of its determinants is fragile. Recently, Amoateng and Amoako-Adu (1996) find a causal linkage between economic growth and exports for 35 African countries.

Numerous other studies (e.g., Syran and Walsh (1968), Michalopoulos and Jay (1973), Michaely (1977), Salvatore and Hatcher (1991), Van den Berg and Schmidt (1994), Balassa (1978, 1985), Tyler (1981), Feder (1983) and Kavoussi (1984)) investigated the association between the growths of exports and aggregate national output. With some qualifications, most of these studies found that there exists a positive association between growth of exports and GNP growth. Jung and Marshall (1985) tested for Granger causality using time series data on thirty-seven developing countries and found limited qualified support for export-led growth hypothesis. Chow (1987) found bidirectional causality between growth of exports and growth of industrial output in eight

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newly industrialized countries. Kunst and Martin (1989), Alam (1991), and Helpman and Krugman (1985) suggested the existence of bidirectional causality between growths of national output and exports. Bhagwati (1988), Pomponio (1996), Henriques and Sadorsky (1996) and Abhayaratne (1996) also found evidence of bidirectional causality and feedbacks between economic growth and export growth which may be termed as "virtuous circle". Sharma et al. (1991) investigated causal relationships between economic growth, exports and factor inputs (capital and labor) in Germany, Italy, Japan, U.K. and the U.S. over the period 1960-87. According to their findings, Germany and Japan experienced export-led growth. In the case of the U.S. and U.K., reverse causality was found between exports and GNP growth. For Italy, they could not find any causal relation between exports and output. Afxentiou and Serletis (1991) drew a general conclusion that industrial countries' export promotion policies are not instrumental in the stimulation of GNP growth, nor are GNP growth policies necessarily effective in fostering export growth. This conclusion is in agreement with a similar one reached by Jung and Marshall (1985) with respect to developing countries. Hansen (1994) finds that exports have a positive effect on economic growth in G-7 countries, but the effect is not robust. Ukpolo (1994) also supports the hypothesis of a positive linkage between the non-fuel primary exports and economic growth. However, his results cast some doubts on the significance of the positive contribution of the manufactured export sector to the growth process of low-income African countries.

In light of the above controversies and inconclusive evidence on the direction of causality between economic growth and export growth, the issue merits further investigations. In particular, this undertaking is timely and quite useful to some Asian countries because of their enormous trade and growth potentials. The thirteen countries considered in this paper include Bangladesh, India, Pakistan, Sri Lanka, Nepal, Japan, China, Indonesia, Thailand, South Korea, Singapore, Philippines and Malaysia. These countries have been selected because of their eminence and rapidly growing importance in international business, increased emphasis on export promotion as a vital tool for enhancing economic growth, deregulations, privatization, market reforms and trade liberalizations. To carry out the investigation, this paper applies the relatively new cointegration and error-correction procedures. The cointegration methodology is appropriate to the nonstationary time series. The application of simple ordinary least squares (OLS) to the nonstationary time series is likely to lead to erroneous conclusions due to spurious correlation. The remainder of the paper is organized as follows. Section II briefly outlines the empirical methodology. Section III reports the results. Finally, Section IV summarizes the results, offers conclusions and states the policy implications.

II. Empirical Methodology

At first, it is necessary to examine the stationary/nonstationarity property of time series data to determine the most appropriate econometric technique in order to avoid incorrect conclusions. Provided the time series data are found stationary, the most appropriate procedure is the simple Granger causality test. In the case of nonstationarity in the time series data, the most appropriate procedures are cointegration and error-correction models.

To begin with this examination, the cointegration regression is specified as follows:

$$x_t = \alpha_0 + \alpha_1 y_t + e_t \tag{1}$$

where x_t = log of real GDP, y_t = log of real exports, and e_t is the stochastic error term. The variables x_t and y_t are integrated of order d (i.e., I(d)) if the time series data on x_t and y_t have to be differenced d times to restore stationarity. For d = 0, x_t and y_t are stationary in levels and no differencing is needed. Again, for d = 1, first differencing is needed to restore stationarity.

