Available online at www.elixirpublishers.com (Elixir International Journal)

Economics

Elixir Economics 63 (2013) 18379-18383

ISSN: 2229-712X

Export-led Growth in Iranian Economy

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ARTICLE INFO

Article history:

Received: 10 August 2013;
Received in revised form:
29 September 2013;
Accepted: 7 October 2013;

Keywords

Export-Led Growth,
Causality,
Cointegration,
Iran.

ABSTRACT

The goal of this study is to investigate the relationship between export and economic growth for the Iranian economy over the period of 1966-2006. The study applies several econometric techniques that involve: unit root test, cointegration test, impulse response function (IRF), and Toda & Yamamoto (1995) causality test. The findings of the unit root test indicate that two variables are stationary in their levels. Result of cointegration confirms the existence of the long run relationship between export and growth in Iranian economy. Finally, the finding of Toda and Yamamoto test indicate the bidirectional causality between export and growth.

Introduction

The importance of increasing exports an engine for economic growth has been the matter of considerable debate in the economic development and economic growth literature in many years ago. There are a numerous of reasons within trade theory to support the Export-led-Growth (ELG) hypothesis. Firstly, export growth may represent an increase in demand for the countries output's and thus serves to increase real output. Second, the expansion in exports may promote specialization in the production of export products, which in turn may boost the productivity level and may cause the general level of skills to rise in the export sector. And this may lead reallocation of resources from the inefficient non-trade sector to the higher productive export sector. And finally, an increase in exports may loosen a foreign exchange constraint, which makes it easier to import inputs to meet domestic demand, and so enable output expansion (Giles and Williams, 2000, pp3).

At the empirical studies, using with quarterly data for period from 1976-2003, Mamun and Nath (2005) investigated the relation between export and economic growth for Bangladesh. The result of their paper shows that the industrial production and export are cointegrated, and result of ECM suggest that there is a long run unidirectional causality from export to growth for Bangladesh. Merza (2007) in his study for Kuwait find that bidirectional causality between oil export and economic growth, and a unidirectional causality from non-oil export to economic growth. Abdullah (1993) analyzed the ELG hypothesis in the agricultural sector for Malaysia. Result of his study indicates that growth of GDP causes exports. Awokuse (2004) find a unidirectional causality between export and growth for Canada. Lin and Li (2002) examined the relation among export and growth for China and find that a ten percent increase in exports resulted in a one percent increase in GDP in the 1990s in China, when both direct and indirect contributions are considered. Staitn (2005) in his study for Egypt conclude that there is a unidirectional causality between export and economic growth. Jordaan and Eita (2007) study the causal relationship between export and GDP for Botswana, that finding suggest that there is bi-directional causality between these variables. Maneschiold (2008) analyzed the export-led growth hypothesis for Argentina, Brazil, and Mexico using the cointegration and causality techniques. He confirmed the export-led growth hypothesis for Argentina and Brazil. Furthermore, the causal is either bi-directional or unidirectional from export to GDP.

Motavaseli (1998) utilize a Granger causality procedure to annual data of 1967-1995 and recognized two-side causality between export growth and GDP growth in Iran. Using annual time series data spanning from 1960 to 2003, Pahlavani (2005) indicated that in the long run, policies aimed at promoting various types of physical investment, human capital, trade openness and technological innovations will improve economic growth in Iran. Result of Roshan (2007) for Iranian economy show that there is a positive relationship between export and growth. Bakhshoodeh and Shahnoushi (2009) investigated the Causality between non-oil exports and GDP growth in Iran over the period of 1967-2003. Results of this study showed that in short run, causality direction is from non-oil export growth to non-oil GDP and in long run this is expected to be reverse. Therefore, in short run, non oil export growth has a positive influence on non-oil GDP growth, while in long run, non-oil GDP growth has a positive influence on non-oil export growth and not vice versa. Results of Ahmad et al., (2004) for Pakistan support the export-led growth hypothesis.

