



THE CAUSAL RELATIONSHIP BETWEEN THE AGRICULTURAL EXPORTS AND AGRICULTURAL GROWTH IN IRAQ

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Abstract

The object of this paper is to investigate the causal relationship between agricultural exports and agricultural growth in Iraq using annual data for the period 1990 – 2017 under Vector Auto-regressive (VAR) framework. The order of integration of variables is determined by using unit root tests. The tests show that the variables are non-stationary in their levels but stationary at the first differences by applying of a modified version of the Granger causality test developed by Hiro Y. Toda and Taku Yamamoto in 1995. The results show that there is no causal relationship from any direction between agriculture exports and agriculture growth in Iraq and this result shows that Iraq still suffering from economic disruption from sanctions imposed by the United Nations started in (August, 1990) until the invasion of Iraq in 2003 and the economics disturbing because of that especially in agriculture sector.

Key words: agriculture exports, agriculture production, Iraq, VAR models, Granger causality, Toda-Yamamoto approach.

Introduction

The world today, in a new global trading system background is witnessing many fluctuations, mainly due to complexity of economic life in major countries all around the world. In sight of expand and multiple business dealings, which led to the initiate economic clusters, which there mainly goal is to lift out tariff barriers and restrictions to international trade based on the principle of specialization and division of Labour. Trade laws have been developed to ensure the good conduct of these trade exchanges, over time the importance of economic international relationships has grown up due to high proportion of the foreign trade sector in Gross Domestic Production of countries. This sector (Foreign trade) became the representatives for the vital and influential role of the activity economic because it is the most important images of economic relations, which goods and services are exchanged in form of exports and imports, in addition to different production resources (especially work and capital) between countries, with a view to achieving mutual benefits for trade participants, especially in the great transformations that have taken place in foreign trade theories and the emergence of the so-called

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modern trade Theory, which focuses on the competitive advantages of economies of scale, diversification and distinct goods, rather than comparative advantages resulting from the abundance of primary resources as a modern foreign trade, Economic theory referring to the relationship between exports and economic growth, saying that there are two basic hypotheses of them:

- The increased economic growth leads to increased exports, Growth-Led Export Hypothesis (GLEH).
- That Increased exports lead to increased economic growth, Export-Led Growth Hypothesis (ELGH).

Both hypotheses have reason for their assuming. This study represents a new addition to this topic in Iraq, especially in the aspect of agriculture for the period (1990-2017), by identifying the causal relationship between agricultural exports and agricultural growth using econometrics methods. Since this relationship differs among countries, several empirical studies have been conducted to examine the relationship between the two variables over the past few decades. Yet there seems to be no consensus regarding the direction of causality between imports and exports. For some countries there is a bi-directional causality while for others there is no causality at all, as some studies have shown (Bel Haj,

2014). Large number of researchers tested the hypothesis of Exports-Led growth in different countries, not only because they evolved to be widely accepted by researchers or became a new conventional wisdom but because it has shaped the economies of a large number of countries and even World Bank policy (Shirazi, 2005).

Iraq is an open country that has experienced difficult circumstances during the period of study (1990-2017). Included sanctions imposed by the United Nations (August, 1990) until the invasion of Iraq in 2003. The political disturbing after that has major impact in both economically and socially sides in agriculture sector precisely. Because of that agricultural exports have pass through difficult conditions, necessitating study the relationship between agricultural exports and agricultural growth, so the importance of research comes from the importance of agricultural export promotion policies as an economic tool to increases agricultural growth and because the relationship between the two variables may take one of the two hypotheses Export-Led Growth or vice versa. Considering that Agricultural export is a source of cash access which is necessary to finance the importation of agricultural technologies and Reducing the lack in balance-of-payments and ensure the continuity presence in markets especially traditional ones. As well as ability to compete for market share at least or trying to increase it. Therefore, agricultural export activity is a tool for achieving increasing of agricultural growth rates.