For nonstationarity in each variable, unit root tests are to be conducted for which the following equations are considered:

$$x_t = \mu + \beta T + \alpha x_{t-1} + \sum_{i=1}^{k} c_i \triangle x_{t-i} \tag{2}$$

$$y_t = \theta + \pi T + \phi y_{t-1} + \sum_{i=1}^{k} d_i \triangle y_{t-i} \tag{3}$$

Each time series has non-zero mean and non-zero drift. That is why the estimation should include both a constant and a trend term in each specification. The relevant null hypothesis is that $|\alpha| = 1$ or $|\phi| = 1$ against the corresponding alternative hypothesis that $|\alpha| < 1$ or $|\phi| < 1$. A failure to reject the null hypothesis would imply that each variable is nonstationary.

Next, the following ADF regression is considered:

$$\triangle e_t = a e_{t-1} + \sum_{i=1}^{m} b_i \triangle e_{t-i} + q_t \tag{4}$$

The ADF test is applied on $|\hat{a}|$ to infer about the null hypothesis of no-cointegration. The null hypothesis is rejected if the calculated pseudo t-value associated with $\hat{a}$ is greater than its critical value, provided in Engle and Yoo (1987).

The Engle-Granger (1987) cointegration procedures are not without drawbacks since they do not consider explicitly the error structure of the data processes. The cointegration procedure, as developed in Johansen (1988) and Johansen and Juselius (1990, 1992), avoid the above drawback by allowing interactions in the determination of the relevant economic variables and being independent of the choice of the endogenous variable. Most importantly, it allows explicit hypotheses tests of parameter estimates and rank restrictions using likelihood ratio tests. The empirical exposition of Johansen and Juselius methodology is as follows:

$$\triangle V_t = \tau + \Omega V_{t-1} + \sum_{j=1}^{k-1} \Omega_j \triangle V_{t-j} + m_t \tag{5}$$

where V_t denotes a vector of log of real GDP and log of real exports, and $\Omega = \alpha \beta'$. Here, α is the speed of adjustment matrix and β is the cointegration matrix. Equation (5) is subject to the condition that Ω is less than full rank matrix, i.e., r < n. This procedure applies the

maximum eigenvalue test (λ_{max}) and the trace test (λ_{trace}) for null hypotheses on r. Of these two tests, λ_{max} test is expected to offer a more reliable inference as compared to λ_{trace} test (Johansen and Juselius (1990)). Again, the Johansen and Juselius test procedure suffers from its supersensitivity to the selection of the lag structures. As a result, this study pursues both the ADF and Johansen-Juselius procedures for cointegration. It is likely that these two procedures will provide contradictory evidence in some instances.

If x_t and y_t are found cointegrated by either ADF procedure or Johansen-Juselius procedure or both, there will exist an error-correction representation (Engle and Granger (1987)). The error-correction model may take the following form:

$$\triangle x_t = \beta_1 e_{t-1} + \sum_{i=1}^{k} \phi_i \triangle x_{t-i} + \sum_{j=1}^{k} \delta_j \triangle y_{t-j} + u_{1t} \tag{6}$$

$$\triangle y_t = \beta_2 e_{t-1} + \sum_{i=1}^{k} \pi_i \triangle x_{t-i} + \sum_{j=1}^{k} \gamma_j \triangle y_{t-j} + u_{2t} \tag{7}$$

The reverse specification is considered due to plausible bidirectional causality. In these two equations, the series x_t and y_t are cointegrated when at least one of the coefficients β_1 or β_2 is not zero. If $\beta_1 \neq 0$ and $\beta_2 = 0$, they y_t will lead x_t in the long run. Again, if $\beta_2 \neq 0$ and $\beta_1 = 0$, then x_t will lead y_t in the long run. If δ_j's are not all zero, movements in y_t will lead those in x_t in the short run. If π_i's are not all zero, movements in x_t will lead movements in y_t in the short run.