The purpose of this paper is to investigate the relationship between export and economic growth for Iranian economy over the period of 1966-2006. The rest of the paper is organized in the following manner. Section 2 presented the brief review on trade in Iranian economy. Section 3 introduces the Data and Methodology. The Empirical Result is discussed in section 4, and section 5 concludes the paper.

Overview on Trade in Iranian Economy

Iran is a large country with population of about 70 million people. More than 65 percent of the population lives in the cities

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and the proportion of the rural population are continuously declining. Although the country is rich in mineral resources and has some of the largest hydrocarbon reserves in the world, its per capita income is about USD 2300 and is among the lower middle income countries (World Bank 2006).

The Iranian government is of two minds regarding the country's accession to GATT and the World Trade Organization (WTO). Economic arguments militate in favor of joining the WTO, while arguments against joining see GATT as a tool of powerful industrialized states and cite possible disadvantages of following its rules. Membership in the WTO would reinforce the country's current trend toward economic liberalization and lead neighbors to think of Iran as a lucrative country to do business with (Afrasiabi, 1995).

According to the Iranian Ministry of Finance and Economic Affairs, Iran exported USD 27.1 billion worth of goods, including USD 4.5 billion non-oil exports, and imported USD 20.1 billion worth of commodities during the third Five-Year Economic Development Plan (2000-2004). The Iranian government has made significant progress in implementing trade reforms and intends to do more according to the ambitious plan outlined in the 3rd five-year development plan. Many non-tariff barriers on imports have been replaced by their tariff equivalents. During the year 2000, restrictive import licensing requirements were lifted on 895 products. At the same time, import taxes on many of these items were increased in an attempt to compensate domestic producers for loss of protection. Despite the important reforms conducted as part of the recent Government's trade liberalization agenda, important areas, where additional substantial steps to use market mechanisms as a means of regulating foreign trade remain.

Exports, imports and GDP in Iran are shown in Table 1. As can be seen, exports and imports have gone up between 2000 and 2007 in terms of both percentage of GDP and their absolute terms. Share of non-oil exports has also increased from almost 4% in 2000 to 7% in 2007(Bakhshoodeh and Shahnoushi, 2009).

Based on result of table (1) the Exports of Goods and Services increased from 22.22 percentage of GDP in 2000 to 32.23 percentage of GDP in 2007, therefore in this period volume of export in Iranian economy raised.

Data and Methodology

Data

The data used in this paper included the rate of real gross domestic product (GDP) and rate of real export. The annual time series data of two variables (real exports and real GDP) for Iranian economy over the period of 1966-2006, collected from the International Financial Statistics (IFS) CD-ROM Published by international Monetary Fund (IMF).

Unit Root Test

Stationary testing of time series leads to the implementation of the econometric model using the appropriate methodology. In order to determine the degree of cointegration variables Augmented Dickey-Fuller (1979, 1981) test (ADF) are used. This test is based on the following equation containing a random walk and constant:

$$\Delta Y = \mu + (\varphi - 1)y_{t-1} + \sum_{j=1}^{k} \delta_j \Delta y_{t-j} + \varepsilon_t \qquad 1)$$

Where $\varepsilon_t \sim WN(0, \sigma^2)$.

Test of unit root requires testing the *null hypothesis* H_0: (φ-l) = 0, the series is non-stationary versus the *alternative hypothesis* H_1: |φ|< 1, under the assumption that ε_t is a white noise. If the calculated statistic is higher the critical value then we does not reject the H_0 and considered variable is nonstationary, and if the null hypothesis is rejected then the variable is considered to be stationary.