Agricultural exports in Iraq were characterized with low annual growth rate of (3.38%), while the compound annual growth rate of agricultural exports was (-8.85%). This is due to the significant decline in the value of agricultural exports in Iraq during the period of economic sanctions that mentioned earlier. There is uncertainty and lack of clarity about the nature of the relationship between agricultural exports and agricultural growth in Iraq (represented by Agricultural Domestic Production) and the fuzzy of that agricultural exports can contribute in agricultural growth in Iraq, rather than agricultural growth leads to growth in agricultural exports. In order to identify appropriate agricultural policies, by mapping the comparative advantages of agricultural products (plant and animal) to identify the most important commodities that can be export, thus increasing their competitiveness and developing price intervention policies that encourage the domestic product for the purpose of increasing it surpluses for export. It is necessary to take a quick look at some of the previous studies and to indicate the results that have been reached. Awokuse in 2004 studied Viability of export hypothesis leads growth in Canada, using applied evidence linking exports to growth Economic of which is

a Granger causality and Vector Error Correction Models (VECM) and applying the methodology of Augmented Vector Auto Regressive (AVAR), using quarterly data for the period (1961-2004). The result found a short-and long-term causal relationship between the variables in Canada confirming the validity of the export-led growth hypothesis (Awokuse, 2004). In 2007 Alhajhoj studied Exports and economic growth in Saudi Arabia using model VAR as well as the Impulse response function IRF. Also check the existence of a Granger causal relationship in the long term and found cointegration among variables, also found that exports caused growth in the Saudi economy While the opposite is not (Alhajhoj, 2007). Faridi in 2012 studied the contribution of agricultural exports to economic growth in Pakistan, in which the relationship between GDP on the one side and agricultural and non-agricultural exports in another side. He used Johansen cointegration Analysis for the period (1972-2008), the results showed that Exports Agriculture has a negative significant effect on economic growth with Agricultural export elasticity (-0.58). Also found there is a two-way causal relationship between agricultural exports and gross domestic product (GDP) (Faridi, 2012). Ewetan and Okodua in 2013 studied the relationship between exports and economic growth in Nigeria over the period (1970-2010), using the cointegration analysis and Granger causality test within the framework of VAR model, they found that the model is not Supports the hypotheses of exports are driving economic growth in Nigeria (Ewetan, 2014). In 2014 Agrawal 2014 studied the role of exports in economic growth in India during the period of Indian trade liberalization (1960-2012), the analysis found a positive causal relationship between export and growth, and was used analysis of error variance, the results showed that rapid growth in exports played a crucial role in increasing the economic growth rate of post-trade liberalization in India after 1990 (Agrawal, 2014). In 2014 Abu Shihab published a paper titled “the Causal Relationship between exports and economic growth in Jordan” using the Geringer methodology to determine the relationship causal trend for the period 2000-2012 and the researcher used economic growth as a representative of the Gross Domestic Product GDP and exports at current prices. The researcher found that the significant value of causal relationship from economic growth towards exports is (0.15) and the researcher accepted the existence of the first relationship at this level of significant (Abu Shihab, 2004).

This paper came to check the causal relationship between agricultural exports and agricultural production in Iraq using a modified version of Granger causality test

that presented by both Toda and Yamamoto in the year (1995). This procedure has been found to be superior to ordinary Granger-causality tests since it eliminates the need for pre-testing for cointegration and therefore avoids pre-test bias and is applicable for any arbitrary level of integration for the series used (Bel Haj, 2014) and applicable at any level to integrate time series and randomly. The Todd-Yamamoto approach is useful because it fits the standard Vector Autoregressive Model at level $I(0)$ rather than the first difference $I(1)$ (as the case with Granger causality tests), as the treatment is a low level of risk (Risks) that accompanies the probability of faulty diagnosis of the system integration of the series (Mavrotas, 2001). The paper will be presented on the second parts will discuss the data and the standard method that employee and the third empirical results and fourth Conclusions.