The error-correction model (ECM) was first introduced by Sargan (1964) and subsequently popularized by numerous papers (i.e., Davidson et al. (1978), Hendry et al. (1984)). It has enjoyed a revival in popularity due to the recent work of Granger (1986, 1988), and Engle and Granger (1987) on cointegration. Its importance lies in its ability to combine short-run dynamics and long-run relationship in a unified system. If two variables are cointegrated, the long-run Granger causality will stem at least from one direction. Sometimes, it is desirable to exclude the insignificant lags to improve the efficiency of OLS estimates of parameters (Baghestani and Mott (1997)). A lack of cointegration does not, however, preclude the short-run dynamics and Granger causality. In the absence of a long-run relationship, Equations (5) and (6) should not include the error-correction term for the detection of Granger causality between two variables (Bahmani and Payesteh (1993)).

Annual data are employed in this study. Initially, all the data have been collected in nominal terms and in U.S. dollar. Their real magnitudes have been obtained by deflating the nominal values with the respective consumer price indices/GDP deflators depending upon the data availability. The same sample period could not be used for each country because of the data availability constraints. All the data have been collected from the various monthly and annual issues of *International Financial Statistics*, published by the International Monetary Fund (IMF). Only the annual data have been used in this study because GDP data are usually available on yearly basis in most of the developing countries.

III. Empirical Results

The unit root test results are reported as follows:

Table 1 ADF Test of Unit Root: Equations (2) and (3)

Variable	ADF (with Trend)		ADF (without Trend)	
	Level	Difference	Level	Difference
BANGLADESH (1971-1994)				
RGP	-0.11956 (4)	-4.248 (4)	-1.303 (4)	-4.508 (4)
REX	0.1548 (4)	-3.031 (2)	-0.2613 (4)	-3.780 (2)
INDIA (1965-1994)				
RGP	-1.0965 (4)	-4.6412 (4)	1.6923 (2)	-4.512 (4)
REX	-2.5782 (4)	-5.475 (5)	-0.6509 (3)	-5.471 (5)
PAKISTAN (1965-1994)				
RGP	-1.9942 (2)	-3.554 (1)	-0.07558 (3)	-5.58 (2)
REX	-3.192 (4)	-3.935 (4)	0.28753 (0)	-4.351 (4)
SRI LANKA (1965-1991)				
RGP	-1.4837 (4)	-4.1815 (4)	0.55536 (4)	-4.589 (4)
REX	-2.4309 (4)	-3.9112 (3)	-0.92451 (4)	-4.0121 (4)
NEPAL (1975-1994)				
RGP	-3.055 (4)	-2.710 (4)	2.1614 (4)	-3.150 (4)
REX	-1.4507 (4)	-3.943 (2)	-0.9549 (4)	1.601 (2)
CHINA (1978-1994)				
RGP	-2.57 (4)	-3.58 (2)	-2.5762 (4)	-6.51 (2)
REX	-1.8799 (4)	183.5 (5)	-0.0669 (4)	-3.15 (6)
JAPAN (1965-1994)				
RGP	-2.934 (4)	-3.25 (4)	-1.3929 (4)	-3.167 (4)
REX	-1.0643 (4)	-1.593 (3)	-3.018 (4)	-3.21 (2)
INDONESIA (1968-1992)				
RGP	-2.17156 (4)	-3.0973 (2)	-0.7343 (4)	-14.792 (2)
REX	-1.95016 (4)	-3.224 (3)	-2.5408 (4)	-3.00 (2)
THAILAND				
RGP	-2.86914 (4)	-3.54609 (1)	0.606 (4)	-5.5457 (2)
REX	-2.6458 (4)	-3.608 (4)	-2.3611 (4)	-3.332 (4)
SOUTH KOREA (1966-1994)				
RGP	-2.4358 (4)	-3.200 (2)	-0.59077 (4)	-3.378 (2)
REX	-2.1708 (4)	-4.224 (4)	-2.9878 (4)	-4.504 (4)
SINGAPORE (1972-1993)				
RGP	-1.9275 (4)	-2.652 (2)	-0.2167 (4)	-10.210 (3)
REX	-2.242 (4)	-3.8414 (4)	-0.8180 (4)	-1.752 (3)
PHILIPPINES (1965-1994)				
RGP	-1.7175 (4)	-2.521 (1)	-1.9018 (4)	-4.7312 (2)
REX	-1.6964 (4)	-4.321 (2)	-1.475 (4)	-3.196 (4)