3.3. Johansen Cointegration Test

To find out the long run relationship among the variables, we employed the Johansen's (1988) cointegration test. Consider a q^{th} order vector autoregressive model

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + ... + A_p y_{t-q} + \underline{e}_t,\ t = 1,2,3,...,T \qquad 2)$$

Then, subtracting $\underline{X}_{t-1}$ from both sides, we will have

$$\nabla y_t = \Pi y_{t-1} + B_1 \nabla y_{t-1} + B_2 \nabla \underline{y}_{t-2} + ... + B_q \nabla y_{t-q+1} + \underline{e}_t \qquad (3)$$

$\nabla y_t = y_t - y_{t-1}$. If the matrix $A_i, i = 1,2,...,q$ is known, then it is easy to determine the existence of any stationary linear combinations by looking at the eigenvalues of Π (if all eigenvalues are less than one in absolute value, then the process is stationary). However, the coefficient matrices are unknown. Let $rank(\Pi) = r$. Johansen (1988) elaborates on a procedure to test whether there is any stationary linear combination, based on the squared canonical correlations. Let λ_i be the squared canonical correlations of the coefficient matrix Π such that $\lambda_1 \geq \lambda_2 \geq ... \geq \lambda_p$ where *p* is the dimension of y_t (Berument et al., 2005) The Johansen cointegration test uses two likelihood ratios test, the first test statistic is the *Trace test*:

$$Trace = -n \sum_{i=r_0+1}^{n} \ln(1 - \lambda_i) \qquad (4)$$

That this statistic evaluates the null hypothesis of at most r_0 cointegrating vectors against the general hypothesis of p cointegrating vectors the second test statistic in the *maximum eigenvalue* test:

$$\lambda_{\max} = -n \ln(1 - \lambda_i) \qquad (5)$$

This test evaluates the null hypothesis of r cointegrating vectors against alternative hypothesis of (r+1) cointegrating vectors.

Toda and Yamamoto Test

For test the causality between variables, we applied the Toda and Yamamoto Granger causality test. Toda and Yamamoto (1995) proposed a causality test, which can be applied "whether the VAR's may be stationary (around a deterministic trend), integrated of an arbitrary order, or cointegrated of an arbitrary order" (Toda and Yamamoto, 1995, pp. 227). For perform this method at the first step, we should determine the maximum order of integration of variables in the model (d_{max}). Then we determine the lag length of VAR model (*k*), and now we construct a vector autoregressive model (VAR) in their levels with a total of $(k + d_{max})$ lags. Thus, if $k = 1$ and if two series y_t and x_t have different orders of integration, viz., I (0) and I (1) respectively so that d_{max} =1, then one extra lag is added to each variable. Thus, a VAR with 2 lags is constructed as follows:

$$\begin{bmatrix} x_{1t} \\ x_{2t} \end{bmatrix} = \begin{bmatrix} \alpha_{10} \\ \alpha_{20} \end{bmatrix} + \begin{bmatrix} \alpha_{11}^{(1)} & \alpha_{12}^{(1)} \\ \alpha_{21}^{(1)} & \alpha_{22}^{(1)} \end{bmatrix} \begin{bmatrix} x_{1,t-1} \\ x_{2,t-1} \end{bmatrix} + \begin{bmatrix} \alpha_{11}^{(2)} & \alpha_{12}^{(2)} \\ \alpha_{21}^{(2)} & \alpha_{22}^{(2)} \end{bmatrix} \begin{bmatrix} x_{1,t-1} \\ x_{2,t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \qquad 6)$$

A Wald test (also called the modified Wald or MWALD) is carried out to determine the relationship between the two variables. (Deb &Mukherjee, 2008).

Table (1): Basic statistics

	Exports of Goods and Services		Non-oil Exports		Imports of Goods and Services			GDP	
	(% of GDP)	(Annual % Change)	Million USD	(% of Exports)	(% of GDP)	(Annual % Change)	Million USD	Current Market Prices (Million USD)	Per Capita (Dollars)
2000	22.22	1.67	22869.2	4.06	17.06	8.29	17556.6	102930	1609.8
2001	20.86	-1.91	23026.8	5.36	19.11	17.28	21098.9	110411	1699.2
2002	27.60	8.39	37406.8	4.97	23.64	23.26	32036.5	135525	2053.0
2003	28.72	11.17	39239.3	5.72	27.10	23.86	37034.5	136646	2038.2
2004	30.49	-0.85	49624.3	4.38	27.22	13.90	44295.6	162747	2390.9
2005	34.84	7.69	66906.2	4.95	25.88	2.05	49696.1	192020	2779.4
2006	31.35	4.93	69873.8	7.02	26.73	3.89	59583.9	242146	3454.4
2007	32.23	4.98	93441.0	-	26.61	7.59	77152.9	-	-

Source: The SESRIC BASEIND (Basic Social and Economic Indicators) Statistics Database, (Bakhshoodeh and Shahnoushi, 2009).