Materials and Methodes

The Data

1. Agricultural Exports: Annual data on agricultural exports and Agricultural Domestic Production were obtained at current prices from Central Organization for Statistics and information Technology Iraqi (Government agency) for the duration 1990-2017, the data was converted into a logarithmic formula to eliminate the problem of Heteroscedasticity. The value of exports during the study period fluctuated between a minimum of 4 million dollars in 1993 and a maximum of \$61.3 million in 2004. Averaged 25.1 million dollars, with an annual growth rate of 5.9%, the best annual Change happened in 2008 (312%). The value of exports shifted from \$17 million in 2007 to \$70 million in 2008 as shown in fig. 1.
2. Agricultural Production: The Iraqi agricultural sector faces several problems and challenges that have increased with the succession of years of drought, erratic rainfall, various environmental, political and demographic changes and the result was decline in the role of the agricultural sector in the national

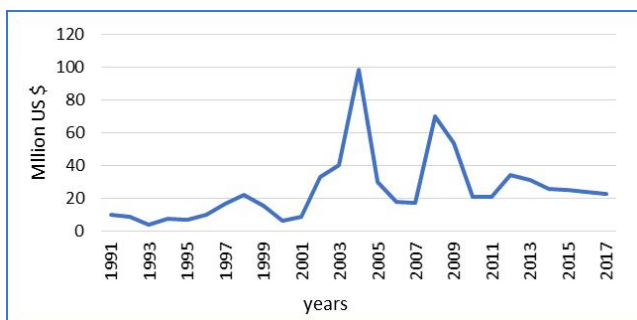


Fig. 1: Agricultural exports in Iraq.

Source: The researchers based on government official data.

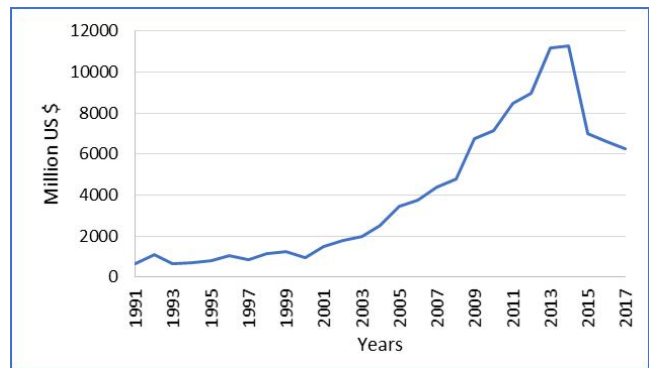


Fig. 2: Agricultural production in Iraq.

Source: The researchers based on government official data.

economy and the emergence of many problems challenges in the context of the liberalization of agricultural commodity trade. From here it was necessary to spot the light on the reality of agricultural production for the period 1990-2017 as part of GDP and to stand on its most important parts by calculating different growth rates and their relative importance. Average agricultural production 3970 Million US dollars for the period studied, ranged from a minimum of 663 million in 1990, the maximum reached 11259.4 million in 2014 with an annual growth rate of 11% at current prices as shown in fig. 2, the years of economic sanctions from 1990-2003 have seen a clear decline in agricultural production, after which the agricultural product rose rapidly to its maximum extent in 2014, but political and security conditions puts obstacles against the agricultural sector after 2014, leading to a decline Agricultural production again.

Granger Causality Versus Toda-Yamamoto Causality: About the causality test method, there are several tests developed in this area, Granger causality (Granger, 1969) is the early methods developed to calculate the causal effect in time series observations. Causality testing in Granger sense is conventionally conducted by estimating VAR models. Even so, this model suffers of the non-stationary problem. The hard parts of testing multivariable Granger causality are how to confirm the cointegrating relationship and how to estimate the VAR exactly when its system is integrated. (Sims, 1990) have shown that the Wald test for non-causality in an integrated or cointegrated unrestricted VAR system will have nonstandard limit distributions.

The test of Toda-Yamamoto causality overcame the problem of not having to approach critical values when applying a causal test with unstable data or even shared integrity. One of the intended benefits of this methodology is it's Makes Granger's causality easier, researchers don't have to test the joint integration or convert a vector autoregression model VAR to the error correction vector

model VECM (Granger, 1969), the test is applied by the following steps:

- We extend the two degrees of integration and deceleration between variables according to the self-regression formula of each variable and uses the standard Schwarz Information Criterion to determine the slowdown of variables we get the roll k the upper limit of integration (stability) d_{max} .

