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THE IMPACT OF CITRUS EXPORTS ON ECONOMIC GROWTH: EMPIRICAL ANALYSIS FROM TUNISIA

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Abstract

The contribution of this paper is to investigate the impact of citrus exports on the economic growth on Tunisia since it never been treated before. In order to achieve this purpose, annual data were collected from the reports of Tunisian Central Bank for the periods between 1970 and 2016 was tested by using co integration analysis of Error Correction Model. According to the result of the analysis, citrus exports do not influence on economic growth in the long term. However, empirical results show that there is a positive unidirectional causality from citrus exports to economic growth in the short run. These results provide evidence that citrus exports, thus, are not seen as source of economic growth in Tunisia because the miserable economic strategy. For this reason, it is very important to make new reforms and to create robustness strategies to refine investment and trade strategy in this sector, so it can support economic growth in Tunisia.
Keywords: *Citrus Exports, Economic Growth, Cointegration, ECM, Tunisia.*
JEL Classification: *F11, F14, O47, O55, Q17, Q18.*

1. Introduction

During the second half of the twentieth century, an acceleration of international trade leads us to care about a new structure of trade, which is which is very various like; (i) the classic commercial theories based on the comparative advantages; (ii) Adam Smith's theory of the division of labor and specialization for economic growth and development; (iii) the Heckscher-Ohlin Samuelson model (HOS), which was that countries should specialize in the production of goods for which they have a comparative advantage.

In contrast, recent literature has suggested that countries tend to diversify their production and exports as they develop. In most studies, reference is made to the "concentration phenomenon", which consists essentially of a concentration of commodities and markets, which is considered to be the main factor in the instability of export earnings[1]. Thus, countries in which product concentration is high would suffer the negative effects of market price volatility through fluctuations in foreign exchange earnings[2].

For this reason, it is generally argued that expanding the export base through diversification of the national trade portfolio can help maintain stable export earnings, thereby stimulating long-term economic growth.

The impact of agricultural trade on economic growth in developing countries has latterly been a serious nut in the controversy on the analysis of international trade and development policies. In these countries, agricultural trade reforms can affect households in different ways, as households are diverse in their participation in this process. A number of studies have been conducted in the area of agricultural trade and its impacts, but their combined focus on economic and political measures has not been clearly taken into account.

Despite its diversified economy, Tunisia is under severe pressure due to; currency depreciation, instability of security, instability of economic policies, increased debt burden, reduced of foreign direct investment, bankruptcy domestic investments and other economic and social problems.

The agricultural sector occupies an important place in the Tunisian economy by contributing to the creation of employment and the balance of payments balance through exports, in addition to its role in the guarantee of the food security of the country. Today, sector revenues account for over 10% of gross domestic product and food exports account for 11% of exports of goods[3].

The main agricultural products of the country are cereals, olives, dates and citrus for the vegetable sector, and sheep for the animal sector. The olive sector and the phoenicultural sector are largely export-oriented. In 2017, olive growing accounts for 40% of national exports and just ranks second behind the textile sector. However, Tunisia is facing strong competition from citrus fruits from Spain and Morocco and there has been a decline in exports in recent years[4].

The areas devoted to citrus fruits are 23 600 hectares. In 2013-2014, production was 330 000 tones, including 39% oranges of the Maltese variety. Cape Bon, with more than 70% of the production is the first citrus region of the country. The local market absorbs 80 to 90% of the production; the rest is exported, mainly Maltese which are appreciated on the European markets and in particular French.

In all its years, and despite the importance of the citrus sectors in the Tunisian economy, we have noticed a complete absence of economic studies that focus on the economic structure of this sector. This encourages us to look for whether citrus exports are a source of economic growth or not in Tunisia. The objective of this article is to study the contribution of citrus exports to economic growth in Tunisia in the long term and in the short term, applying an empirical analysis based on the analysis of cointegration and the error correction model. The rest of the article is organized as follows. A descriptive analysis of economic growth, imports and the citrus sector's place in Tunisian exports is presented in the first paragraph. The second paragraph focuses on a review of the literature on the link between total exports and agricultural exports on the one hand and growth on the other. The empirical methodology and the results of the econometric estimations are the subject of paragraphs three and four, respectively. The last section concluded the paper with an emphasis on economic policy recommendations.

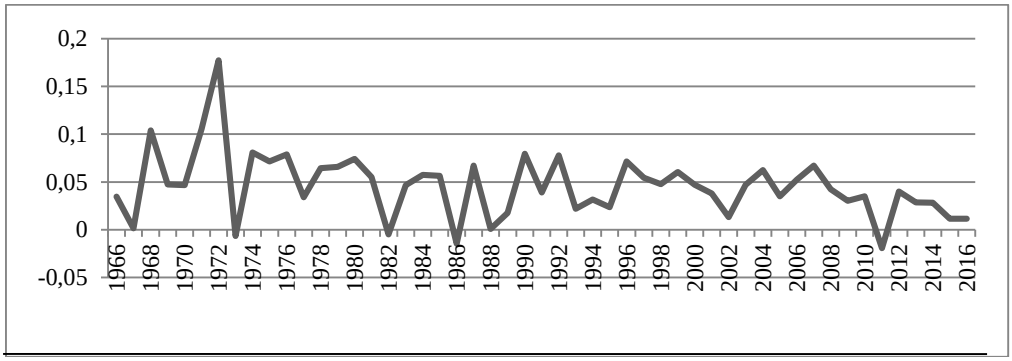
2. Evolution of Economic Growth, Total Imports, Total Exports and Citrus Exports in Tunisia