Toda and Yamamoto (1995) confirm that the Wald statistic converges in distribution to a χ^2 random variable with the degrees of freedom equal the number of excluded lagged variables regardless of whether the process is stationary possibly around a linear trend or whether it is cointegrated (Tsani,2010,p286). Zapata and Rambaldi (1997) explained that the advantage of using the Toda and Yamamoto Procedure is that in order to test the Granger causality in the VAR framework, it is not necessary to pretest the variables for the integration and cointegration properties, provided the maximal order of integration of the process does not exceed the true lag length of the VAR model (Magnus and Fosu, 2008, p. 106).

Impulse Response Function

For further delve into the dynamics interaction between variables, we used the impulse Response Function (IRF). The IFR is the centerpiece of the VAR model. It has been used to measure the effect of various shocks on the behavior of the endogenous series in the system. It defines the response of the dependent variable in the VAR model to shocks in error terms. In other words, the IRF detects the impact of a onetime shock to one of the innovations on current and future values of the endogenous variables. The plot of IRF shock shows the effect of one standard deviation shock to one of the innovations on current and future values of endogenous variables. In the case of two variables the general form for IRF would be:

$$y_{y,t} = \alpha_1 + \varepsilon_{y,t} + \eta_1 \varepsilon_{y,t-2} + \cdots + \eta_i \varepsilon_{y,t-i} \quad 7)$$

$$y_{x,t} = \alpha_2 + \varepsilon_{x,t} + \omega_1 \varepsilon_{x,t-2} + \cdots + \omega_i \varepsilon_{x,t-i} \quad 8)$$

Where $y_{y,t}$ and $y_{x,t}$ indicates the vectors of depend variables; α_1 and α_2 is a vectors of constants; ε_i is a vector of innovations for all variables that has been included in the VAR model; and in final ω_j and η_j indicates the vectors of parameters that measure reaction of independent variable to innovations in the all variables included in the VAR model (Merza, 2007).

Empirical Results

In order to determine the cointegration degree of variables under study Augmented Dickey-Fuller test (ADF) is used. Table (2) shows the results of the ADF unit root test for two variables. Based on these results, two variables are stationary in their level, which means that two variables are I (0). For test the existence of long run relationship between real export and economic growth, we perform the Johansen Cointegration Technique and results of this test presented in table (3).

Table (3) shows the results of both *Trace* and *Maximum Eigenvalue* tests. Based on the results of both *Trace* and *Maximum Eigenvalue* tests, the all null hypotheses rejected at the significant level, and confirm the existence of long run relationship between real export (REXP) and real GDP (RGDP).

Table 2. ADF Unit Root Test for variables in levels

Result	Critical Value	ADF	Variables
stationary	-2.95*	-3.45	**RGDP**
stationary	-2.95*	-5.11	**REXP**

Note: (*) denote statically significant level at 5%.

Hence that the maximum order of integration *(d_{max})* equals zero, in the next step we should determine the number of lagged terms *(k)* to be included using AIC / SIC rule and find it to be 5 an at last, we construct a VAR in levels, similar to that depicted in Eq. 5 with a total of *($k + d_{max}$)* equaling 5 lags.

Table 3. Johansen Cointegration Test Results

95%Critical Value	Likelihood Ratio Statistic	Number of Cointegration vector	
		Trace Test	
		Alternative	**Null**
15.5	33.63*	r>=1	r=0
3.84	9.45*	r=2	r<=1
		Maximum Eigenvalue	
		Alternative	**Null**
14.27	24.18*	r=1	r=0
3.84	9.45*	r=2	r=1

Note: The (*) indicate rejection of likelihood ratio tests at %5 significant level.

