

# **Exports and Economic Growth**

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### **Abstract**

Utilizing unit root and cointegration techniques, we find out of 96 countries only 8 show unidirectional or bidirectional causality from exports to GDP with positive relationship between the two variables. Causality from GDP to Exports with positive relationship between the two variables is found for only 9 countries.

## **EXPORTS and ECONOMIC GROWTH**

### **1. Introduction**

Economic development is one of the main objectives of every society in the world and economic growth is fundamental to economic development. There are many contributors to economic growth. Export is considered as one of the very important contributors among them. There are also some concerns about the trade, especially between the primary and industrial goods exporting countries where the terms of trade are deteriorated against the poorer countries.

Although most of the empirical work support the export led economic growth hypothesis, there is no overall consensus on this issue. While some economists (Krueger, 1978; Chenery, 1979; Tyler, 1981; Kavoussi, 1984; Balassa, 1985; Ram, 1985, 1987; Chow, 1987; Fosu, 1990; and Salvatore and Hatcher, 1991) seem to generally agree that exports benefit economic growth, others ( Jung and Marshal, hereafter referred as JM,1985; Kwan and Cotsomitis, 1990; Ahmad and Kwan, 1991; Dodaro, 1993; Oxley, 1993; Yaghmaian, 1994; and Ahmad and Harnhirum, hereafter referred as AH, 1995) did not find much support to the export led economic growth hypothesis.

Most of the empirical studies have been conducted on the basis of intercountry cross-section data sets but there are large differences between economic and demographic structures of different countries. According to Ram (1987), even if the

sample of countries chosen seems homogeneous, using cross-sectional analysis, it is hard to unveil the important parametric differences across countries. The statistical methodologies employed by researchers who used time series data have concentrated upon simple Granger-type tests assuming that data on variables are stationary (for example Chow, JM, and Ram). But it is now well known fact that many macroeconomic time series are not stationary and contain unit roots and give rise to many econometric problems. The possibilities of spurious regression relationships among variables exist unless an appropriate statistical test of long run relationship takes into account important characteristics of time series data. The time series on the variables in the model should be tested for their long run relationship prior to testing for causality between them.

JM conducted their study with time series data for 37 countries for the period of 1950-1981. They found evidence for exports promoting economic growth in only four countries. Chow's sample includes 8 NICs and data for the 1960s and 1970s. He found bidirectional causality in Brazil, Hong Kong, Israel, Korea, Singapore, and Taiwan, unidirectional causality in Mexico and no causality in Argentina. Ram used data for 88 countries for the period of 1960-1982. For more than 80 percent of the countries, he found positive correlation between exports and economic growth. Oxley conducted his study only for Portugal, using data from 1865 to 1985 and rejected exports led economic growth hypothesis but on the other hand found

causality from income growth to export growth. AH for their study of ASEAN countries used data for the period of 1966 to 1990. The data did not generally support the exports growth link. Singapore is the only single country where they found bidirectional causality between exports and economic growth.

Although Oxley and AH took into consideration appropriate methodologies to test the long run relationships between exports and economic growth, their studies focussed only on a very few countries. The purpose of this study is to test whether there is any evidence for exports led economic growth hypothesis using data for 96 countries for the period of 1960 to 1992, utilizing the time series techniques.

## **2. Methodology**

The concept of causality due to Granger (1969) is appropriate and used by most of the studies for testing the relationship between economic growth and exports. According to the Granger causality approach a variable Y is caused by X, if Y can be predicted better from past values of Y and X than from past values of Y alone. Four patterns of causality can be distinguished: (a) unidirectional causality from X to Y; (b) unidirectional causality from Y to X; (3) feedback or bi-directional causality; and (d) no causality.

For a simple bivariate model, the pattern of causality can be identified by estimating regression of Y and X on all the relevant variables including the current

and past values of X and Y respectively and by testing the appropriate hypothesis.

By using the following model the causality between two variable can be tested.

$$Y_t = b_0 + a_0X_t + \sum_{j=1}^m a_jX_{t-j} + \sum_{i=1}^n b_iY_{t-i} + u_t \quad (1)$$

$$X_t = c_0 + d_0Y_t + \sum_{i=1}^n c_iX_{t-i} + \sum_{j=1}^m d_jY_{t-j} + v_t \quad (2)$$

where  $u_t$  and  $v_t$  are mutually uncorrelated white noise series. Testing the null hypothesis that  $a_j=d_j=0$  for all  $j$  ( $j=0,1,\dots,m$ ) against the alternative hypothesis that  $a_j \neq 0$  and  $d_j \neq 0$  for at least some  $j$ s will determine the direction of the relationship between X and Y.