Table 1 (Continued)

Variable	ADF (with Trend)		ADF (without Trend)	
	Level	Difference	Level	Difference
MALAYSIA (1965-1994)				
RGP	-2.6756 (4)	-3.0261 (2)	-0.0292 (4)	-8.772 (2)
REX	-1.9116 (4)	-4.879 (4)	1.1351 (4)	-3.4127 (4)

RGP = log of real GDP (U.S. $), and REX = log of real exports (U.S. $).
Critical ADF values at 5% level of significance are -3.410 (with trend) and -2.8600 (without trend).

Evidently, each time series on log of real GDP and log of real exports is nonstationary both with trend and without trend at 5 percent and higher levels of significance. Table 1 also demonstrates clearly that each time series becomes nonstationary after it is differenced once only. The optimum lag-lengths, as reported in parentheses, are determined by the final prediction error (FPE) criterion (Hslao (1981)).

Since each time series is nonstationary, the next logical step is to determine if both series are cointegrated. At first, the ADF procedure is applied. The cointegration results based on this procedure are reported as follows:

Table 2 Cointegration Tests Based on ADF Procedure: Equation (4)

Dependent (X_t)	Independent (Y_t)	ADF Statistics	DW	Adj R^2
BANGLADESH				
RGP	REX	-3.367 (1)	1.85	0.39
INDIA				
RGP	REX	-3.055 (5)	1.938	0.39
PAKISTAN				
RGP	REX	-3.170 (1)	1.80	0.27
SRI LANKA				
RGP	REX	-2.274 (3)	1.85	0.277
NEPAL				
RGP	REX	-0.868 (1)	2.220	0.05
JAPAN				
RGP	REX	-1.197 (3)	1.89	0.05
CHINA				
RGP	REX	-5.521 (1)	2.001	0.832
INDONESIA				
RGP	REX	-1.689 (2)	1.910	0.25
THAILAND				
RGP	REX	-3.428 (2)	1.735	0.35
SOUTH KOREA				
RGP	REX	-1.732 (4)	1.920	0.23
SINGAPORE				
RGP	REX	-1.695 (5)	1.918	0.25

Table 2   (Continued)

Dependent (X_t)	Independent (Y_t)	ADF Statistics	DW	Adj R^2
PHILIPPINES				
RGP	REX	-4.222 (4)	1.904	0.48
MALAYSIA				
RGP	REX	-3.061 (5)	1.86	0.34

The critical values of ADF statistics, as reported in Engle and Yoo (1987), are -4.07, -3.37, and -3.03 at the 1, 5 and 10 percent levels of significance respectively. The optimum lag-lengths are reported within parentheses and they are determined by the final prediction error (FPE) criterion.

Based upon a comparison of the calculated values of the ADF statistic with its above critical values, log of real GDP and log of real exports are found cointegrated at 10 percent and higher levels of significance in Bangladesh, India, Pakistan, China, Thailand, Philippines and Malaysia. The existence of cointegration implies a long-run equilibrium relation between log of real GDP and log of real exports in the above Asian countries. Likewise, the optimum lag-lengths, as reported in parentheses, are determined by the FPE criterion for each country. In contrast, no evidence of cointegration is found for Japan, Indonesia, Nepal, South Korea and Sri Lanka. The absence of cointegration implies that log of real GDP and log of real exports move being independent of each other in the long run without any tendency to converge. The DW-values are reported to indicate white noise and the numerical values of $\overline{R}^2$s are reported to indicate the relative strength of long-run association between the variables.

