Causality between non-oil exports and GDP growths in Iran

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Abstract

Applying Johansson's multivariate procedure and vector error correction model to time series of 1967-2003, this study investigates the role of non-oil exports in growth of Iran economy. 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, whilst in long run, non-oil GDP growth has a positive influence on non-oil export growth and not vice versa. Thus, export supporting policies are expected to lead to increase export and GDP only in the short run.

Keywords: export-led growth, Johansson's procedure, short and long run causality, Iran

Introduction

As one of the most efficient tools for growth and development, export promotion policy has been taken by many countries since 1970. The role of exports in economic growth and the

relationship between these two have been the subject to a wide range of empirical and theoretical studies in international trade and economic development field. As stated by Abou-Stait (2005), the argument concerning the role of exports as one of the main deterministic factors of economic growth goes back to the classical economic theories by Adam Smith and David Ricardo. According to Aljarrah (2008), there are four types of empirical studies in this regard and are based on the assumptions of being exports an engine of growth, both endogenous and affected by each others, economic growth stimulates expansion in export sectors, and exports and economic growth have a bidirectional causality relationship. Based on the most recent literatures, export growth promotes overall economic growth and there is strong association between these two variables and exports expansion contribute to the rate of economic growth, and the latter enhances investment in exports sector. Combining Granger causality with Akaike's Final Prediction error (FPE), Bahmani-Oskooee *et al* (1991), obtained some support for the export-led growth hypothesis. Dodaro (1993) investigated the issue of causality by employing Granger's approach to a set of 87 countries and found very weak support for the contention that export growth promotes GDP growth or for the alternative that GDP growth promotes export growth. Bahmani-Oskooee and and Alse (1993) using Engle and Granger (1987) two-step approach to co integration and error correction modeling and employing quarterly data instead of annual data for the eight countries, find that there is a strong empirical support for two-way causality between export growth in eight out of nine countries. Chandra and Love (2005) utilized Johansson's multivariate approach and found that long and short run causality directions run from GDP growth to export growth and

reverse is insignificant. Motavaseli (1998) applied 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-term, policies aimed at promoting various types of physical investment, human capital, trade openness and technological innovations will improve economic growth in Iran. Similar findings are discussed by Harvie and Pahlavani, (2006) in South Korea**.**

Detailed reviews of the empirical literature for analyzing the relationship between exports and economic growth is provided by Subasat (2002) and Abou-Stait (2005). Meanwhile, our short review of literature refers to the fact that a unique causality direction does not exist between the variables of our interest and therefore further studies are needed to clarify dominant relationships in transition economies such as Iran. The rest of this paper is structured as follows: a background of Iran export is discussed following by methodology specifications and findings are discussed afterward. At the end, some policy implications are provided.

The structure of the remainder of this paper is as follows: an overview of Iran export is presented at the next section; section 3 conducts the methodology following by the main findings and discussions. Finally, a summary of the key conclusions from this paper are presented at the end.

An overview of Iran exports

As the fourth largest oil producer in the world, Iran is slowly integrating into the global economy and financial markets. 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). Total exports of non-oil commodities stood at USD 4 billion in 2001 and more than USD 4.4 billion in 2002. The figure reached to USD 6 billion in 2003, surpassed USD 10.5 billion in 2005 and recently rose to USD 12 billion. Iran's non-oil exports stood at $16.3 billion in the year ending March 20, 2007, a rise of 47.2% from the previous period. Pistachios, liquefied propane, methanol (methyl alcohol,) hand-woven carpets and automobiles are the core items of Iran's non-oil exports. The rapid growth in Iran's non-oil exports in recent years was due to a policy of non-dependence on oil income and diversification of goods and services exported.

Agricultural products as a whole have been an important contributor to the country's non-oil exports that has been of the Iranian government interest in recent decades. However, the agricultural export potential has not been fully tapped. By 2003, a quarter of Iran's non-oil exports were agricultural based. Iran’s agricultural sector contributed 11 percent of the GDP in 2004 and employed 23 percent (1996) of the labor force. Since 1979 commercial farming has replaced subsistence farming as the dominant mode of agricultural production.

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.

Implementing successful non-oil trade intensification and a shift from import substitution to export-oriented activities will require a new set of policies affecting agricultural trade beyond the ratification process carried recently.

The upward trend in value of non-oil exports in recent years is consistent with the trend of development due largely to the government's policies, particularly towards lessening its dependency on oil exports and encouraging non-oil exports. In this context, several policy including export subsidy and export bonus have been taken mainly since 2001. The latter policy was first introduced to the leather exporters and then to the exporters of agricultural products such as raisins, eggs, chicken meats, tea, prawn, etc.

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.

