Economics Bulletin

Volume 30, Issue 3

Recent evidence of the validity of the export-led growth hypothesis for Thailand

Komain Jiranyakul
National Institute of Development Administration

Abstract

Numerous empirical studies have devoted to analyze the role of exports in the growth process. This paper examines the relationship between real exports and real GDP in Thailand using quarterly data from 1993 to 2008. The results from the bounds testing for cointegration in a multivariate framework show that there is evidence of the validity of the export-led growth hypothesis, even though some previous studies that used Thailand data reject it. There exists the long-run causation running from exports to GDP. The policy implication of the results from this study is that deliberate policy measures that can stimulate production for exports will be growth enhancing for Thailand.

I am grateful to my colleagues for comments and suggestions.
Citation: Komain Jiranyakul, (2010) "Recent evidence of the validity of the export-led growth hypothesis for Thailand", *Economics Bulletin*, Vol. 30 no.3 pp. 2151-2159.
Submitted: Aug 03 2010. **Published:** August 19, 2010.

1. Introduction

Export growth as a major source of economic growth is identified by the export-led growth (ELG) hypothesis. Numerous studies have focused on this hypothesis, but there is no concensus on whether exports are an engine of growth. With time series analysis, research works tend to disprove the ELG hypothesis. Empirical studies examine the ELG hypothesis in both advanced and developing countries, but the main focus is on developing countries. For developed countries, Martin (1992) uses causality test and finds that the ELG hypothesis is valid for Germany, Japan, the United Kingdom, and the United States. Awokuse (2003) finds the causation is unidirectional from real exports to real GDP in Canada and thus the evidence resolves the mixed results from previous studies for this country. Earlier studies emphasizing developing countries by Michaely (1977) and Balassa (1978) and for NICs by Chow (1987) give a strong and positive relationship between exports and economic growth. However, Jung and Marshall (1985) find that the ELG hypothesis is supported by only four out of 37 developing economies. Hsiao (1987) applies causality tests on the data of Hong Kong, Taiwan, South Korea, and Singapore (the four Asian NICs). The results show no causal relationship between exports and GDP, except for Hong Kong. In a cross-country analysis, Conclaves and Richtering (1986) find a strong support for the ELG hypothesis using a sample of 70 developing countries while Colombatto (1990) finds that the ELG hypothesis is rejected. Medina-Smith (2000) indicates that different studies give mixed results depending mainly on the econometric methods being used. Cross-sectional studies generally support the ELG hypothesis, but ignore specific characteristics of those countries. This leads to numerous studies that focus on a case of a particular country by applying an advanced time series analysis. Since a bivariate cointegration test might not be reliable in testing the ELG hypothesis because the model might be misspecified. Recent studies incorporate the terms of trade (TOT) as one of the explanatory variables. Dhawan and Biswal (1999) and Chandra (2003) reexamine the ELG hypothesis in India. They conclude that exports, real GDP and terms of trade are cointegrated. Chandra (2003) finds that the causation running from GDP to exports is stronger than that from exports to GDP. Love and Chandra (2005) find that the causation running from GDP to exports in Bangladesh. Husein (2009) also finds cointegration of the three variables, and the existence of the long-run bidirectional causality between real exports and real GDP in Jordan. Rangasamy (2009) finds that there is a unidirectional causality running from exports to economic growth in South Africa.

Empirical evidence on Thailand tends to reject the ELG hypothesis. Bahmanee-Oskooee and Alse (1993) find evidence of causation running from economic growth to exports in Korea, Pakistan, the Philippines, and Thailand, but no evidence that exports cause economic growth. Amed and Harnhiran (1995) estimate the long-run relationship between exports and economic growth in the ASEAN-5 economies (Indonesia, Malaysia, the Philippines, Singapore, and Thailand) using annual data from 1966-1990. The results from Johansen cointegration test show that there exists a long-run relationship only in Singapore. Wong (2008) uses sample during the 1960-1996 period to examine the relationship between real GDP and exports for Asian countries including Thailand, and the evidence from Thailand shows that there exists no cointegration between real GDP and exports. The weak causation running from exports to real GDP is observed.

Even though many developing countries gained from import-substitution strategy in terms of economic growth and development over the past three decades, they had decisively switched to export-led growth strategy. The problems still remained. Promoting primary exports to stimulate growth did not substantially benefit these countries due mainly to trade barriers from the

advanced countries, and a declining in terms of trade.[1] Thailand is one of developing countries that had adopted export-promotion strategy since 1972. This strategy had become the dominant strategy in 1976. The main target of adopting this strategy was to achieve higher economic growth. The main objective of the present paper is to examine the relationship between real exports and real GDP in Thailand during the period 1993-2008 using quarterly data. Since the emergence of new developments in time series analysis, researchers employ more sophisticated econometric methods.