To overcome any confusions about the cointegrating relation, the Johansen-Juselius Procedure is applied next. The results are as follows:

Table 3   Johansen's Procedure of Cointegration Test: Equation (5)

Data Vector	Null Hypothesis	λ_{Max}	λ_{Trace}
BANGLADESH			
(RGP, REX)	$r \le 1$ $r \le 0$	2.2878 (2)** 14.5737 (2)	2.2878 (2)*** 16.8617 (2)
INDIA			
(RGP, REX)	$r \le 1$ $r \le 0$	3.7468 (5) 7.8955 (5)	3.7468 (5) 11.6423 (5)
PAKISTAN			
(RGP, REX)	$r \le 1$ $r \le 0$	0.0135 (5)* 33.8707 (5)	0.0135 (5) 33.8841 (5)
SRI LANKA			
(RGP, REX)	$r \le 1$ $r \le 0$	18.4283 (9)* 36.944 (9)*	18.4283 (9)** 55.3727 (9)*
NEPAL			
(RGP, REX)	$r \le 1$ $r \le 0$	3.123 (5)* 24.835 (5)*	3.123 (5)* 27.9587 (5)*

Table 3   (Continued)

Data Vector	Null Hypothesis	λ_{Max}	λ_{Trace}
JAPAN			
(RGP, REX)	$r \leq 1$ $r \leq 0$	1.549 (3)*** 12.7018 (3)***	1.5491 (3)* 12.2509 (3)*
CHINA			
(RGP, REX)	$r \leq 1$ $r \leq 0$	0.2244 (2)* 25.36632(2)*	0.2244 (2)* 25.59075(2)*
INDONESIA			
(RGP, REX)	$r \leq 1$ $r \leq 0$	0.3741 (2)* 16.522 (2)*	0.3741 (2)*** 16.896 (2)***
THAILAND			
(RGP, REX)	$r \leq 1$ $r \leq 0$	0.5092 (5)* 33.4959 (5)*	0.5092 (5)* 34.005 (5)*
SOUTH KOREA			
(RGP, REX)	$r \leq 1$ $r \leq 0$	9.3165 (7)** 32.3994 (7)*	9.3165 (7)** 41.7159 (7)*
SINGAPORE			
(RGP, REX)	$r \leq 1$ $r \leq 0$	0.0334 (4)* 32.0382 (4)*	0.0334 (4)* 32.0717 (4)*
PHILIPPINES			
(RGP, REX)	$r \leq 1$ $r \leq 0$	0.4898 (6)* 19.880 (6)*	0.4898 (6)* 20.3708 (6)*
MALAYSIA			
(RGP, REX)	$r \leq 1$ $r \leq 0$	0.278 (4)* 18.9202 (4)*	0.278 (4)** 19.1982 (4)**

  * significant at the 99% confidence level

  ** significant at the 95% confidence level

  *** significant at the 90% confidence level

The optimum lag-lengths are reported in parentheses. Likewise, they are determined by the FPE criterion.

The null hypothesis of $r \leq 0$ (signifying no-cointegrating relation between variables) is rejected at 99% confidence level, based upon the λ_{max} test in the cases of Pakistan, China, Indonesia, Thailand, Sri Lanka, Nepal, South Korea, Singapore, Philippines and Malaysia. In Bangladesh and Japan, the null hypothesis of $r \leq 0$ is rejected at the 95 percent and 90 percent confidence levels respectively. These findings contradict those from the ADF procedure for Japan, Indonesia, Sri Lanka, Nepal and South Korea. The most noteworthy exception is India here which shows no-cointegrating relation between the variables based upon both λ_{max} and λ_{trace} tests. In other cases, no references have been made to λ_{trace} test because λ_{max} is more reliable, as stated earlier.