The agricultural sector is a strategic and vital sector, not only in Tunisia, but around the world. In addition to its contribution to GDP, agriculture is a highly labor-intensive sector and a factor in reducing the regional imbalance. According to the National Institute of Statistics (2016), the agricultural sector accounts for 9.22% of gross domestic product (GDP) and operates around 14.98% of the active population. Agricultural investments amount to 7.04% of total investments in Tunisia and are valued at around 1 250 million dinars. Agricultural exports account for 10.57% of the country's total exports and cover nearly 65% of its food imports. These indicators clearly highlight the importance of the agricultural sector in the Tunisian economy.

2.1 Evolution of economic growth in Tunisia

Figure 1 shows that for the entire period 1966-2016, there is an annual average of 4.59%. The change between the first and last year is 66%. The highest value was registered in 1972 (17.74) and the lowest value was recorded in 2011 (-1.92). The graph allows analysis between

sub-periods characterized by different gradual transformations of the GDP. Indeed, until the end of the 1970s, growth rates were more often than 5%. It is a virtue that originates mainly in an international environment conducive to Tunisian exports of hydrocarbons and mining products[5] (However, the economy benefits from the positive results of the two oil shocks (1973 and 1979), which increase prices of oil and phosphates, but also thanks to higher agricultural production and higher tourism receipts). Between 1982 and 1986, Tunisia witnessed an economic crisis due to its heavy dependence on oil revenues, rising external debt, depending on price support policy, weak production base (inability to absorb surplus labor) and lack of government investment in infrastructure private sector), which led to a rise in social tensions during the late seventies with the deterioration of the international economic situation and inappropriate policies to make Tunisia in an economic crisis led to lower growth rates. In 1986, Tunisia witnessed its first year of negative growth since independence. Due to the gravity of the economic situation, the authorities conducted negotiations with the International Monetary Fund and the World Bank and adopted a structural adjustment plan in that year.



Source: Graph constructed by the author using data from the Tunisian central bank

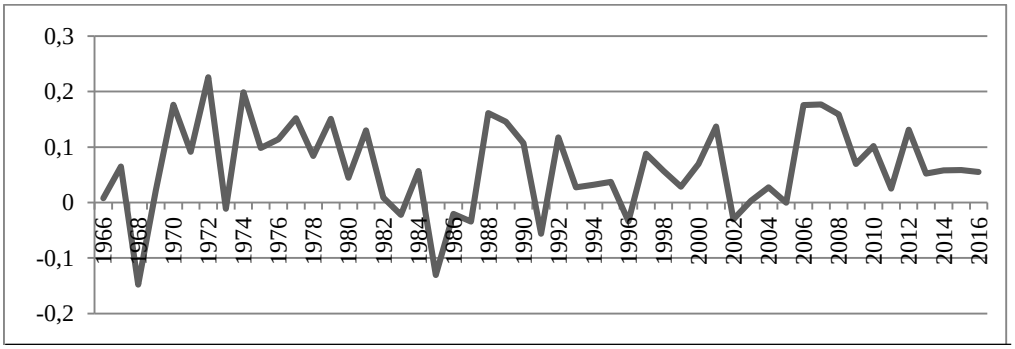
Figure 1. Evolution of The Annual GDP Growth Rate in% During The Period 1966-2016

It appears that the policies adopted resulted in positive results in terms of growth during the period 1990-2007. This plan included a series of changes and economic reforms including privatization of public institutions, tax reform, and reduction of quantitative and tariff barriers. The period between 2007 and 2010 witnessed a slight decline in economic growth due to the deteriorating economic conditions, the large number of protests about unemployment, marginalization and poverty, widespread corruption and bribery, neglecting the ruling family and officials in exploiting their influence. These problems were one of the reasons that led to the fall of the Ben Ali regime on 14 January 2011, which led to the tightening of the limits of the adopted strategies. The latter did not allow in particular solving the problems of unemployment and regional imbalance. However, the fall of the Ben Ali regime would lead to a period of instability and social tension, and the main result would be a decline in GDP growth during the period 1990 - 2016.

2.2 Evolution of Total Imports in Tunisia

During the period 1965-2016, it can be seen from the combination of the two graphs 1 and 2 that increased imports lead to an increase in the gross domestic product in the following periods; 1986, 1972, 1974, 1977, 1981, 1984, 1988, 1992, 1977, 2001, 2004 and 2012.

