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Trade and economic growth: Is export-led growth passé?

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Abstract

Using relatively recent data, this paper examines the causal relation between trade and production in some Asian developing countries. We find that causality analyses provide no evidence of export-led growth. Export-oriented growth has not been the primary strategy.

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1. Introduction

In small open economies, exports have had important positive effects on the promotion of economic growth (Frankel and Romer, 1999; Grossman and Helpman, 1997). The export sectors of Japan and the Asian tigers were found to have played an important role in their respective unprecedented economic growth (Hsiao and Hsiao, 2006); apparently, there often existed positive links between the high economic and export growth witnessed here.

According to conventional international economic theory, export expansion enables related firms to avail of certain benefits, such as the enhancement of efficient resource allocation, exploitation of economies of scale, foreign technological knowledge through learning-by-doing and technological innovation stimulated by exposing foreign-market competition. This causal relation from exports to economic growth is commonly termed “export-led growth hypothesis” (Balassa, 1978; Edwards, 1998). Economic growth through productivity gains at the domestic level, such as productivity improvement or reduced unit costs, also stimulates exports (Bhagwati, 1988; Krugman, 1984). Domestic growth also leads to exchange-rate depreciation owing to an increase in the concerned country’s income and import demand, thus generating large-scale exports. This is the growth-led exports hypothesis.

On the basis of these hypotheses, the positive relationship between high economic and export growth can be said to stem from productivity improvement, either in the tradable or relatively non-tradable sector. However, this positive link may lead to the erroneous conclusion that high economic growth accompanied by high export growth is an absolute signal of export-led growth. To argue the hypotheses, we should consider including terms of trade or exchange rates in the system (Mahadevan and Suardi, 2008; Yang, 2008).

Many previous studies present diverse results on the causal relationship between economic growth and exports (e.g., Chow, 1987; Hsiao, 1987; Giles and Williams, 2000). However, very few studies have examined recent data to identify the causal links between trade and economic growth in the Far Eastern and Southeast Asia. Recent times have witnessed a drastic change in the national and trade circumstances in this region. More specifically, most Asian economies have experienced economic and monetary policy reforms since the Asian currency crisis of 1997. Over the last two decades, they have become highly specialized in the production of information and communication technology (ICT) equipment, intensifying the intra-industry trade in intermediate products in the region (IMF, 2001 and 2007). This paper empirically investigates the causal relationships between trade and production in three Asian countries.

2. Pre-data analysis

In this study, we utilize monthly data to analyze the post-crisis period (extending from January 2000 to June 2008) in three Far Eastern and Southeast Asian countries: Korea, Singapore, and Thailand. The sample period covers the time when the floating or more flexible exchange-rate regime had already been adopted.[1] In sections 2 and 3, the variables included are industrial production (*y*), real exports (*X*), real imports (*M*), and real effective exchange rate (*reef*).

In particular, we employ the real effective exchange rate as a variable not only to control the empirical model but also to distinguish between the two hypotheses—export-led growth and growth-led export. Although the former might cause an appreciation in the real effective exchange rate, an increased demand for imports due to high economic growth leads to the depreciation of the real effective exchange rate in the growth-led exports hypothesis. All variables are represented by natural logarithms. These data are obtained from the IMF's International Financial Statistics, except for Thailand's data and Korea's real effective exchange rate, which are obtained from the Bank of Thailand and the OECD web site, respectively.

To investigate the nature of the relationship between trade and economic growth, we employ the Johansen (1988) cointegration test to estimate a four-variable cointegrated vector error correction model (VECM). Eq. (1) compactly summarizes the model:

$$\Delta x_t = \mu + \sum_{i=1}^{k-1} \Gamma \Delta x_{t-i} + \Pi x_{t-1} + e_t \ , \tag{1}$$

where x_t is a four-dimensional vector of the variables of $I(1)$, Δ represents the first difference operator, μ is a four-dimensional vector of constants, Γ matrices denote coefficients, e_t is a four-dimensional vector of error terms with zero means and a covariance matrix Σ_e, and Πx_{t-1} is the error correction term. The rank of Π is equal to the number of cointegrating vectors. Hence, if the rank of Π is zero, the variables in x will not be cointegrated since there is no linear combination of all variables that are stationary. In contrast, if Π is full of rank, $\Pi x_{t-1}$is considered an error correction term.