The present study uses the autoregressive distributed lag (ARDL) approach to cointegration to examine the long-run relationship between real GDP, terms of trade, and real exports. The results show that there is a long-run equilibrium relationship between real exports (both total and manufacturing exports), terms of trade, and real GDP. In addition, the causation running from real exports to real GDP is observed. Therefore, the evidence in the present study supports the ELG hypothesis. The outline of the paper is organized as follows. Section 2 presents the methodology used in the analysis. Section 3 presents estimations and empirical results. The last section concludes.

2. Methodology

The empirical model used to test the relationship between real GDP and real exports and terms of trade can be specified by a simple model as:

$$Y = f(X, TOT) \tag{1}$$

where Y is real GDP, X is real exports, and TOT is the terms of trade. There should be a positive relationship between exports and real GDP. If exports determine real GDP, exports play an important role in the overall growth process.

2.1 Bounds Testing for Cointegration

Due to the complex nature of the time series data, the autoregressive distributed lag (ARDL) approach proposed by Pesaran, Shin, and Smith (2001) is utilized. The equation used for testing for cointegration in the multivariate framework with three variables is specified as:

$$\begin{aligned}\Delta LY_t = {} & \alpha_0 + \alpha_1 LY_{t-1} + \alpha_2 LX_{t-1} + \alpha_3 LTOT_{t-1} + \sum_{i=1}^{p} \beta_i \Delta LY_{t-1} + \sum_{j=0}^{q} \gamma_j \Delta LX_{t-j} \\ & + \sum_{k=1}^{r} \delta_k \Delta LTOT_{t-k} + \varphi D + \varepsilon_t\end{aligned} \tag{2}$$

where LY is the log of real GDP, and LX is either the log of real total or manufacturing exports (LXT or LXM), LTOT is the log of terms of trade, and D is the dummy variable that captures the impact of the financial crisis of mid-1997.[2] The alphabets p, q, and r are the optimal number of lagged differences of log of real GDP (LY), log of real exports (LXT or LXM), and log of terms of trade (LTOT) respectively. It should be noted that deleting the lagged levels of the three variables leads to the ARDL(p, q, r) model. Equation (2) is used to test for cointegration of the

[1] See details in Todaro (1991), and World Bank (1993).

[2] Adopting the floating exchange rate regime could alter the competitiveness of the country through real exchange rate effect on exports.

three series without the prior knowledge of the order of integration of the series. The computed F-statistic is obtained by adding the lagged levels of variables to the ARDL(p,q,r) model, and this statistic is compared with the critical values provided by Pesaran, et al. (2001). If the computed F-statistic is above the upper bound critical value, the null hypothesis of no cointegration is rejected. If the computed F-statistic is lower than the lower bound critical value, the null hypothesis of no cointegration is accepted. When the computed F-statistic takes the value between the upper bound and lower bound critical values, the result is inconclusive. Unlike other techniques of cointegration test, re-parameterizing the model into the equivalent vector error correction model (VECM) is not required. This is the main advantage of this procedure. If ΔLY, ΔLX, and ΔLTOT as well as the dummy variable are equal to zero, equation (2) will be reduced to equation (3), which is specified as:

$$LY_t = b_0 + b_1 LX_t + b_3 LTOT_t + \nu_t \tag{3}$$

Equation (3) is equivalent to the long-run equilibrium or cointegrating equation, where $b_1 = -\alpha_0/\alpha_1$, $b_2 = -\alpha_2/\alpha_1$, $b_3 = -\alpha_3/\alpha_1$, and $v_t = (-1/\alpha_1)e_t$.

2.2 Error Correction Mechanism

If cointegration exists, the error correction model can be analyzed by the following equation:

$$\Delta LY_t = \alpha_0 + \lambda ECT + \sum_{i=1}^{p} \beta_i \Delta LY_{t-1} + \sum_{j=0}^{q} \gamma_j \Delta LX_{t-j} + \sum_{k=1}^{r} \delta_k \Delta LTOT_{t-k} + \varphi D + \varepsilon_t \tag{4}$$

where λ is the speed of adjustment toward the long-run equilibrium. The coefficient β_i,γ_j, and δ_k are expected to capture the short-run dynamics.