Similarly, a decrease in imports leads to a decrease in the gross domestic product, which is clear in the following years; 1973, 1983, 1991, 2002 and 2012. This confirms the importance of imports in stimulating economic growth. The liberalization of imports in Tunisia took place in two stages. In early 1990, the first phase was inaugurated and was achieved through the liberalization of import licenses and the reduction of tariffs. Both measures increased the competitive pressure on domestic industries. The second phase of import liberalization was commenced in 1995, and took the form of a five-year tariff reduction program for all countries. During this period, a greater and faster lessening of commercial rates than during the first phase was achieved.



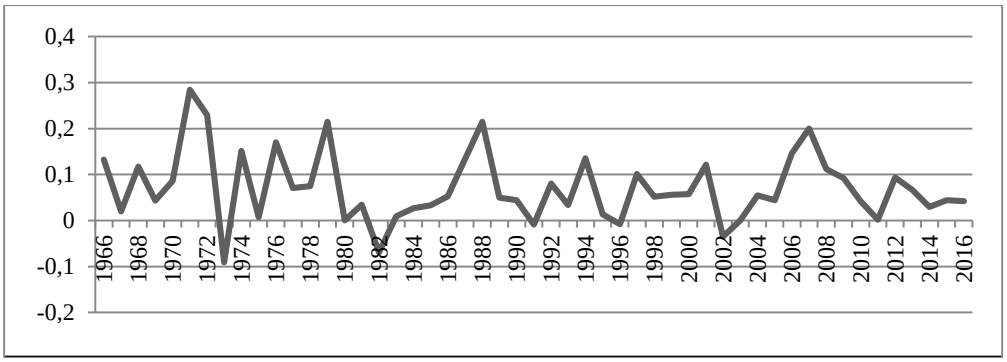
Source: Graph constructed by the author using data from the Tunisian central bank

Figure 2. Evolution of Imports Growth Rate in % During The Period 1966-2016

The purpose of the trade opening was to lower the prices of imported goods. This decline in prices may have contributed over time to the acquisition of machinery and equipment. These have been an important factor for importing foreign technologies. Ben Hammouda, H et al, (2007) find in Tunisia that the pace of change in technology, measured by growth in total factor productivity, increased by 1% in the long term and by 1.02% after period of commercial reform.

2.3 Evolution of Total Exports in Tunisia

During the period of socialist planning between 1962 and 1969, coverage ranged from 48.7 per cent in 1965 to 72.4 per cent in 1968 because of poor climatic conditions and the devaluation of the currency. During this period, agricultural production suffered very severely from a prolonged drought that lasted far beyond that predicted by the theory of cycles. Nevertheless, the average coverage rate was 57.3%. Although benefitting from much more favorable climatic conditions and the positive evolution of the terms of trade, the years 1970-1979 (economic liberalism tinged with dirigisme) did not record the rate of coverage that could be expected (68% on average), ranging from 50.9% in 1977 (its lowest level) to 81.4% in 1974 (its highest level). As with the GDP growth rate, the economic reforms and trade liberalization policies of the 1990s (e.g. free trade agreement with the EU and World Trade Organization membership in 1995) seem to have been favorable to exports whose weight in GDP was more often than 40% from 1990 to 2010.



Source: Graph constructed by the author using data from the Tunisian central bank

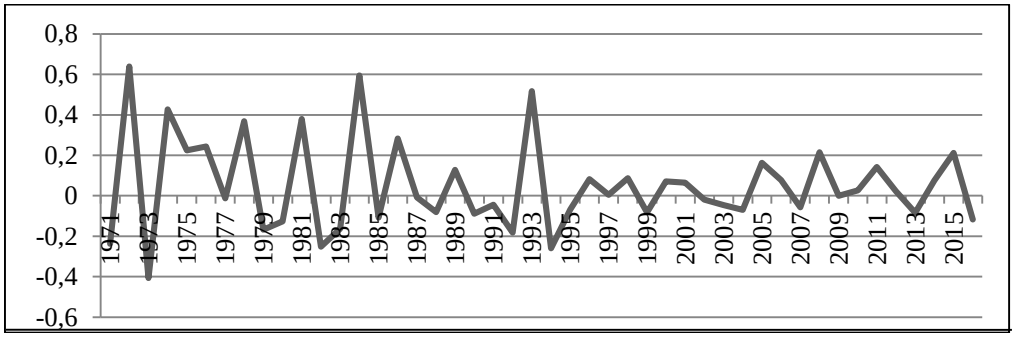
Figure 3. Evolution of Exports Growth Rate in% During the Period 1966-2016

Despite reforms to boost exports, the trade balance has always remained negative and this has generally been explained by low productivity and strong competition in the international market. The situation of political and social instability that emerged after the 2011 revolution seems to have negatively affected exports, whose share fell by almost 5% between 2010 and 2016.

2.4 Evolution of Citrus Exports in Tunisia

According to Figures 4 and 5, it is generally noted that citrus fruit productivity and citrus fruit exports evolve during this period in a parallel manner.