First, the optimal lag length of the unrestricted vector autoregression model is set at *k* in each case (Table 1), by referring to the sequential modified likelihood ratio test. Hence, the lag length for the first differenced series in the VECM is *k*–1. Next, we investigate the number of cointegrating vectors on the basis of the trace and max-eigen statistics.[2] The null hypothesis stating that no cointegrating relationship exists between the variables is rejected in the trace and/or max-eigen statistics (Table 1). Therefore, there appears to be at least one cointegrating vector in approximately every case, which also implies that none of the variables are individually stationary.[3] However, the exception is Korea. We replace the real effective exchange rate with the terms of trade (*tot*)[4] to reject the null hypothesis that the

[1] We also note that there is a structural break in the 1997–1999 data owing to the crisis.
[2] A deterministic constant is allowed in the cointegrating space.
[3] The results of the unit root test also indicate that all variables appear to be $I(1)$ (Appendix).
[4] Here, *tot* is defined as

$$tot_t = P_t^{EX} - P_t^{IM} \ ,$$

Table 1

Results of the Johansen's cointegration test

	lag (k)	Cointegrating rank (r)			
		$r = 0$	$r \leq 1$	$r \leq 2$	$r \leq 3$
		Trace test			
Korea	$k = 4$	36.685	15.371	2.647	0.010
Singapore	$k = 5$	56.363**	18.053	7.121	0.979
Thailand	$k = 3$	51.508**	20.323	4.901	0.020
		Max-eigenvalue test			
Korea	$k = 4$	21.314	12.724	2.637	0.010
Singapore	$k = 5$	38.309**	10.933	6.142	0.979
Thailand	$k = 3$	31.186**	15.421	4.881	0.020

** and * denote rejection of null hypothesis at the 5% and 10% level of significance, respectively.

rank of Π is zero.

The cointegrating relationship can be normalized with respect to *y* as follows:

$$y_t = b_0 + b_1 X_t + b_2 M_t + b_3 reef_t \tag{2}$$

Table 2 reports the estimation results for the long-run equilibrium relationship (Eq. 2).

Table 2

The long-run cointegrating vector: $y_t = b_0 + b_1X_t + b_2M_t + b_3reef_t$

	b_0	b_1	b_2	b_3
Korea	1.902	-0.072	0.809	-0.146
		[-1.02]	[6.97]	[-2.68]
Singapore	6.370	1.806	-1.988	-0.239
		[3.67]	[-3.14]	[-0.24]
Thailand	2.722	1.185	-0.114	-0.685
		[8.31]	[-0.99]	[-4.52]

Note: number in brackets are *t*-statistics.

where P^{EX} is the export price index, and P^{IM} is the import price index. These data are obtained from the IMF's International Financial Statistics.

First, we find that exports are positively related to the output variable, with the exception of Korea, that is, an increase in exports is accompanied by an increase in production. Second, the relationship between imports and production is found to be different in each country. Finally, we find that the real effective exchange rate behaviour is significantly and negatively associated with the output variable in Korea, although it is insignificantly associated with Singapore and Thailand. This result might be consistent with growth-led exports owing to the depreciation effect of imports over the appreciation effect of exports.

3. Granger causality analysis

To indicate the causal relationships existing between trade and production in Asian countries, we report the results of the Granger causality tests on the basis of the VECM (Eq. 1) in Table 3.

For Korea, we find a unidirectional causality from production to exports at the 5% level of significance, indicating that Korea's domestic efforts in the field are important from the perspective of exports. In addition, we find another unidirectional causality from production to imports at the 1% level of significance. On the other hand, the country's industrial production is not affected by trade variables, while exports cause imports at the 1% level of significance.

In Singapore's case, there is a unidirectional causality from production to imports at the 5% level of significance. There is also a bidirectional causality from exports to imports at

Table 3

Results of the Granger causality test

Null hypothesis	Korea	Singapore	Thailand
$y_t \nrightarrow X_t$	16.309 **	7.119	12.028 ***
$y_t \nrightarrow M_t$	21.747 ***	8.133 *	2.281
$y_t \nrightarrow reef_t$	7.173	14.678 ***	0.219
$X_t \nrightarrow y_t$	10.095	4.909	1.968
$X_t \nrightarrow M_t$	20.637 ***	15.035 ***	2.736
$X_t \nrightarrow reef_t$	4.662	3.442	1.292
$M_t \nrightarrow y_t$	7.403	4.957	0.047
$M_t \nrightarrow X_t$	7.274	12.314 **	6.534 **
$M_t \nrightarrow reef_t$	5.908	2.777	1.185
$reef_t \nrightarrow y_t$	4.397	5.110	4.255
$reef_t \nrightarrow X_t$	13.08 **	5.825	13.592 ***
$reef_t \nrightarrow M_t$	12.088 *	10.473 **	6.918 **

Note: $\nrightarrow$ represents "does not Granger cause."