Before conducting the causality test we need to ensure that variable series are stationary individually and cointegrated together. A series  $X_t$  is said to be integrated of order  $d$  denoted by  $X_t \sim I(d)$  if it becomes stationary after differencing  $d$  times and thus  $X_t$  contains  $d$  unit roots. A series which is  $I(0)$  is said to be stationary. To determine whether a series is stationary or non stationary, unit root test developed by Fuller(1976) and Dickey and Fuller (1981) is used. The Augmented Dickey Fuller test (ADF) is based on the estimation of the following regression.

$$\Delta X_t = a_0 + a_1t + a_2X_{t-1} + \sum_{i=1}^k \Delta \alpha_i X_{t-i} + e_t \quad (3)$$

where  $\Delta$  is the first difference operator,  $t$  is the linear time trend and  $e_t$  is the normally distributed term. In (3) the null hypothesis  $H_0 : \alpha_2 = 0$  against the alternative hypothesis  $H_1 : \alpha_2 \neq 0$  is tested by comparing the calculated t-ratio of  $\alpha_2$  with the critical value from table. If calculated t-ratio is less than the critical t value, then the null hypothesis of unit root (non-stationarity) is rejected. In this case the level of time series  $X_t$  is characterized as integrated of order zero i.e.  $I(0)$ . If it is found that the individual time series in equation (3) are integrated of order one,  $I(1)$ , and hence non-stationary, the next step is to examine the cointegration among the series. A set of variables is said to be cointegrated if a linear combination of their individual integrated series  $I(d)$  is stationary. This procedure needs an estimation of the cointegrating regression of the form (1) or (2) and testing whether the residual series  $u_t$  or  $v_t$  are stationary. If they are stationary, then the variables are said to be cointegrated and hence interrelated with each other in the long run.

If the series are found cointegrated, then we construct standard Granger causality tests by augmenting with an appropriate error correction term derived from the cointegration equation. If the series were  $I(1)$ , the Granger causality tests are applied after taking their first differences and with that (1) and (2) take the form

$$Dy_t = b_0 + a_0DX_t + \sum_{j=1}^m a_jDX_{t-j} + \sum_{i=1}^n b_iDY_{t-i} + \delta ECT_{t-1} + u_t \quad (4)$$



$$DX_t = c_0 + d_0DY_t + \sum_{i=1}^n c_iDX_{t-i} + \sum_{j=1}^m d_jDY_{t-j} + \delta ECT_{t-1} + v_t \quad (5)$$

where D denotes the first difference of the variables and  $ECT_{t-1}$  is the error correction term lagged one period derived from the cointegration equation. The lag length m and n is 2 unless otherwise mentioned.

For ADF, cointegration and causality tests, we used Econometric Views (EV) software package. ADF tests were tried with constant and trend terms, with constant only, and without constant and trend terms. For the cointegration tests, we tried five options in EV and the reported results are pertaining to those for which we found cointegration between government expenditure and GDP.

The data used for this study are taken from World Data available on CD-ROM from the World Bank (1994). Values for GDP and exports of goods and non factor services are in constant local market prices for the years 1960 to 1992. In a few cases the period covered is different from 1960-1992. In such cases the actual period is shown with or below the name of the country. The variables used are: LGDP = log of GDP per capita; LEX = log of share of Exports of goods and non factor services in GDP.

### **3. Empirical Results**

A major short-coming in most of the previous studies is that they presumed that

the variables they used are stationary, but recent development in the field of econometrics showed that most of the macroeconomic series are non-stationary. The inferences drawn from such regressions are unreliable if the variables are not stationary or are integrated of different orders, thus it is important to check for the stationarity and orders of integration of the variables GDP (LGDP) and exports (LEX) being used before examining the long run relationship between them.

### **3.1. Order of integration**

Out of 96 countries, LGDP and LEX are integrated of different orders for 35 countries. These are: Australia, Benin, Canada, Chad, Colombia, Congo, Dominican Republic, Ethiopia (1960-86), Fiji (1960-85), Gabon, Gambia (1960-91), Greece (1960-91), Hong Kong, Iceland, Indonesia, Japan, Korea, Libya (1960-81), Lesotho, Liberia (1960-86), Malawi, Mali, Malta (1960-89), New Zealand, Panama, Papa New Guinea (1960-91), Rwanda, Singapore (1975-92), Somalia, South Africa, Sudan, Tanzania (1960-80), Uruguay, USA, and Zaire (1960-90). Both variables are integrated of order I(0) and I(1) i.e. they are stationary in levels and after taking first difference respectively for all countries except Colombia, Liberia, Malta, and Singapore. For Colombia, Liberia and Malta LGDP is I(2), i.e. stationary after second difference and for Singapore LEX is I(2). LGDP is I(1) for 20 countries and I(0) for 12 countries,

whereas LEX is I(1) for 14 and I(0) for 20 countries. There are 7 developed, 3 Newly industrializing, and the rest of them developing countries in this group. There are no further tests of cointegration and causality for these countries, because the results of those tests would generate inconsistent parameters (Philips, 1980, and Dickey, Jansen and Thornton, 1991). For the other 61 countries GDP and exports are integrated of the same order, I(0) or I(1).