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

Although non-oil exports have increased during the last years, a study is required to investigate the impacts of such an export-led policy on economic growth. This study, investigates relationship between non-oil exports and non- oil GDP growth in Iran.

Methodology

Johansen's multivariate framework and vector error correction model are used in this study to investigate short run and long run causality between non-oil exports and growth. The first step is to determine whether the variables in the model are stationary. If they are non stationary, then the issue is to what degree they are integrated. This is addressed by Augmented Dickey-Fuller (ADF) tests. The next step is to find out whether the variables are cointegrated. Within the Johansson's framework, an unrestricted VAR model is defined by (1):

$$x_t = \mu + \pi_1 x_{t-1} + ... + \pi_k x_{t-k} + \varepsilon_t \quad , \quad t = 1,2,...,T \tag{1}$$

Where ε_t is *i.i.d* (independently and identically distributed) p-dimensional Gaussian error term and white noise, X_t is a Vector of I (1) variable and μ is a vector of constants. Since X_t is non stationary, the above equation can be expressed in first differenced error correction (2) that is expressed as a traditional first difference VAR model except the term πx_{t-k}:

$$\Delta x_t = \mu + \Gamma_1 \Delta x_{t-1} + ... + \Gamma_{k-1} \Delta x_{t-k+1} + \pi x_{t-k} + \varepsilon_t \tag{2}$$

Where $\pi = -(I - \pi_1 - ... - \pi_k)$, $i = 1,...,k-1$, $\Gamma_i = -(I - \pi_1 - ... - \pi_i)$.

The coefficient matrix π contains information about long run relationships between the variables and $\pi = \alpha\beta'$, where α and β are $P\times$ matrix. The co integrating vectors β have the property that $\beta' x_t$ is stationary even though X_t itself is non stationary. In this case, equation (2) can be interpreted as an error correction model. Johansen (1988) and Johansen and Juseselius (1990) derived the likelihood ratio test for the hypothesis of *r* cointegrating vectors or $\pi = \alpha\beta'$. The cointegrating rank, *r*, can be tested with two statistics, namely Trace and Maximal Eigen value. The likelihood ratio test statistics for the null hypothesis that are at most *r* cointegrating vectors against the alternative of more than *r* cointegrating vectors is the Trace test and is computed as:

$$\lambda_{trace} = -T \sum_{i=r+1}^{P} \ln(1 - \hat{\lambda}_i) \tag{3}$$

Where $\hat{\lambda}_{r+1},...,\hat{\lambda}_P$ illustrate $P-$ smallest estimated Eigen values. The likelihood ratio test statistic for the null hypothesis of r cointegrating vectors against the alternative $r+1$ cointegrating vectors are the maximal Eigen value test and are given by:

$$\lambda_{\max} = -T\ln(1-\hat{\lambda}_{r+1}) \tag{4}$$

After having established the number of cointegrating vectors by Trace and Eigen value tests, the next step is to determine the direction of both long and short run Granger causality through vector error correction model for three variables as follow:

$$\begin{aligned}
\Delta LRGDP &= \alpha_1 + (\Delta LRGDP, \Delta LRX, \Delta LTOT)_{-1} + \lambda_1 e(-1) \\
\Delta LRX &= \alpha_2 + (\Delta LRGDP, \Delta LRX, \Delta LTOT)_{-1} + \lambda_2 e(-1) \\
\Delta LTOT &= \alpha_3 + (\Delta LRGDP, \Delta LRX, \Delta LTOT)_{-1} + \lambda_3 e(-1)
\end{aligned} \tag{5}$$

where e (-1) is the lagged value of the error correction term. While error correction term captures the long run relationship, short run dynamics is provided by the lagged values of the difference terms.

This study uses annual data for the period of 1959-2003 and apply the above described methods to non-oil real gross domestic production, non-oil real export rand terms of trade in Iran during this period.

Results

As the first step, all the three variables and their first difference were tested for stationary and the results are given in Table 2. It can seen that for none of the level variables is the calculated ADF statistic less than its 90% critical value and for the first differences of all variables, the ADF statistics are less than their corresponding 90% critical values and thus, all level variables are I(1) since their first differences are I(0).

