

## EXPORTS AND ECONOMIC GROWTH: The Causality Test for ASEAN Countries

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### *Abstract*

*This study proposes to investigate the causality between exports and economic growth in the ASEAN countries over the periods 1966–2000. The role of the export variable in the investigation of economic growth is emphasized. Using the Johansen cointegration procedures test indicate that there is cointegration between export and economic growth in Indonesia and Singapore, while the Granger causality test shows that there is feedback or bi-directional causality between exports and economic growth only in Indonesia and Philippines.*

**JEL classification:** C22; F14; F43;

**Keywords:** export; economic growth; cointegration; causality test.

### **INTRODUCTION**

There is an increasing interest in the relationship between export and economic growth. Theoretically, it has been argued that a change in export rates could change output of production. Export growth, therefore, is often considered to be a main determinant of the production and employment growth of an economy which is shown in Gross Domestic Product (GDP) growth (Ramos, 2001). He suggests that the hypothesis of export-led growth (ELG) is substantiated by the following four arguments. First, export growth leads, by the foreign trade multiplier, to an expansion of production and employment. Second, the foreign exchange made available by export growth allows the importation of capital goods, which, in turn, increase the production potential of an economy. Third, the volume of and the compet-

ition in exports markets cause economies of scale and an acceleration of technical progress in production. Fourth, given the theoretical arguments mentioned above, the observed strong correlation of export and production growth is interpreted as empirical evidence in favour of the ELG hypothesis.

There are three possible relationships between exports and GDP. These are export-led growth, growth-driven exports, and the feedback of two-way causal relationship. The exporting countries with a large share of their output grow faster than others. The growth of exports has a stimulating influence across the economy as a whole in the form of technological spillovers and other externalities considers how export shocks can produce export-led growth (Buffie, 1992).

In contrast to the export-led growth hypothesis, scholars have noted that an increase in GDP generally leads to a corresponding expansion of trade, unless the pattern of growth-induced supply and corresponding demand creates an anti-trade bias. Recently, the most interesting economic scenarios suggest a two-way causal relationship between growth and trade. Increased trade produces more income (increased GDP), and more income facilitates more trade- the result being like a “virtuous circle”. Therefore, the aim of this paper is to forward an additional evidence on those hypotheses using the ASEAN data.

The paper is organized as follows. In the following section contains literature review. In section 3, the methodology and the data are presented. Section 4 presents the empirical results, and in the last section, conclusions and implications are presented.

#### LITERATURE REVIEW

Several recent empirical studies that use Granger-type causality tests have not been particularly supportive of a positive causal relation running from export to economic growth. For examples, Jung and Marshall (1985) run such tests on data for 37 developing countries for the period 1951-1981. They found evidence of unidirectional exports to growth causality for only four countries. Exports-lead-growth causality only appears in one country out of eight newly industrializing economics, bi-directional causality for six, and no causal link for one (Chow, 1987). Further, Hsiao (1987) shown that Granger tests causality confirmed no causal relation between exports and GDP for four Asian newly industrializing economies, except Hong Kong, where unidirectional causality run from GDP to exports.

Other researchers, like Kwan and Cotsomotis (1991) found bi-directional causality between exports and economic growth in China for the period 1952-1988 and no

causality for the sub-period 1952-1978. Ahmed and Kwan (1991) found no causal link from exports to growth in cross section study of 47 African countries, and weak evidence of causality from economic growth to exports, using data for the period 1981-1987. Amoateng and Amoaku-Adu (1996) found that there was feedback or bi-directional causality between external debt servicing, economic growth and exports of 35 African countries. Ahmad and Harnhirun (1995) found that only Singapore exists a bi-directional, feedback relationship between exports and economic growth in ASEAN countries. Thornton (1995) found that real exports and real GDP in Mexico over 1895-1992 were cointegrated and there was a significant and positive Granger-causal relationship running from exports to economic growth. More recently, Ramos (2001) reported that there was a feedback effect between exports-output growth and imports-output growth in the Portuguese economy over 1865-1998.

The purpose of this paper is to investigate the relationship between exports and economic growth (GDP) in the ASEAN countries, namely Indonesia, Singapore, Malaysia, Thailand, and the Philippines over the period 1966-2000. These countries are employed because, like other countries in Asia, they have pursued aggressive export promotion policies and some have witnessed rapid economic growth. In order to test for the existence of a long run or trend relationship between exports and GDP, the theory of causality and cointegration developed by Engle and Granger (1987) and Johansen (1988) will be applied.