### **3.2. Cointegration**

It is also important to test for long run relationship between variables before testing for causality so the next step of our analysis is to test for cointegration, using Johansen

cointegration test for those 61 countries for which the two variables are integrated of the same order. There are 30 countries, for which LGDP and LEX are integrated of the same order of I(1) but there is no long run relationship between them. The results of those regressions have no meanings, which use variables even of the same integrated order but without long run relationship. There is no causality test conducted for these 30 countries. These are: Afghanistan, Argentina, Bangladesh, Brazil, Chile, Central Africa, Guyana (1960-91), Haiti, Honduras, India, Kenya, Kuwait (1962-88), Madagascar, Myanmar, Mauritius, Mexico, Nicaragua, Niger, Nigeria, Norway, Paraguay, Peru, Philippines, Portugal, Sierra Leone (1964-92), Spain, Sri Lanka, Trinidad (1960-91), U.K and Zambia.

There are only 31 countries which show long run relationship between GDP and

exports. The results of cointegration tests for 20 of them which show causality between the two variables are reported in Table 1. The stars \*, \*\*, \*\*\* show statistical significance level at 1, 5, and 10 percent respectively, and c and t shows constant and trend terms respectively, if they are significant in ADF test. Constant and trend coefficients are for those countries, for which these terms are used in their cointegration equations. GDP and exports are integrated of I(1) for all these countries except Belgium, El-Salvador, France, Mauritania, and Senegal for whom they are I(0). There is no cointegration test for 5 countries for whom the two variables are I(0) because variables stationary in levels are supposed to be cointegrated. Relationship between GDP and Export is positive for 18 and

Table 1

Results of ADF, Cointegration, and Causality tests on LGDP and LEX for 20 countries exhibiting causality

Unit root test		Cointegration test					Causality test P. values(Wald test)	
Country	LGDP	LEX	Max.Eign Test L.R. values	LEX	Constant	Trend	LGDP- LEX	LEX- LGDP
Belgium	I(0) <sup>***,c</sup>	I(0) <sup>*</sup>					no	yes <sup>*</sup>
Bolivia	I(1) <sup>***</sup>	I(1) <sup>*</sup>	27.76 <sup>*</sup>	3.75 (2.88)	8.82		yes <sup>**</sup>	no
Burundi	I(1) <sup>*,c</sup>	I(1) <sup>*</sup>	22.80 <sup>**</sup>	2.62 (0.74)	-4.34		yes <sup>***</sup>	no
Cameroon	I(1) <sup>***</sup>	I(1) <sup>*</sup>	16.19 <sup>**</sup>	-1.10 (0.21)	-13.42		yes <sup>***</sup>	yes <sup>*</sup>
Cote d'Ivoire	I(1) <sup>*,c,t</sup>	I(1) <sup>*</sup>	20.33 <sup>*</sup>	1.63 (0.31)	-10.76		yes <sup>*</sup>	no
Costa Rica	I(1) <sup>**</sup>	I(1) <sup>***,c</sup>	24.34 <sup>**</sup>	-0.60 (0.09)	-8.89		no	yes <sup>**</sup>
Egypt	I(1) <sup>*,c</sup>	I(1) <sup>*</sup>	12.99 <sup>**</sup>	3.97 (0.09)			yes <sup>*</sup>	no
El Salvador(3)	I(0) <sup>**,c</sup>	I(0) <sup>*,c</sup>					no	yes <sup>**</sup>
Finland	I(1) <sup>**,c,t</sup>	I(1) <sup>*</sup>	23.74 <sup>**</sup>	-2.79 (1.20)	-14.34		yes <sup>**</sup>	no
France	I(0) <sup>**,c</sup>	I(0) <sup>*</sup>					yes <sup>*</sup>	no
Germany	I(1) <sup>*,c</sup>	I(1) <sup>*,c</sup>	34.63 <sup>*</sup>	-0.87 (0.04)	-11.15		no	yes <sup>**</sup>
Ireland(1)	I(1) <sup>*,c</sup>	I(1) <sup>*,c</sup>	32.75 <sup>*</sup>	-0.89 (0.10)	-9.52		yes <sup>***</sup>	no
Israel(1)	I(1) <sup>*,c</sup>	I(1) <sup>*,c,t</sup>	27.41 <sup>*</sup>	-1.88 (1.02)	-12.05		yes <sup>*</sup>	yes <sup>**</sup>
Luxembour g	I(1) <sup>*,c</sup>	I(1) <sup>*,c</sup>	21.88 <sup>**</sup>	-1.66 (0.18)	-13.32		yes <sup>***</sup>	no
Malaysia	I(1) <sup>*,c</sup>	I(1) <sup>*,c,t</sup>	17.16 <sup>*</sup>	5.80			yes <sup>**</sup>	no
Mauritania	I(0) <sup>***,c</sup>	I(0) <sup>*,c</sup>					yes <sup>**</sup>	no
Pakistan	I(1) <sup>**,c</sup>	I(1) <sup>*</sup>	14.98 <sup>**</sup>	-2.38 (20.21)			no	yes <sup>**</sup>
Senegal	I(0) <sup>**,c,t</sup>	I(0) <sup>***,c</sup>					no	yes <sup>**</sup>
Switzerland	I(1) <sup>**,c</sup>	I(1) <sup>*,c</sup>	24.29 <sup>**</sup>	-1.82 (3.26)	-11.71		yes <sup>*</sup>	no
Turkey	I(1) <sup>**,c</sup>	I(1) <sup>*</sup>	14.94 <sup>**</sup>	-0.27 (2.79)			yes <sup>**</sup>	no