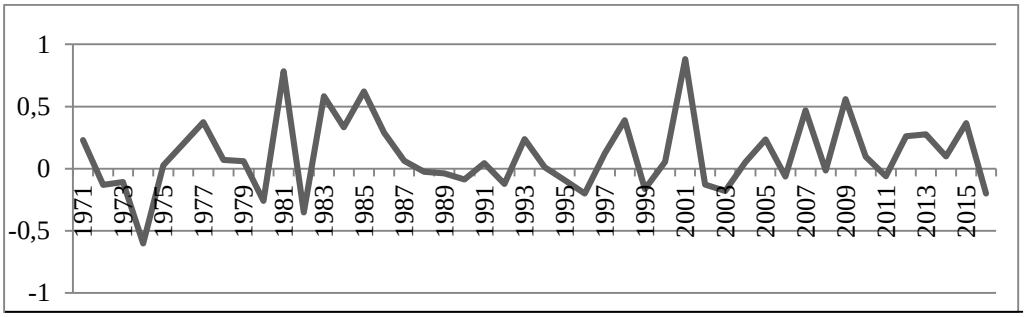
In certain sub-periods such as 1972, 1974, 1984, 1996 and 2011, we observe a set of contradictory developments presented by an increase in citrus fruit productivity and a decline in citrus fruit exports. This is explained by the strong competition that characterizes the international citrus market (Spain, Turkey, United States, South Africa, the Netherlands, Italy, and Greece) and above all the instability of policies in 2011 and 2013 which led the loss of several international customers.



Source: Graph constructed by the author using data from the Tunisian central bank

Figure 4. Evolution of Citrus Production in Thousands of Tones

In other sub-periods such as the years 1977, 1985, 2007 and 2013, there is also another type of contradictory evolution, of which a decreasing in the productivity of citrus fruit is accompanied by an increase in citrus exports.



Source: Graph constructed by the author using data from the Tunisian central bank

Figure 5. Evolution of Citrus Exports Growth Rate in% During the Period 1971-2016

This can be explained by some reforms and strategies that limit the national consumption of citrus fruits and increase the share of exports for the entry of the currencies because of the worst economic situations that attack Tunisia in different periods.

Table 1. The Share of Citrus in Total Exports							
1969	1,09%	***1981***	0,61%	***1993***	0,57%	***2005***	0,51%
1970	1,28%	***1982***	0,33%	***1994***	0,55%	***2006***	0,44%
1971	1,42%	***1983***	0,45%	***1995***	0,52%	***2007***	0,57%
1972	1,15%	***1984***	0,49%	***1996***	0,38%	***2008***	0,56%
1973	1,17%	***1985***	0,69%	***1997***	0,39%	***2009***	0,78%
1974	0,42%	***1986***	0,96%	***1998***	0,51%	***2010***	0,78%
1975	0,43%	***1987***	0,90%	***1999***	0,38%	***2011***	0,76%
1976	0,46%	***1988***	0,84%	***2000***	0,34%	***2012***	0,83%
1977	0,60%	***1989***	0,72%	***2001***	0,58%	***2013***	0,99%
1978	0,62%	***1990***	0,65%	***2002***	0,50%	***2014***	1,01%
1979	0,63%	***1991***	0,63%	***2003***	0,43%	***2015***	1,17%
1980	0,44%	***1992***	0,53%	***2004***	0,45%	***2016***	0,92%

Source: Table constructed by the author using data from the Tunisian central bank

Table 1 shows that citrus exports averaged 1.08 of total exports. Despite the importance of productivity in this sector, their export has very low values and volumes to cover Tunisian imports.

3. Literature survey

Among the studies that have shown that an expansion of exports has a significant positive impact on economic growth are Michaely, (1977); Balassa, (1978); Tyler, (1981); Savvides, (1995); Asmah, (1998); Edward, (1998); Ram, (1987).

According to the empirical research which describe the contribution of agricultural exports to economic growth, it is very astonishing that it has been ignored in the literature and its role in the development process has long been renowned for agricultural economies.

But various economies argue that the increase in agricultural exports plays a crucial role in economic growth, such as Johnston and Mellor (1961); Levin and Raut (1997); Ekanayake

(1999), Karp and Perloff (2002); Ardeni and Freebairn (2002); Schiff and Valdes (2002); Lopez (2002); Dawson (2005); Pingali and Kelley (2007); Kwa and Bassoume (2007); Nadeem (2007); Gollin (2010); Anderson (2010); Sanjuan-Lopez and Dawson (2010).