***, **, and * denote rejection of null hypothesis at the 1%, 5%, and 10% level of significance, respectively.

the 1% significance level and vice versa at the 5% level of significance. Singapore's trade does not Granger cause its output, which may imply the possibility that the effects of the trade on domestic output are indirect or that the added value resulting from the trade system is relatively small. This result could be consistent with the recent experiences of the Far Eastern and Southeast Asian countries, in which the intra-industry trade of ICT-related intermediate products has displayed increasing growth.

In the case of Thailand, we find evidence of a unidirectional causality from domestic output to exports at the 1% significance level. This result implies that the hypothesis of "growth-led exports" is more applicable to Thailand than the "export-led growth." However, in Thailand, the occurrence of growth-led exports might be driven by the impact of its large FDI inflows on its domestic productivity growth. In addition, we also find another unidirectional causality from exports to imports at the 1% significance level. This result might indicate that Thailand has depended on external demand owing to globalization of the world economy.

Contrary to the general perception, this result appears to imply that export-led growth might not apply to this region. Conversely, reverse causation—from production to exports—seems to occur in Korea and Thailand. We also find that causation from production to imports holds for Korea and Singapore.

4. Concluding remarks

This paper investigated the causal relationships between trade and production in three Asian countries. We applied the cointegration analysis and Granger causality tests to the 2000–2008 monthly trade and production data sourced from these countries. We found that causality analyses carry no evidence of export-led growth, implying that the export-oriented growth strategy has not been centred. On the other hand, the empirical results indicate that the growth-led exports hypothesis is applicable.

Appendix

Unit root test statistics

Variable	ADF		DF-GLS	
	Constant	Constant and trend	Constant	Constant and trend
Level				
Korea				
y	0.397 (3)	-7.501 (0)***	2.757 (3)	-1.849 (3)
X	-0.301 (2)	-1.926 (2)	2.918 (2)	-1.859 (2)
M	-0.382 (2)	-2.929 (2)	1.664 (2)	-2.862 (2)*
reef	-1.160 (0)	-0.077 (4)	-0.728 (0)	-0.691 (0)
tot	1.609 (0)	-0.898 (1)	3.202 (1)	-1.321 (1)
Singapore				
y	-1.203 (2)	-3.158 (1)*	-0.510 (2)	-2.279 (2)
X	0.113 (2)	-1.431 (2)	2.845 (2)	-1.378 (2)
M	0.648 (2)	-1.571 (2)	1.961 (2)	-1.413 (3)
reef	-0.648 (0)	0.464 (0)	-0.722 (0)	-0.125 (0)
Thailand				
y	-0.042 (3)	-2.978 (3)	2.029 (3)	-2.682 (3)
X	0.701 (2)	-2.258 (2)	2.472 (2)	-1.535 (2)
M	-0.889 (3)	-1.716 (3)	-0.302 (3)	-2.439 (2)
reef	-0.861 (1)	-2.611 (1)	-0.916 (1)	-1.305 (1)
1st-difference				
Korea				
△*y*	-9.676 (2)***	-9.677 (2)***	-4.334 (3)***	-9.182 (2)***
△*X*	-13.233 (1)***	-13.161 (1)***	-2.813 (3)***	-3.733 (3)***
△*M*	-13.855 (1)***	-13.785 (1)***	-13.147 (1)***	-12.814 (1)***
△*reef*	-8.080 (0)***	-8.112 (0)***	-3.496 (1)***	-7.550 (0)***
△*tot*	-8.085 (0)***	-8.359 (0)***	-2.316 (2)**	-3.344 (2)**
Singapore				
△*y*	-10.941 (1)***	-10.889 (1)***	-14.410 (0)**	-15.855 (0)***
△*X*	-14.058 (1)***	-14.012 (1)***	-0.733 (3)	-1.788 (3)
△*M*	-12.095 (1)***	-12.236 (1)***	-2.389 (3)**	-3.146 (3)**
△*reef*	-9.780 (0)***	-10.241 (0)***	-9.421 (0)***	-10.305 (0)***
Thailand				
△*y*	-5.802 (2)***	-5.780 (2)***	-2.044 (2)**	-3.482 (2)**
△*X*	-12.054 (1)***	-12.133 (1)***	-11.902 (1)***	-12.050 (1)***
△*M*	-6.448 (2)***	-6.369 (2)***	-0.302 (3)	-2.439 (2)
△*reef*	-6.575 (0)***	-6.913 (0)***	-6.034 (0)***	-5.870 (0)***

Note: number in parentheses are optimal lag length chosen by SBIC.

***, **, and * denote rejection of null hypothesis at the 1%, 5%, and 10% level of significance, respectively.

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