Following the approach of Toda and Yamamoto (1995) the export and economic growth modeled in the present paper given in the following VAR system:

$$RGDP_t = c_1 + \sum_{i=1}^{5} \alpha_{1i} RGDP_{t-i} + \sum_{i=1}^{5} \beta_{1i} REXP_{t-i} + \varepsilon_{1t} \quad (9)$$

$$REXP_t = c_2 + \sum_{i=1}^{5} \alpha_{2i} RGDP_{t-i} + \sum_{i=1}^{5} \beta_{2i} REXP_{t-i} + \varepsilon_{2t} \quad (10)$$

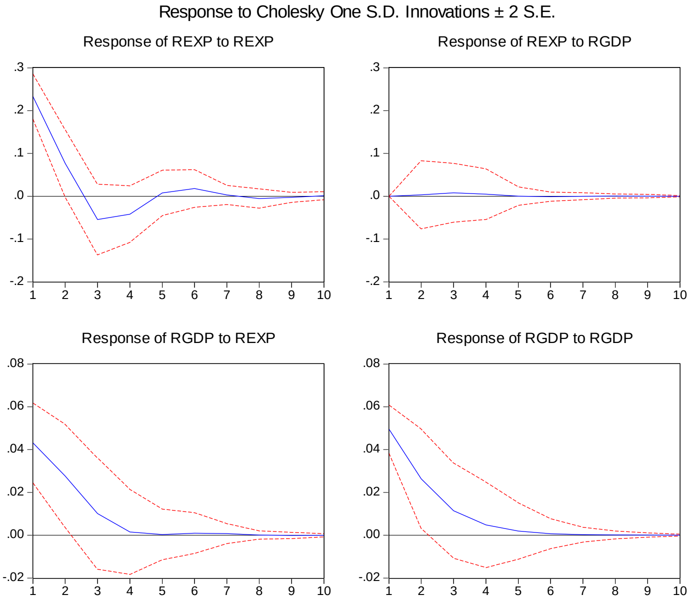
The above systems of equations were estimated by unrestricted vector autoregressive (VAR). For example, if we want to test that *REXP* does not Granger-cause *RGDP*, the null hypothesis will be *H*0: $\beta_{1i}=0$ (i=1, 2, 3, and 4). Where the $\beta_{1i}=0$ (i=1, 2, 3, and 4) are the coefficient of the REXP appearing in the Eq.5.

Table 4. Results of Long Run Causality due to Toda-Yamamoto (1995) Procedure

p-values	WALD Statistics	Null Hypothesis
		Real GDP (GDP) versus REXP
.037	5.3085	RGDP does not *Granger cause* REXP
.041	4.9901	REXP does not *Granger cause* RGDP

Results of table (4) show that the null hypothesis rejected for two cases. In other word, RGDP does not Granger causes REXP and REXP does not Granger RGDP is rejected and the alternative hypothesis accepted in the significant level. Therefore the result of Toda and Yamamoto test indicated the bidirectional causality between economic growth and real export, which confirm the ELG hypothesis.

Figure (1): Result of Impulse Response Function



Results of Impulse Response Function (IRF) presented in figure (1). Raw 1 of figure (1) shows the response of real export to shocks to real export and real GDP, respectively. Second graph in this row shows that real export responds positively to the shock in the real GDP, but this shock is very weak.

Raw 2 in figure (1) shows the response of real GDP to socks of real export and real GDP, respectively. According to this figure the responds of real GDP to shock of real export is positive, and slowly tend to zero. This effect disappears in the period of 4.

Conclusion

In this paper, we investigate the relationship between real export and economic growth for the Iranian economy over the period of 1966-2006. For this purpose we used several econometric techniques such as unit root test, cointegration, Impulse Response Function (IRF) and Toda & Yamamoto (1995) causality test. The results of the ADF test shows that two variables are stationary in their levels, and results of Johansen Cointegration technique confirmed the existence of long run relationship between real export and economic growth. Also, findings of Toda and Yamamoto causality test indicated the bidirectional causality between export and growth. Therefore, the results of paper support the existence of ELG hypothesis in Iranian economy.

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