- Be estimated Model VAR.

- The relationship between the variables is estimated to be $(k+d_{max})$. This means that $k \geq d_{max}$ we adopt a statistic. Wald Tracking distribution χ^2 with a degree of freedom equal to the number of views and reflects the model of non-population in the following form (Salisu, 2015).

$$Y_t = a + \sum_{i=1}^k \beta_i Y_{t-i} + \sum_{i=k+1}^{k+d_{max}} \beta_i Y_{t-i} + \sum_{i=1}^k \lambda_i X_{t-i} + \sum_{i=k+1}^{k+d_{max}} \lambda_i X_{t-i} + \mu_t$$

$$X_t = a_2 + \sum_{i=1}^k \psi_i Y_{t-i} + \sum_{i=k+1}^{k+d_{max}} \psi_i Y_{t-i} + \sum_{i=1}^k \zeta_i X_{t-i} + \sum_{i=k+1}^{k+d_{max}} \zeta_i X_{t-i} + \nu_t$$

Where:

$a_1, a_2, \beta, \lambda, \psi$ and. The capabilities of the model.

μ & ν the error limits with a sum and a zero-arithmetic mean for each of them.

This method tests the hypothesis that there is no causal link from X to Y which can be worded as follows:

$$H_0 : \lambda_i = 0 \forall i = 1, 2, \dots, k$$

Results and Discussion

The main goal of the study is to investigate the nature of the relationship between agricultural exports and agricultural growth (represented by agricultural production) and to determine the direction of any possible relationship between them. To do that we need to apply

a modified model of the Granger causality test as previously explained. A number of information needed to be identified as lag length (k) and the maximum order of integration (d_{max}) for the two variables. The reason for this is to avoid any possibility of a false causal (Spurious causality) (Clark, 2006). The table shows 1 unit root test results. If the data is non-stationary in the case of the constant, the case of the constant and trend and in case of none of them due to Augmented Dicky-Fuller (ADF) and Phillips-Perron (PP). The data stabilized at the first difference on level of significant 1%.

Table 2 Illustrated the optimum lag length is 1 by chosen by (FPE, AIC, SC, HQ). This is determined by value and value (k) in the causal equation. Ganger causality test is very sensitive to the selection of lag length. If the chosen lag length is less than the true lag length, the omission of relevant lags can cause bias. If the chosen lag length is more, the irrelevant lags in the equation cause the estimates to be inefficient (Caporale 1999).

The final step is the process of estimating the causal trend by the approach of the Toda-Yamamoto between agricultural exports (E) and agricultural production (Y). Empirical results of Granger causality test based on Todd-Yamamoto methodology (Toda and Yamamoto, 1995). This test is following the Chi-Square distribution reported in table 3.

That undertake Toda-Yamamoto version of Granger causality test of non-causality for VAR (2) ($d_{max} = 1$ and $k = 1$) we estimate the following equations:

$$\begin{bmatrix} E_t \\ Y_t \end{bmatrix} = \begin{bmatrix} a_1 \\ a_2 \end{bmatrix} + \sum_{i=1}^2 \begin{bmatrix} E_{t-i} \\ Y_{t-i} \end{bmatrix} \begin{bmatrix} \beta_{1i} & \gamma_{1i} \\ \beta_{2i} & \gamma_{2i} \end{bmatrix} + \begin{bmatrix} \epsilon_{1t} \\ \epsilon_{2t} \end{bmatrix}$$

where

Table 1: Unit root tests

		Level				Δ			
		ADF		PP		ADF		PP	
		IY	IE	IY	IE	D(LY)	D(LE)	D(LY)	D(LE)
With Constant	t-Statistic	-0.6095	-2.6333	-0.4994	-4.2082	-7.3904	-5.8700	-7.1787	-11.4824
	Prob	0.8526	0.0994	0.8766	0.0030	0.0000	0.0001	0.0000	0.0000
		no	*	no	***	***	***	***	***
With Constant & Trend	t-Statistic	-2.5162	-3.1858	-2.5872	-5.4222	-7.2533	-5.7490	-7.0571	-12.5413
	Prob	0.3183	0.1090	0.2883	0.0008	0.0000	0.0005	0.0000	0.0000
		no	no	no	***	***	***	***	***
With Constant & Trend	t-Statistic	1.1793	-1.4739	1.4091	-1.4716	-1.5974	-5.9629	-6.2988	-10.9764
	Prob	0.9345	0.1285	0.9565	0.1291	0.1022	0.0000	0.0000	0.0000
		no	no	no	no	no	***	***	***