#### METHODOLOGY AND DATA

This study employs Engle’s and Granger’s causality test to analyse the relationship between exports and economic growth (GDP growth). Engle and Granger (1987) show that when time series are cha-

acterized by non-stationarity, cointegration is particularly appropriate statistical technique. If two series are integrated of order 1, namely I(1), then Granger causality must exist in at least one direction in the I(0) variables. In the case where two series are cointegrated I(1), a Vector Autoregressive (VAR) model can be constructed in terms of the levels of the data or in terms of their first differences with the addition of an error correction term to capture the short-term dynamics and to reduce the possibility of identifying spurious causality.

To test the cointegration and causality, the procedure involves three steps. First, we test the order of integration of the natural logarithm of the levels of the real exports (X) and real GDP (Y). This step can be done by computing the augmented Dickey-Fuller (ADF) test statistics. ADF is used to test the presence of unit roots under the alternative hypothesis that the time series in question is stationary around a fixed time trend. The second step is to test for cointegration using the Johansen (1988) maximum likelihood approach. If cointegration exists, the either unidirectional or bi-directional Granger causality exist in at least the I(0) variables. The third step is to carry out a standard Granger causality test to know the long-run cointegrating relationship between exports and economic growth. For valid inferences to be derived, such tests need to be undertaken on I(0) variables. Assuming the levels of real GDP and real exports are I(1) (and cointegrated), the appropriate formulations of a Granger-type test of causality are:

$$\ln Y_t = \alpha_0 + \sum_{i=1}^m \alpha_i \ln Y_{t-i} + \sum_{i=1}^m b_i \ln X_{t-i} + \varepsilon_t \dots 1$$

$$\ln X_t = \gamma_0 + \sum_{i=1}^m \beta_i \ln X_{t-i} + \sum_{i=1}^m d_i \ln Y_{t-i} + \mu_t \dots 2$$

where Y is the growth rate of real GDP measured as  $\ln(GDP_t / GDP_{t-1})$  and X is growth rate of real export of goods and services measured as  $\ln(Export_t / Export_{t-1})$ ,  $\varepsilon_t$

and  $\mu_t$  are zero-mean, serially uncorrelated random error terms.

The hypothesis that export causes economic growth, if supported by the data, should imply that null hypothesis of

$\sum_{i=1}^m b_i = 0$  should be rejected by the calculated F-value when X is excluded in the restricted form of equation (1). If there is bi-

directional causality then  $\sum_{i=1}^m b_i \neq 0$  and

$\sum_{i=1}^m d_i \neq 0$ . To implement the Granger

causality test, F-statistics values are calculated under the null hypothesis that in equations (1) and (2) all the coefficients of  $b_i$  and  $d_i = 0$ . Because the results from Granger-causality test are sensitive to the selection of lag length, results are presented using the minimum final prediction error (FPE) criterion suggested by Akaike (1969) to determine the appropriate lag length. This study used optimal lags for each variable. The F-value is calculated as:

$$F_{(m, n-2m-1)} = \frac{(ESS_R - ESS_U) / m}{ESS_U / (n - 2m - 1)} \dots \dots \dots 3$$

where  $ESS_R$  and  $ESS_U$  are the sum of squared residuals for the constrained and unconstrained causality regressions respectively,  $n$  is the total number of observations and  $m$  is the number of lags per variable.

The data used in this study are annual series data for the years 1966-2000 taken from the International Monetary Fund annual reports for the years 1991 and 2001. The series are on real exports and real gross domestic product.

**EMPIRICAL RESULTS**

Before testing for causality, the stationary of the variables were checked by means of Augmented Dickey-Fuller (ADF) test. Table 1 presents the ADF test statistics

for the log levels and first differences of the logs of real GDP and real exports, respectively. From the result, all variables are non-stationary in their level form. It means the null hypothesis that the levels of the series contain unit roots cannot be rejected. Accordingly, the unit root tests are

re-run on first-differenced data and the results reject the hypothesis of a unit root. Thus, the stationary property is found in the first-differencing level of the variables. On the other words, it means that in level form the series are I(0) but in first difference form they are I(1).