Table 2. ADF tests for unit roots

Variable	Test statistic		95% critical value	
	levels	First difference	levels	First difference
LRGDP (log of real non-oil GDP)	-1.847(1)	-3.424(0)	-2.937	-2.94
LRX (log of real non-oil exports)	-1.115(0)	-6.176(0)	-2.937	-2.94
LTOT (log of terms of trade)	-1.854(0)	-6.652(0)	-2.937	-2.94

TOT is defined as proportion value index of exports upon value index of imports; terms in the parenthesis show the number of augmentations or lags (k) in ADF regressions; k is chosen with the help of a model selection criterion such as Akaike information (ADF), Schwarz Bayesian Criterion and Hnnan _Quinn criterion (HQC)

As shown in Table 3, the null hypothesis of zero cointegrating vector by use of Trace and Eigen value statistics is rejected and the null hypothesis of one cointegrating vector is not rejected. Thus, the number of cointegrating is one. After having established the number of

co integrating vectors and model where intercept is presented in the cointegration relation, the restricted cointegration vector (-LRGDP + 0.377LRX + 1.341LTOT + 1.257) is obtained after Normalization. It can be seen that both real non-oil exports and terms of trade have positive influences over real non-oil GDP.

Table 3. Cointegration rank selection

H_0	H_1	Test statistic	90% critical value
λ_{trace}:			
$= 0$	≥ 1	33.95	31.93
≤ 1	≥ 2	12.33	17.88
≤ 2	$= 3$	3.08	7.53
λ_{trace}:			
$= 0$	$= 1$	21.61	19.86
≤ 1	$= 2$	9.25	13.81
≤ 2	$= 3$	3.08	7.53

r is the cointegration rank of the cointegrating vectors

The next step is to determine both the long and short run Granger causality. The presence of one co integrating vector allows using Engle and Granger error correction to test for Granger causality. Since the error correction model are written in the first difference form and with justification order of VAR, which is 2, the optimal lag length in them gets reduced by one. The results of the causality analysis are presented in Table 4. It can be seen that the error correction term with ΔLRGDP as the dependent variable is insignificant at even 10% level of significance. Therefore, in the long run, non-oil export and terms of trade do not Granger causes the non-oil GDP. The error correction term with ΔLRX as the dependent variable is significant; therefore, non-oil GDP and terms of trade Granger cause non-oil

export in the long run. So, it can be concluded that there is long run one-way causality between real non-oil export and real non-oil GDP, which the direction being from real non-oil GDP to real non-oil export.

Table 4. Results of granger causality in a multivariate framework

Dependent variable	Coefficients of lagged ΔLRGDP	Coefficients of lagged ΔLRX	Coefficients of lagged ΔLTOT	Joint significance	Error correction term (Prob)
ΔLRGDP	—	(0.047)^{S}	(0.01)^{S}	(0.004)^{S}	-.52(0.37)
ΔLRX	(0.403)^{NS}	—	(0.001)^{S}	(0.001)^{S}	-1.868(0.00)
ΔLTOT	(0.275)^{NS}	(0.473)^{NS}	—	(0.541)^{NS}	-0.194(0.847)

NS: not significance; S: significance
Note: (1) figures in the parenthesis are the probability values showing the exact level of significance; (2) the positive sign of the error correction term with DLRGDP as the dependent variable is incorrect but the coefficient itself is insignificant.

The short run dynamics can be seen by looking at the coefficients of lagged differenced terms. Coefficients of lagged ΔLRX and ΔLTOT with ΔLRGDP as the dependent variable are significant. This implies that growth of real non-oil export and terms of trade in short run does exercise a significant influence on real non-oil GDP. Coefficients lagged ΔLRGDP and ΔLTOT with ΔLRX as the dependent variable, respectively are insignificant and significant, implying growth of non-oil GDP in the short run does not have a significant influence on growth of non-oil export, and growth terms of trade significantly affects the growth of non-oil export in the short run. In same way, non-oil export and non-

oil GDP do not significantly influence on the terms of trade neither in the short run nor in the long run. It may also be noted that non-oil GDP on their own may exercise insignificant influence on non-oil export in short run, but conjunction with other variables they become important as the tests of joint significance show.

Conclusions

Based on the findings of this study, the direction of short run causality is from real non-oil export growth to real non-oil GDP growth in Iran whilst the long run causality direction is reversed. Furthermore, the hypothesis of export-led growth is to be existed in the short run. This result implies that support policies such as export subsides can lead to increase export and GDP only in the short run, whereas in the long run increasing export can be achieved via well-being infrastructure economic and increasing production in the country.

Although exports can increase intra-industry trade, help the country to integrate in the world economy and reduce the impact of external shocks on the domestic economy, expanding export, as one of the long run purposes of macro programming in Iran, can be achieved through increasing production. Although protection policies in foreign trade has conflict with the WTO agreements, implementing strategies that increase productivity and production are corresponding with principals of this organization. Based on the literature (e.g. Abou-Stait, 2005), export led growth strategies aim to increase the capability of producing goods and services that are able to compete in the world market, to use advanced technology, and to provide foreign exchange needed to import capital goods. Utilizing

convenient strategies that improve Iran's infra-structure of production, it is expected that joining Iran to WTO can increase non-oil export of Iran.

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