The grid search method for selecting the order p, q and r starts from the most parsimonious ARDL(1,1,1). If the ARDL(1,1,1) does not show serial correlation at the 5% level using LM serial correlation test, the model is suitable for testing for cointegration. However, if the serial correlation is present, the number of lagged differences will increase. The search continues for all combinations of p, q, and r until a model that is free of serial correlation is detected.

3. Estimations and Empirical Results

3.1 Data

The data in the analysis are obtained from *IMF International Financial Statistics* and the *Bank of Thailand*. The quarterly data on nominal GDP, GDP deflator, nominal total exports, and unit values of exports and imports are obtained from IMF International Financial Statistics, while the quarterly data on manufacturing exports are obtained from the Bank of Thailand. The data sample covers the period from 1993Q1 to 2008Q4, except for the data on manufacturing exports that cover the period from 1995Q1 to 2008Q4.[3] The variable for real GDP is computed as the ratio of nominal GDP to GDP deflator multiplied by 100. The quarterly nominal total exports are deflated by unit value of exports (the proxy for export price) to obtain real total exports. Similarly, real manufacturing exports are obtained by deflating nominal manufacturing exports

[3] This is due to the availability of the data that makes the sample sizes different.

by the unit value of exports. The data for terms of trade are computed as the ratio of unit value of exports and imports. All series are transformed to logarithm.

3.2 Unit Root Tests

Augmented Dickey-Fuller (ADF) and Phillips and Perron (PP) tests are carried out to determine the order of integration of each series used in the analysis so as to determine the appropriate approach of cointegration technique being used. The results of unit root tests are reported in Table 1. The variables to be tested for unit root at level and first difference are LY (log of real GDP), LXT (log of real total exports), LMX (log of real manufacturing exports), and LTOT (log of terms of trade).

The two popular unit root tests do not seem to give the same results. The variable LY is integrated of order one, I(1), by the PP test, but is not I(1) by the ADF test with a constant and a linear trend. Similarly, LXT is I(1) by the ADF and PP tests with a constant only, and is weakly integrated of order zero, I(0), by the PP test with a constant and a liner trend. For LXM, the ADF test with a constant and the PP tests indicate that the series is I(1), but the ADF test with a constant and a linear trend indicates that it is I(0). Therefore, it can be concluded that there exists a complex nature of time series in the data set. The variable that is I(1) series is LTOT. The results of unit root tests reject the use of Engle-Granger and Johansen cointegration tests.

Table 1 Results of Unit Root Tests

Variable	ADF Stat. (constant)	ADF Stat. (constant and trend)	PP Stat. (constant)	PP Stat. (constant and trend)
LY	-0.351 [10]	-2.773 [9]	-0.934 [26]	-3.304 [9]
	(0.910)	(0.213)	(0.771)	(0.132)
ΔLY	-2.853 [5]	-2.788 [5]	-9.092 [20]	-8.880 [20]
	(0.57)*	(0.208)	(0.000)***	(0.000)***
LX	-0.582 [6]	-3.122 [4]	-1.147 [5]	-3.354 [1]
	(0.866)	(0.111)	(0.569)	(0.067)*
ΔLX	-3.149 [5]	-3.050 [5]	-10.474 [10]	-
	(0.029)**	(0.128)	(0.000)**	
LXM	-1.121[13]	-4.220 [12]	-1.743[9]	-6.472 [5]
	(0.707)	(0.005)***	(0.408)	(0.000)***
ΔLXM	-3.731 [12]	-	-3.433 [5]	-
	(0.005)***		(0.011)	
LTOT	-1.466 [0]	-1.672 [0]	-1.424 [5]	-1.630 [3]
	(0.544)	(0.752)	(0.565)	(0.770)
ΔLOT	-7.732 [0]	-7.715 [0]	-7.756 [6]	-7.745 [7]
	(0.000)***	(0.000)***	(0.000)***	(0.000)***

Note: The number in bracket is the optimal lag length determined by AIC for ADF tests and the optimal bandwidth determined by Bartlet kernel for PP tests. Probability of accepting the null of unit root is in parenthesis. ***, **, and * denotes significance at the 1, 5 and 10 percent respectively.

3.3 Results from Cointegration Test

The results of bounds testing for cointegation are obtained by estimation of the ARDL model with financial crisis dummy (D).[4] The ARDL(p, q, r) model using the grid search method are

[4] The dummy variable takes the value of one after the second quarter of 1997 and zero otherwise.