**Table 1. The ADF Results of the Unit Root Test**

Variables Difference	Level	From	First
Indonesia			
Exports		-2.5193	-6.6853*
Economic growth (GDP)		-2.7446	-12.7724*
Singapore			
Exports		1.9836	-4.7663*
Economic Growth (GDP)		2.6173	-6.2178*
Malaysia			
Exports		0.6879	-4.8720*
Economic Growth (GDP)		-0.2476	-4.1462*
Thailand			
Exports		0.2268	-3.6336*
Economic Growth (GDP)		-1.2942	-5.0591*
The Philippines			
Exports		0.2099	-6.6301*
Economic Growth (GDP)		-1.2702	-4.1975*

Note: \* Significant at the 5% level.

**Table 2: Tests for cointegration between exports and economic growth using the Johansen's procedure**

Countries	Eigenvalue	Likelihood Ratio	5% Critical Value	1% Critical Value
Indonesia	0.3017	16.5674*	15.41	20.04
Singapore	0.2890	15.8724*	15.41	20.04
Malaysia	0.1648	3.3369	15.41	20.04
Thailand	0.1589	7.1238	15.41	20.04
The Philippines	0.1587	9.8290	15.41	20.04

Note: \*denotes that a test statistics is significant at the 5%, means there is cointegration between exports and economic growth.

**Table 3: The result of Granger's causality test**

Countries	F-statistic	Probability
Indonesia LXPT → LGDP LGDP → LXPT	21.0763*) 12.5728*)	1.9E-06 0.00011
Singapore LXPT → LGDP LGDP → LXPT	7.6937*) 0.6599	0.00201 0.52420
Malaysia LXPT → LGDP LGDP → LXPT	0.0747 1.1390	0.92817 0.33359
Thailand LXPT → LGDP LGDP → LXPT	0.3392 1.3518	0.71504 0.27409
The Philippines LXPT → LGDP LGDP → LXPT	3.3940*) 6.2390*)	0.04691 0.00542

Note: \* denotes significant at the 5% level.

LXPT = Ln export; LGDP = Ln Gross Domestic Product

Table 2 presents the results of the Johansen cointegration test. The figures show that this study is able to reject the null hypothesis of non-cointegration only in the case of Indonesia and Singapore, where Likelihood ratios of these countries are more than F-critical value. In the case of other countries, there appears to be no cointegration evidence. In other words, there is no common trend in the movement of the two variables (exports and economic growth). Therefore, any search for causality in the case of countries other than Indonesia and Singapore are unwarranted and can obtain a misleading inference.

Table 3 presents the results of the Granger causality test for ASEAN countries. The results indicate that Indonesia and Philippines have two-way causal relationship or bi-directional relationship between exports-economic growth and economic growth-exports. It means exports Granger-cause economic growth, in turn, economic growth Granger-cause exports. The results also reveal that an increase in exports is as-

sociated with an appreciation of the economic growth and vice versa. While, only Singapore has unidirectional causality running from exports to economic growth (LXPT to LGDP) where F-value 7.6937 is significant at the 5% level and thus supported growth hypothesis. However, the F-statistics from the Granger-causality test suggest that no causality between exports and economic growth in Malaysia and Thailand.

### CONCLUSIONS

The main objective of this study is to test empirically the causality relationship between export and economic growth (GDP) in the case of ASEAN countries over the period 1966-2000. The existence of this relationship has been analysed using a co integration and causality framework. The results of the tests for co integration indicate that: first, exports and economic growth are integrated in Indonesia and Singapore. This conclusion implies that there exists a long-run relationship between exports and economic growth. While in others countries

there exist a short run relationship between exports and economic growth. Second, there is two-way causality relationship between exports and economic growth in Indonesia and the Philippines. While, In Singapore there is only unidirectional causality running from exports to economic growth. However, there is no causality between exports and economic growth in Malaysia and Thailand countries directly. The policy implications of this study are not optimistic for the hy-

pothesis of export-led growth in the ASEAN region. As the results for Indonesia, Singapore, and the Philippines there is evidence of a growth pattern in which internally generated mechanism and the growth of exports interact with economic growth. The government policy of these countries will be different from Malaysia and Thailand which no causality relationship between exports and economic growth directly.

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