Table 2. Studies Related to the Relationship between Exports and Economic Growth

No	Authors	Countries	Periods	Empirical analysis	Results
1	Forgha and Aquilas (2015)	Cameroon	1980 - 2014	Cointegration Analysis	AX # Y: SR
				VECM	AX => Y: LR
				Granger Causality Tests	
2	Hussaini et al (2015)	India	1980 - 2013	Cointegration Analysis	X <=> GDP
				VECM	
3	Rai and Jhala (2015)	India	2000 - 2013	Cointegration Analysis	X <=> GDP
				Granger Causality Tests	
4	Alam and Myovella (2016)	Tanzanian	1980 - 2010	Cointegration Analysis	AX => Y
				Granger Causality Tests	
5	Edeme et al (2016)	ECOWAS Countries	1980 - 2013	Fixed Effect Model	AX => Y
				Random Effect Model	
6	Mehrara and Baghbanpour (2016)	34 Developing Countries	1970 - 2014	Fixed Effect Model	AX # Y
				Random Effect Model	MX => Y
				Hausman Test	
7	Oluwatoyese et al (2016)	Nigeria	1981 - 2014	Cointegration Analysis	AX => GDP: LR
				VECM	AX # Y: SR
				Granger Causality Tests	
8	Bakari (2017a)	Gabon	1980 - 2015	Cointegration Analysis	X => Y: LR (-)
				ECM	X => Y : SR
9	Bakari (2017b)	Malaysia	1960 - 2015	Correlation Analysis	X => Y: LR
				Cointegration Analysis	
				ECM	
10	Bakari (2017c)	Sudan	1976 - 2015	Cointegration Analysis	X # Y : SR
				VECM	X # Y : LR

11	Bakari and Krit (2017)	Mauritania	1960 - 2015	Cointegration Analysis	X => Y : LR
				VECM	X <= Y
				Granger Causality Tests	
12	Bakari and Mabrouki (2017)	Panama	1980 - 2015	Cointegration Analysis	X => Y
				VAR	
				Granger Causality Tests	
13	Cong and Hiep (2017)	Vietnam	1999 - 2014	Cointegration Analysis	X <=> Y: SR
				VECM	X <=> Y: LR
14	Kalaitzi and Cleeve (2017)	United Arab Emirates	1981 - 2012	Cointegration Analysis	AX # Y: SR, LR
				VECM	MX <=> Y: SR, LR
				Granger Causality Tests	
15	Keyo (2017)	Cote d'Ivoire	1965 - 2014	ARDL	X => Y : LR
				Granger Causality Tests	X => Y : SR
16	Mahmood and Munir (2017)	Pakistan	1970 - 2014	Cointegration Analysis	AX <= Y
				Granger Causality Tests	
17	Nguyen (2017)	Vietnam	1986 - 2015	ARDL	X => Y: LR (-)
					X # Y : SR
18	Pacific (2017)	Cameroon	1996 - 2014	Cointegration Analysis	X # Y
				VAR	X => Y :SR
				Granger Causality Tests	

Note: X means Exports, M means Imports, Y means Economic Growth, AX means Agricultural Exports, MX means Manufacture Exports, LR means Long Run, SR means Short Run, (+) means Positive Effect and (-) means Negative Effect.

It is clear from those recent studies and investigations in the nexus between exports and economic growth have attended to focus on VAR and VECM models and cointegration approach to capture the short run dynamics and the long term effects between the two variables.

4. Data and Methodology

To determine the contribution of citrus exports to economic growth in Tunisia, we must study its short-term and long-term impact to better clarify the relationship between them. For this reason, we will use the Sims model that aims to achieve this mission. In addition, the Sims model consists of respecting a set of econometric rules and a well-defined statistical tools approach.

First, all the variables included in our model must be stationary whether in level, in first difference or in secondary difference. Second, determine the optimal number of delays that characterizes the variables included in the econometric model. Third, as soon as, the optimal delay number is determined, we will apply the analysis of cointegration relationships to check whether the estimated variables are cointegrated or not. Fourth, this step depends on the result of the third step. In the case of the absence of a cointegration relationship, we will apply the VAR model which aims to study the causalities between the estimated variables. On the other hand, in the case of the presence of one or more cointegration relationships, we will apply the VECM model which aims to study the effects between the variables estimated in the short term and in the long term. Finally, since econometric analysis is always an approximation of results and events. We will perform a set of diagnostic tests, robustness tests and stability tests to see the robustness of our results, the quality of our model and the credibility of our econometric analysis.

Exports of goods and services are seen as an incentive of economic and social development out of their strength to manipulate economic growth and to reduce poverty. Exports are a source of foreign exchange outflows to deal with imports. Eventually, they materialize a vigorous component of State revenue through customs duties they may hatch or when they are taken out by public enterprises. In some situations, imports are seen as intrinsic usefulness for foreign technology and knowledge to develop the national economy, as new technologies could be inserted into imports of intermediate goods such as machinery and equipment and labor productivity could rise over time as workers gain knowledge of the new incorporated technique.

The augmented production function including exports and imports is expressed as[6]:

$$Y = AX^{\alpha_1}M^{\alpha_2} \tag{1}$$

In equation (1) Y is GDP, X is Export, M is Import and A show the level of technology utilized in the country which is assumed to be constant. The returns to scale are associated with export and import which are shown by $\alpha_1$and α_2 respectively.