Since neither approach is perfect and the evidence is mixed on cointegration between the two variables for several countries, the error-correction models (6) and (7) are estimated for each country. The results are reported as follows:

Table 4 Granger-Causality Test: Equations (6) and (7)

Dependent Variable	"Causal" Variable	Lag Orders[a]	F-Statistics[b]	$\overline{R}^2$	t-statistics of the coefficient of e_{t-1}
BANGLADESH					
RGP	REX	n=5, m=4	(4,11)=2.492***	0.60	-2.552**
REX	RGP	n=3, m=2	(3,14)=6.4518*	0.58	0.315
INDIA					
RGP	REX	n=4, m=4	(2,19)=1.2358	0.2512	-0.477
REX	RGP	n=2, m=5	(2,18)=2.7912**	0.3185	1.869***
PAKISTAN					
RGP	REX	n=5, m=5	(3,18)=1.90	0.440	-2.291**
REX	RGP	n=5, m=3	(5,17)=6.477*	0.660	3.643
SRI LANKA					
RGP	REX	n=2, m=1	(2,23)=0.8672	.101	-1.006
REX	RGP	n=3, m=4	(3,17)=2.1874***	.122	-2.437**
NEPAL					
RGP	REX	n=5, m=4	(2,18)=3.65**	0.507	-0.586
REX	RGP	n=5, m=1	(4,18)=4.020*	0.47	-2.109**
JAPAN					
RGP	REX	n=2, m=3	(2,20)=2.694**	0.581	-2.101**
REX	RGP	n=4, m=5	(3,17)=1.926	0.3435	-0.064
CHINA					
RGP	REX	n=2, m=1	(2,10)=3.172***	0.750	-2.516**
REX	RGP	n=1, m=3	(2,9)=7.355*	0.632	3.818*
INDONESIA					
RGP	REX	n=1, m=3	(2,17)=1.902	0.321	0.939
REX	RGP	n=3, m=2	(3,18)=4.5178*	0.42	-3.011*
THAILAND					
RGP	REX	n=3, m=5	(4,12)=7.100*	0.808	-4.177
REX	RGP	n=5, m=3	(5,15)=5.085*	0.63	-0.198
SOUTH KOREA					
RGP	REX	n=3, m=4	(3,17)=3.1614*	0.44	-2.003**
REX	RGP	n=3, m=4	(3,17)=2.6564***	0.4125	1.676***
SINGAPORE					
RGP	REX	n=5, m=4	(5,8)=3.716**	0.7499	0.331
REX	RGP	n=5, m=5	(5,6)=6.722*	0.9048	-0.005
PHILIPPINES					
RGP	REX	n=5, m=5	(3,18)=17.74*	0.7475	-2.238**
REX	RGP	n=5, m=5	(4,17)=11.4023*	0.751	0.736

Table 4 (Continued)

Dependent Variable	"Causal" Variable	Lag Orders[a]	F-Statistics[b]	$\overline{R}^2$	t-statistics of the coefficient of e_{t-1}
MALAYSIA					
RGP	REX	n=2, m=3	(3,20)=3.76[**]	0.365	-2.575[*]
REX	RGP	n=3, m=3	(3,20)=3.593[**]	0.35	2.487[**]

Notes: a. Lag orders are selected based on the FPE criterion, m = lag length of dependent variable, n = lag length of "causal variable".

b. The F-statistics (with degrees of freedom in parentheses) tests the joint null hypothesis that all coefficients of the "causal variable" are simultaneously equal to zero.

* significant at 99% confidence level.

** significant at 95% confidence level.

*** significant at 90% confidence level.

The error-correction models (6) and (7) are estimated by using OLS for each country. After excluding the highly insignificant lagged differences, the ECMs are then re-estimated. For Granger causality, joint F-test is conducted throughout. The results reveal that real export growth is predominantly causally prior to real GDP growth in Bangladesh (at 90% confidence level) and Japan (at 90% confidence level). There are evidence that real GDP growth is causally prior to real export growth in India (at 95% confidence level), Pakistan (at 99% confidence level), Indonesia (at 99% confidence level), Sri Lanka (at 90% confidence level), and Nepal (at 99% confidence level). There are evidence of bidirectional Granger causality between real export growth and real GDP growth in Pakistan, China, South Korea, Singapore and Malaysia. However, the relative strength of causality between the variables varies from one country to another as reflected through the numerical values of $\overline{R}^2$s. In the case of Singapore, short-run bidirectional causality is detected on the basis of joint F-test without any indication of long-run causality between the variables. The significance of a long-run relation is usually determined by the t-value associated with the respective numerical coefficient of the error-correction term.