***Significant at 1%, *Significant at 10%, Source: outputs of Eviews 10 program.

Table 2: Determining number of lags.

Lag	LogL	LR	FPE	AIC	SC	HQ
1	-10.31474	73.60063*	0.013386*	1.359562*	1.654075*	1.437696*
2	-7.967952	3.715753	0.015514	1.497329	1.988185	1.627553
3	-6.654586	1.860602	0.019848	1.721216	2.408414	1.903529
4	-2.084477	5.712637	0.019740	1.673706	2.557247	1.908110

*: Number of lag length, Source: outputs of Eviews 10 program.

$$E_{\tau}(\epsilon_t) = \begin{bmatrix} \epsilon_{1t} \\ \epsilon_{2t} \end{bmatrix} = 0 \text{ and } E(\epsilon_t, \epsilon'_t) = \Sigma$$

To test that agricultural exports do not Granger cause agricultural production, a model was estimated with VAR (2) and test that agr.exports (E) does not appear in agr.production (Y) equation and (Y) does not appear in (E) equation. The null hypothesis is: $H_0: Y_{11} = Y_{12} = 0$, the same situation in the equation of the agr.production, the null hypothesis is: $H_0: \beta_{21} = \beta_{12} = 0$

The existence of causality between (E) and (Y) is based on rejection of the null hypothesis above and this requires a significance of (Chi-sq) statistics for the group of the lagged independent variables identified above, four possibilities for the relationship between the two variables are expected to emerge:

First: A one-way causal relationship (Uni-Directional from agricultural exports to agricultural growth.

Second: Having a relationship One-way causal (Uni-Directional from agricultural growth to agricultural exports.

Third: Having a relationship Multidirectional Causation (Bi-Directional between agricultural exports and agricultural growth.

Fourth: Lack of causal relationship between agricultural exports and agricultural growth.

Table 3 reveal the nature of the relationship and the result of the causal analysis in the Toda-Yamamoto approach. The result is to reject the null hypothesis and accept the alternative which is indicate the presence of Uni-Directional from agr.exports to agr.growth (the first case above), which means there is a causal relationship

Table 3: Toda-Yamamoto test for Causality.

Dependent variable: LY			
Excluded	Chi-sq	df	Prob.
IE	4.424183	2	0.1095
Dependent variable: LE			
Excluded	Chi-sq	df	Prob.
IY	2.182106	2	0.3359

Source: outputs of Eviews 10 program.

between agr.exports and agr.production in one direction.

The study came to investigate the nature of the causality between agricultural exports and agricultural growth (represented by agr.production) in Iraq using a time series for the

period 1990-2017, for this purpose a modified method of causation was introduced by both Toda and Yamamoto (Toda and Yamamoto, 1995) for a bilateral causal test between the two variables. The empirical results have shown that there is no causal relationship between agr.exports and agr.growth in Iraq for the abovementioned period and neither one causes the other. This result confirms that Iraq is still absent from commercial effectiveness. This is due to the low value of agr.exports relative to agr.production. Iraq influenced by political and security conditions that Iraq has been throw, and the depreciation of the local currency against US dollar, which has been reflected in agr.production and hence agr.exports. The agricultural policy makers in Iraq should take into their mind the adoption of structural reforms to enhance the export capacity in the agricultural sector, as well as the manufacturing capabilities whose inputs depend on the outputs of the agricultural sector, such as packing plants and packing dates industries. The care of supporting the private sector and increasing its contribution to economic activity, which will increase its performance and enhance its role in the economy.

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