All the variables are mutated into logarithms in order to fabricate linear the non linear form of Cobb-Douglas production. The Cobb-Douglas production function is presented in linear functional form as follows:

$$Log(Y_t) = Log(A) + \alpha_1 Log(X_t) + \alpha_2 Log(M_t) + \varepsilon_t \tag{2}$$

The overhead empirical will explore the influence of export and import on economic growth by keeping technology constant. The linear model rendering the impact of export and economic growth on economic growth after keeping technology constant can be written as follows:

$$Log(Y_t) = \alpha_0 + \alpha_1 Log(X_t) + \alpha_2 Log(M_t) + \varepsilon_t \tag{3}$$

Export in Tunisia comprises a lot of sectors. As we note that we will focus on citrus exports. In this case we will be devising exports in two sectors; the first sector represents citrus exports and the second sector represents the remaining share of export in the other sectors.

$$X = CX + OX \tag{4}$$

Equation (4) presents our export division (X) of which (CX) presents the citrus export values in constant prices and (OX) presents the export in the other sector values in constant

prices. In equation (5), (CX) and (OX) are relocated into logarithms in order to carry out linear the nonlinear form of Cobb–Douglas production.

$$Log(X_t) = Log(CX_t) + Log\ (OX_t) \quad (5)$$

When we merge equation 3 and 5, we obtain the following equation which presents our final model for our estimation.

$$Log(Y_t) = \alpha_0 + \alpha_1 Log(CX_t) + \alpha_2 Log(OX_t) + \alpha_3 Log(M_t) + \varepsilon_t \quad (6)$$

In equation (6); $\{Y$, CX, OX and M$\}$ present respectively economic growth, citrus export, export in the other sector and import. The returns to scale are associated with citrus export, other export and import which are shown by $\alpha_1, \alpha_2 and \alpha_3$ respectively.

To analyze the impact of citrus exports on economic growth of Tunisia this study utilized the time series data based on 47 annual observations for the time period of 1970–2016. The brief description of variables is given as under in Table 3.

Table 3: Description of Variables

No	Variable	Description	Source
1	Y	Gross domestic product (constant TND)	The Tunisian central bank
2	CX	Citrus exports (constant TND)	The Tunisian central bank
3	OX	Other exports (constant TND)	The Tunisian central bank
4	M	Imports (constant TND)	The Tunisian central bank

5. Empirical Analysis

5.1 Test for Unit Root

This involves testing the order of integration of the individual series under consideration. Several procedures for the test of order of integration have been developed. The most popular ones is Augmented Dickey-Fuller (ADF) test due to Dickey and Fuller (1979, 1981). The general form of ADF test is estimated by the following regression:

$$\Delta Y_1 = a + \beta Y_{t-1} + \sum_{i=1}^{n} \beta_1 \Delta Y_i + \varepsilon_t \quad (7)$$

Where; Δ is the first difference operator, Y is a time series, t is a linear time trend, $\alpha$is a constant, n is the optimum number of lags in the dependent variable and ε is the random error term.

Table 4 shows that all variables have unit root in the first difference and the second difference, and denote significances at 1%.

Table 4. Test for Unit Root ADF

	Exogenous: Constant	**Exogenous: Constant, Linear Trend**	**Exogenous: None**
Log(Y)			
Level	[0.291954]	[1.920240]	[6.549618]
First Difference	[6.336770]***	[6.262309]***	[2.248102]***
Second Difference	[7.796642]***	[7.699056]***	[7.876085]***
Log(CX)			
Level	[0.027433]	[2.807934]	[1.553943]***
First Difference	[7.239881]***	[7.434229]***	[6.933736]***
Second Difference	[7.116766]***	[7.027736]***	[7.204218]***
Log(M)			
Level	[0.348799]	[2.698157]	[5.261760]
First Difference	[6.773042]***	[6.679997]***	[4.486993]***
Second Difference	[7.539719]***	[7.476039]***	[7.626994]***
Log(OX)			
Level	[0.833854]	[3.147167]	[5.060965]
First Difference	[7.941432]***	[7.849720]***	[7.849720]***
Second Difference	[8.872586]***	[8.797728]***	[8.984782]***

Note: *** denote significances at 1% and 5% levels respectively

5.2 Determination of the Number of Lags

Most VAR models are estimated using symmetric lags, he same lag length is used for all variables in all equations of the model. This lag length is frequently selected using an explicit statistical criterion such as the AIC or SIC.

$$\mathrm{AIC} = 2\mathrm{k} - 2\mathrm{l\,n}(L) \quad (8)$$

$$SIC = -2\,ln(L) + k.l\,n(n) \quad (9)$$

Where; L is the maximum values of the likelihood function for the model; K is the number of estimated parameters in the model and n is the number of observation.

Table 5: Lag Order Selection Criteria

VAR Lag Order Selection Criteria						
Lag	**Log L**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	163.1222	NA*	4.12e-09*	-7.956110	-7.787222*	-7.895046*
1	175.6258	21.88134	4.93e-09	-7.781292	-6.936852	-7.475969
2	191.1112	24.00237	5.19e-09	-7.755562	-6.235570	-7.205981
3	207.0578	21.52781	5.57e-09	-7.752888	-5.557345	-6.959049
4	220.9364	15.96049	7.07e-09	-7.646822	-4.775727	-6.608725
5	240.1773	18.27877	7.60e-09	-7.808863	-4.262216	-6.526507
6	262.4914	16.73558	8.27e-09	-8.124568*	-3.902369	-6.597954
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Note: * indicates lag order selected by the criterion

VAR lag order selection criteria prove that the number of lags chosen is equal to 6 lags.