<sup>\*\*\*</sup>, <sup>\*\*</sup>, <sup>\*</sup> denotes significant at 1, 5, and 10 percent respectively, <sup>c</sup> constant, <sup>t</sup> trend, I(0) stationary in

levels

I(1) stationary after first difference, Lag length used for causality test is 2 if otherwise mentioned

in parenthesis with country, Standard errors are in parenthesis under the coefficient of LEX.

negative for 8 countries.<sup>1</sup> All those countries for which relationship between GDP and exports is negative are less developed.

### 3.3. Causality

The next step of our analysis is to test for causality between GDP and exports for those countries for which they are related in the long run. Basic macroeconomic theory suggests that exports promote economic growth especially in the case of poor LDCs, which need foreign exchange to import capital inputs for their domestic production. On the other hand, countries with comparative advantages in certain commodities, produce more than they consume and export their surplus, thus GDP causing exports. The third scenario is possible when GDP and exports causes each other simultaneously due to the reasons mentioned above. Another pattern could emerge when GDP and exports do not cause each other but there are other factors which keep them moving together.

We tested for causality between GDP and exports after confirming that they are of the same integrated order and are related in the long run. Table 1 displays the

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<sup>1</sup> In cointegration equation all variables except the error term remain on the left hand side, therefore the sign with LEX coefficient shows opposite relationship between GDP and exports.

results of those causality tests. For causality test lag length used is 2, unless otherwise mentioned in the table. Causality runs between GDP and exports at least in one direction for 20 countries. There is bidirectional causality for 2 countries. Of those 18 countries with unidirectional causality, 12 show causality from GDP to exports and the other 6 in the opposite direction. Of the 12 countries showing causality from LGDP to LEX, 6 belongs to DCs, one to OPEC and the rest to LDCs, whereas 2 developed countries are in the other group, where causality runs from LEX to LGDP, all others in this group are LDCs. There are 5 countries, for which causality runs from GDP to exports with negative relationship between them, meaning that as GDP grows, exports decline. As Dodaro (1993) argues, it is possible because with increase in income, aggregate domestic demand also increases, leaving less to export.

There are 8 countries, which show unidirectional or bidirectional causality from export to GDP with positive relationship. Contrary to the generally held belief, there are only 8 out of 96 countries, which support exports led economic growth hypothesis. Causality from GDP to exports with positive relationship between them runs for only 9 countries, which suggests that GDP growth promotes exports growth also does not have much support from data. For over wheming, majority of the countries there does not seem to be any kind of causal relationship between GDP and exports. There is no causality found between GDP and exports for 10 countries

even though the two variables are cointegrated. These are: Algeria, Guatemala, Italy, Jamaica, Morocco, Netherlands, Saudi Arabia (1963-81), Sweden, Thailand, Togo, and Tunisia. Among them 3 are DCs, one OPEC and the rest LDCs.

## **5. Concluding Remarks**

There are different opinions among economists about the relationship between exports and economic growth. In an attempt to resolve the difference, we examined causality between exports and economic growth for 96 countries, using data from the World Bank for the period of 1960-1992. While determining the stationarity of the two variables and their orders of integration, we found that GDP and exports are integrated of different orders for 35 countries. Among the other 61 countries, for 30 countries there was no long run relationship between the two variables; 20 countries show causality at least in one direction, with unidirectional causality from GDP to exports for 12, from exports to GDP for 6 and bidirectional causality for 2 countries; and 11 countries do not show any causality between GDP and exports. There are only 9 out of 96 countries which show positive impact of economic growth on exports. Contrary to the common thinking that exports promote economic growth we found that majority of the countries do not show any relationship



between exports and economic growth.

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