ARDL (4,2,1) for both the real total and manufacturing exports equations without serial correlation, i. e., $\chi^2_{(2)}$=1.582 (p=0.453) and $\chi^2_{(2)}$=3.181 (p=0.204) repectively. By adding lagged level of the three variables to the ARDL(4,2,1) model, the computed F-statistics for total exports and manufacturing exports equations are 8.484 and 8.846 respectively. The upper bound critical value is 4.35 while the lower bound critical value is 3.23 (from Table CI(iii) Case III in Pesaran, et al. (2001). Since the computed F-statistics are above the upper bound critical value, there exist cointegrating equations. Table 2 illustrates two estimated cointegrating equations. Panel A shows the long-run relationship between real GDP, terms of trade, and real total exports while Panel B shows the long-run relationship between real GDP, terms of trade, and real manufacturing exports.

The results show that an increase in real total exports by one percent will cause real GDP to grow by 0.510 percent. Similarly, an increase in real manufacturing exports by one percent will lead to an increase in real GDP by 0.469 percent. The coefficients of the terms of trade variables in both equations are significantly positive. An increase in terms of trade by one percent will cause real GDP to increase 0.362 percent in the total exports equation and 0.493 percent in the manufacturing exports equations.

Table 2 Estimates of the Long-run Relationship

Panel A: Total Exports

LY_t = 1.164* + 0.510***LXT_t + 0.362**$LTOT_t$

(1.781) (13.880) (2.443)

R^2 = 0.887, F = 238.859

The number of observations is 64.

Panel B: Manufacturing Exports

LY_t = 1.361 + 0.469***LXM_t + 0.493***$LTOT_t$

(1.410) (12.998) (2.984)

R^2 = 0.850, F = 149.859

The number of observations is 56.

Note: The number in parenthesis is t-statistic of OLS estimates of equation (3). *** , and ** denote significance at the 1 and 5 percent level respectively.

Short-run Dynamics

The existence of cointegrating relations suggests that one can estimate the coefficient of an error-correction term (ECT) from equation (4). The estimates of short-run dynamics are shown in Table 3.

The coefficient λ in Panel A of Table 3 is -0.289, which is significant at the 1 percent level while that of Panel B is -0.337, which is also significant at the 1 percent level. Since the absolute value of the coefficient λ is less than one, any deviation from the long-run equilibrium will be corrected. The estimated equations confirm the existence of the long-run causality running from real exports to real GDP in both estimated equations. In the short-run, causality cannot be witnessed because of the insignificant coefficients of lagged changes in exports and terms of trade that affect real GDP. However, the positive relationship between exports growth and GDP growth and between a change in terms of trade and economic growth can be observed in both equations.

Table 3 Estimates of Short-Run Dynamics Model

Panel A: Real Total Exports

$$\Delta LY_t = 0.026^{**} + 0.100\Delta LY_{t-1} - 1.164\Delta LY_{t-2} - 0.125\Delta LY_{t-3} + 0.387^{***}\Delta LY_{t-4}$$
$$(2.890) \quad (0.891) \quad (-1.517) \quad (-1.125) \quad (3.459)$$
$$+ 0.180^{**}\Delta LXT_t + 0.119\Delta LXT_{t-1} - 0.077\Delta LXT_{t-2} + 0.351^{**}\Delta LTOT_t$$
$$(2.330) \quad (1.243) \quad (-0.871) \quad (2.114)$$
$$+ 0.168\Delta LTOT_{t-1} - 0.026^{**}D - 0.289^{***}ECT + u_{1t}$$
$$(0.998) \quad (-2.789) \quad (-3.750)$$

$R^2 = 0.773$, $F = 11.151$

Panel B: Real Manufacturing Exports

$$\Delta LY_t = 0.029^{***} + 0.263^{**}\Delta LY_{t-1} - 0.099\Delta LY_{t-2} + 0.054\Delta LY_{t-3} + 0.498^{***}\Delta LY_{t-4}$$
$$(2.705) \quad (2.037) \quad (-0.843) \quad (0.463) \quad (2.568)^{**}$$
$$+0.156^{**}\Delta LXM_t + 0.129\Delta LXM_{t-1} + 0.084\Delta LXM_{t-2} + 0.442^{**}\Delta LTOT_t$$
$$(2.076) \quad (1.450) \quad (1.000) \quad (2.560)$$
$$+ 0.263\Delta LTOT_{t-1} - 0.035^{***}D - 0.337ECT + u_{2t}$$
$$(1.632) \quad (-2.738) \quad (-3.999)$$

$R^2 = 0.782$, $F = 13.393$

Note: The ECT is the one-period lagged error term from the long-run equation in equation (3). The number in parenthesis is t-statistic. ***, and ** denote significance at the 1 and 5 percent respectively.