IV. Summary, Conclusions and Policy Implications

The empirical results from the preceding section are summarized as follows:

Table 5 Summary of The Empirical Results

Country	Ho: Unit Root and Order of Integration	Ho: No-Cointegration		Causality	
		ADF	Johansen-Juselius	Short-Run	Long-Run
Bangladesh	Ho: cannot be rejected, I(1)	Cointegration	Cointegration	REX↔RGP	REX→RGP
India	Ho: cannot be rejected, I(1)	Cointegration	No-cointegration	RGP→REX	RGP→REX
Pakistan	Ho: cannot be rejected, I(1)	Cointegration	Cointegration	RGP↔REX	RGP→REX

Table 5   (Continued)

Country	Ho: Unit Root and Order of Integration	Ho: No-Cointegration		Causality	
		ADF	Johansen-Juselius	Short-Run	Long-Run
Sri Lanka	Ho: cannot be rejected, I(1)	No-cointegration	Cointegration	RGP→REX	RGP→REX
Nepal	Ho: cannot be rejected, I(1)	No-cointegration	Cointegration	RGP↔REX	RGP→REX
Japan	Ho: cannot be rejected, I(1)	No-cointegration	Cointegration	REX→RGP	REX→RGP
China	Ho: cannot be rejected, I(1)	Cointegration	Cointegration	RGP↔REX	RGP↔REX
Indonesia	Ho: cannot be rejected, I(1)	No-cointegration	Cointegration	RGP→REX	RGP→REX
Thailand	Ho: cannot be rejected, I(1)	Cointegration	Cointegration	RGP↔REX	REX→RGP
South Korea	Ho: cannot be rejected, I(1)	No-cointegration	Cointegration	RGP↔REX	RGP↔REX
Singapore	Ho: cannot be rejected, I(1)	No-cointegration	Cointegration	RGP↔REX	No Long-Run Causality
Philippines	Ho: cannot be rejected, I(1)	Cointegration	Cointegration	RGP↔REX	REX→RGP
Malaysia	Ho: cannot be rejected, I(1)	Cointegration	Cointegration	RGP↔REX	RGP↔REX

where, (↔) indicates bidirectional causality.
        (→) indicates unidirectional causality.

Table 5 reveals that China, South Korea and Malaysia experience bidirectional causality between real GDP growth and real export growth in both short run and long run. In other words, the virtuous circle hypothesis is satisfied in these countries and hence they enjoy spectacularly high real economic growths. Somewhat differently, Bangladesh, Thailand and Philippines have evidence of bidirectional causality in the short-run and long-run unidirectional causality from real export growth to real GDP growth. As a result, these countries are in an economic growth mode caused by export promotion. Furthermore, Pakistan and Nepal enjoy bidirectional causality between the two variables in the short run while the long-run unidirectional causality flows from real GDP growth to real export growth. Also, India, Sri Lanka and Indonesia experience unidirectional causality from real GDP growth to real export growth in both the short run and long run. Only Japan has higher real economic growth due to higher real export growth in the short run as well as in the long run. Surprisingly, Singapore reveals short-run bidirection causality between the variables without any evidence of long-run causality at all.

The general policy implications of the above empirical findings are as follows: (i) countries with short-run and long-run virtuous circles should emphasize both higher economic growth and export promotion policies, (ii) countries with short-run virtuous circle and long-run unidirectional causality from real export growth to real economic growth should accord more importance to export promotion in conjunction with pro-growth policy, (iii) countries with short-run virtuous

circle and long-run causality from real economic growth to real export growth should attach added emphasis to higher economic growth policy pari passu with the continuation of export promotion, (iv) countries with short-run and long-run unidirectional causality from real GDP growth to real export growth should accord more emphasis to higher economic growth policy to spur exports, and (v) countries experiencing unidirectional causality from real export growth to real economic growth should continue the ongoing export promotion policy. The above policy prescriptions can be briefly categorized as "leaning with the wind".

In closing, we have a sample period of at least 20 years for each country. In our opinion, every individual time series is, thus, fairly long to yield meaningful cointegration results.

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