5.2 Cointegration Analysis

The aim of the cointegration test is to check and explore whether there is a co-regression relationship between the different variables or not.

Johansen proposes two different likelihood ratio tests of the significance of these canonical correlations and thereby the reduced rank of the matrix $\prod$: the trace test and maximum Eigenvalue test, shown in equations (10) and (11) respectively.

$$J_{trace} = -T\sum_{i=r+1}^{n} \ln(1-\lambda_i) \quad (10)$$

$$J_{max} = -T\ln(1-\lambda_{r+1}) \quad (11)$$

Where λ_i denotes the estimated values of the characteristic roots obtained from the estimated π, and T is the number of observations.

Table 6. Johansen Test

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.581000	66.21891	47.85613	0.0004
At most 1 *	0.381452	32.29345	29.79707	0.0253
At most 2	0.288978	13.55860	15.49471	0.0959
At most 3	0.006582	0.257556	3.841466	0.6118
Trace test indicates 2 cointegrating eqn(s) at the 0.05 level				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.581000	33.92547	27.58434	0.0067
At most 1	0.381452	18.73485	21.13162	0.1048
At most 2	0.288978	13.30104	14.26460	0.0706
At most 3	0.006582	0.257556	3.841466	0.6118
Max-Eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

The Johanson test ticks the entity of a cointegration relation between the variables studied. Then, we will employ an empirical analysis based on the Error Correction Model (ECM).

5.3 Estimation of Error Correction Model (ECM)

The target to perform an estimate based on the error correction model is to extract the effect of the explanatory variables on the variable to be explained in the short term and the long term.

As, GDP, exports and imports are cointegrated**,** ECM (error correction model) representation would have the following form, in equations:

$$\Delta Y_t = \sum_{i-1}^{k} \alpha_0 \Delta Y_{t-i} + \sum_{i-1}^{k} \alpha_1 \Delta CX_{t-i} + \sum_{i=1}^{k} \alpha_2 \Delta OX_{t-i} + \sum_{i=1}^{k} \alpha_3 \Delta M_{t-i} + Z_1 EC1_{t-1} + \varepsilon_{1t} \quad (12)$$

Where; Δ: The difference operator; k : The number of lags; α_1, α_2 and α_3 : Short run coefficients to be estimated; $EC1_{t-1}$: The error correction term derived from the long-run co integration relationship; Z_1 : The error correction coefficients of $EC1_{t-1}$; ε_{1t}: The serially uncorrelated error terms in equation

The equation of ECM can be transformed in the equation (13), which includes the nexus between variables in the long run and the short run:

$$D(DLOG(Y)) = C(1) * (\mathbf{DLOG(Y(-1))} - \mathbf{0.2} * \mathbf{DLOG(CX(-1))} - \mathbf{1.5} * \mathbf{DLOG(OX(-1))} + \mathbf{0.9} * \mathbf{DLOG(M(-1))} + \mathbf{0.002}) + C(2) * D(DLOG(Y(-1))) + C(3) * D(DLOG(Y(-2))) + C(4) * D(DLOG(Y(-3))) + C(5) * D(DLOG(Y(-4))) + C(6) * D(DLOG(Y(-5))) + C(7) * D(DLOG(Y(-6))) + C(8) * D(DLOG(CX(-1))) + C(9) * D(DLOG(CX(-2))) + C(10) * D(DLOG(CX(-3))) + C(11) * D(DLOG(CX(-4))) + C(12) * D(DLOG(CX(-5))) + C(13) * D(DLOG(CX(-6))) + C(14) * D(DLOG(OX(-1))) + C(15) * D(DLOG(OX(-2))) + C(16) * D(DLOG(OX(-3))) + C(17) * D(DLOG(OX(-4))) + C(18) * D(DLOG(OX(-5))) + C(19) * D(DLOG(OX(-6))) + C(20) * D(DLOG(M(-1))) + C(21) * D(DLOG(M(-2))) + C(22) * D(DLOG(M(-3))) + C(23) * D(DLOG(M(-4))) + C(24) * D(DLOG(M(-5))) + C(25) * D(DLOG(M(-6))) + C(26) \quad (13)$$

Table 7. Granger Causality Test Results based on Error-Correction Model (ECM)

Dependent variable: Y		
	Excluded	Prob.
Long Run	Cointegration Equation	0.0538
Short Run	CX	0.0349**
	OX	0.0019***
	M	0.0001***

Note: ** and *** denote significances at 1% and 5% levels respectively

Table 6 shows that the cointegration equation is not significance, meaning that there is no relationship between citrus exports and economic growth in the long run. However, in the short run we can see that citrus exports affect positively economic growth.

In addition, we can note that other exports and imports can cause economic growth, this finding are confirmed by Saaed and Hussain (2015), Bakari (2017d) and Bakari et al (2017).

As usual at the end of each empirical investigation, we must apply a set of analysis to verify the robustness and credibility of our work, our model and the results of our estimation. To this we will try to apply a broad analysis to achieve this audit objective, including the use of heteroskedasticity tests, diagnostic tests and the stability of the VAR model.