4. Conclusion

There is still a debate among economists regarding the validity of the export-led growth strategy. The present paper uses time series analysis to examine how real exports affect real GDP in Thailand. Using bound testing for cointegation in a multivariate framework, the results suggest that there is a positive long-run relationship between real GDP and real exports (both total and manufacturing). There is also a positive relationship between the growth rates of real total and real manufacturing exports and the growth rate of real GDP. Additionally, there exists long-run causation running from real exports to real GDP. Therefore, it can be concluded that the export-led growth hypothesis is valid for Thailand.

The policy implication of the results from this study is that deliberate policy measures that can stimulate production for exports will be growth enhancing for Thailand. However, it should be recognized that reliance on exports can make the country vulnerable to external shocks, which the country used to experience from the 1997 financial crisis. A sustainable growth of the country can be maintained by the appropriate outward-oriented strategy. A switch from this strategy can substantially harm the economy in terms of economic growth.

References

Amed, J. and S. Harnhirun (1995) "Unit Roots and Cointegration in Estimating Causality between Exports and Economic Growth: Evidence from the ASEAN Countries" *Economics Letters* **49**, 329-334.

Awokuse, T. O. (2003) "Is the Export-led Growth Hypothesis Valid for Canada?" *Canadian Journal of Economics* **36**, 126-136.

Bahmanee-Oskooee, M. and J. Alse (1993) "Export Growth and Economic Growth: An Application of Cointegration and Error Correction Modelling" *Journal of Developing Areas* **27**, 535-542.

Balassa, B. (1978) "Exports and Economic Growth: Further Evidence" *Journal of Development Economics* **5**, 181-189.

Chandra, R. (2003) "Reinvestigating Export-led Growth in India Using a Multivariate Cointegration Framework" *Journal of Developing Areas* **37**, 73-86.

Chow, G. C. (1987) "Causality between Exports and Industrial Performance: Evidence from NICs" *Journal of Development Economics* **26**, 55-63.

Colombatto, E. (1990) "An Analysis of Exports and Growth" *Kyklos* **43**, 579-597.

Dhawan, U., and B. Biswal (1999) "Re-examining Export-led Growth Hypothesis: A Multivariate Cointegration Analysis for India" *Applied Economics* **31**, 525-530.

Gonclaves, R. and J. Richtering (1986) "Export Performance and Output Growth in Developing Countries" *UNCTAD Discussion Peper No.* **17**. Geniva.

Hsiao, M. W. (1987) "Test of Causality and Exogeneity between Exports and Economic Growth: the Case of Asian NICs" *Journal of Development Economics* **12**, 143-159.

Husein, J. (2009) "Export-led Growth Hypothesis: A Multivariate Cointegration and Causality Evidence from Jordan" *Journal of Developing Areas* **42**, 253-266

Jung, W. S. and J. P. Marshall (1985) "Exports, Growth and Causality in Developing Countries" *Journal of Development Economics* **18**, pp. 1-12.

Love, J. and R. Chandra (2005) "Testing Export-led Growth in Bangladesh in a Multivariate Framework" *Journal of Asian Economics* **14**, 1155-1168.

Martin, D. (1992) "Is Export-led Growth Hypothesis Valid for Industrialized Countries?" *Review of Economics and Statistics* **74**, 678-688.

Michaely, M. (1977) "Exports and Growth: An Empirical Investigation" *Journal of Development Economics* **40**, 49-59.

Medina-Smith, E. J. (2000) "Is the Export-led Growth Hypothesis Valid for Developing Countries?: A Case Study of Costa Rica" *United Nations Conference on Trade and Development*, Policy issues in international trade and commodities, Study Series No. **7**.

Pesaran, M. H, Y. Shin, and R. J. Smith (2001) "Bound Testing Approaches to the Analysis of Level Relationships" *Journal of Applied Econometrics* **16**, 289-326.

Rangasamy, L. (2009) "Exports and Economic Growth: the Case of South Africa" *Journal of International Development* **21**, 603-617.

Todaro, M. P. (1997) *Economic Development*, Addison-Wesley, London.

Wong, H-T. (2008) "Exports and Domestic Demand: Some Empirical Evidence in ASEAN-5" *Labuan Bulletin of International Business and Finance* **6**, 39-55.

World Bank (1993) *East Asia Miracle: Economic Growth and Public Policy*, Oxford University Press, London.