6. Diagnostics Tests

To verify the quality of our estimated model and the robustness of our estimation, we use a set of tests called diagnostic tests.

Table 8. Residual Diagnostics Tests

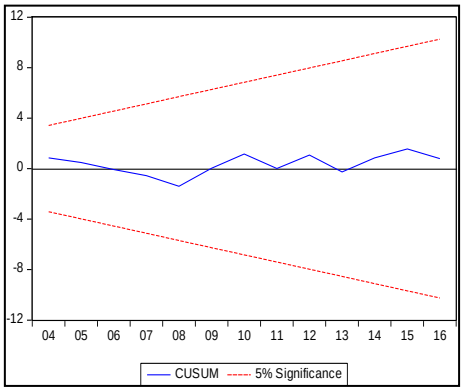
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	3.505854	Prob. F(32,6)	0.0603
Obs*R-squared	37.02009	Prob. Chi-Square(32)	0.2483
Scaled explained SS	3.576699	Prob. Chi-Square(32)	1.0000
Heteroskedasticity Test: Harvey			
F-statistic	0.617282	Prob. F(32,6)	0.8262
Obs*R-squared	29.91369	Prob. Chi-Square(32)	0.5725
Scaled explained SS	42.51433	Prob. Chi-Square(32)	0.1013
Heteroskedasticity Test: Glejser			

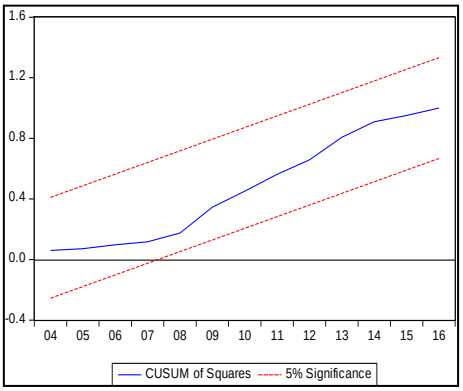
F-statistic	2.340992	Prob. F(32,6)	0.1447
Obs*R-squared	36.10796	Prob. Chi-Square(32)	0.2824
Scaled explained SS	12.72353	Prob. Chi-Square(32)	0.9991
Heteroskedasticity Test: ARCH			
F-statistic	0.754800	Prob. F(6,26)	0.6115
Obs*R-squared	4.895391	Prob. Chi-Square(6)	0.5573
Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	2.957508	Prob. F(6,7)	0.0910
Obs*R-squared	27.96749	Prob. Chi-Square(6)	0.0001

All residual diagnostic tests are satisfactory and assert that our model is acceptable and well treated

7. Model Stability

Finally we will apply to use the test CUSUM, this test makes it possible to study the stability of the model estimated over time.





The tests results of the stability VAR (CUSUM Test and CUSUM of Square Test) show that the Modulus of all roots is less than unity and lie within the unit circle. Accordingly we can conclude that our model the estimated VAR is stable or stationary.

8. Conclusion

This paper is a contribution to the analysis of the impact of citrus exports for economic growth in Tunisia from 1970 to 2016 using the application of cointegration analysis and the correction model error. The main results obtained are the absence of a long-term relationship between citrus exports and economic growth. On the other hand, the results show that in the short run, citrus exports have a positive impact on economic growth. According to these results, it is very clear that citrus exports are not presented as a source of economic growth in Tunisia in the long run. This can be explained by some reasons that we can classify them into two kinds: internal and external reasons. Among the external reasons, the production of citrus fruit in Tunisia is very small and low compared to the rest of the world (rank 39 according to the international statistics of Actualistix) which makes its market share in the international market is lower. On the other hand, international competitiveness in this sector is very rigid and brutal for Tunisia, especially since the majorities of top citrus exporters

are developed countries and use very innovative marketing strategies. Likewise, with the continued depreciation of the Tunisian Dinar, the added value of citrus exports is very insufficient to cover costly imports. Among the internal reasons, the lack of export terminals (only 14 stations) and the poor infrastructure that prevents the opening of other export terminals in the direction of several countries such as Africa, as well as the difficulties faced by the exported materials against facilities in front of the supplied materials. It is therefore advisable to rethink economic policies and strategies to improve citrus exports and to make them a key factor in achieving economic development because of their importance in the global market.

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1 See: FOA (2004); Sannassee and al (2014)

2 See: Romer (1990); Acemoglu and Zilibotti (1997)

3 Annual reports of the National Statistical Institute of Tunisia

4 Annual reports of the agency for the promotion of agricultural investments in Tunisia

[5] Balance of Payments of Tunisia 1960-1980, Central Bank of Tunisia

[6] This modality of production function is very operative and very lucid to rationalize the linkage between trade and economic growth, predominately in the developing countries and especially, in the countries of Africa as the case of Tunisia, since these countries take possession of several Natural resources and rare goods such as oil, gas, phosphate, gold, copper, iron, phosphorus for export, and generally require high-level imports to extract these resources. In addition the share of investment and labor force are not of great influence simply because of the emergence of percentages of unemployment and very high poverty. In addition, there are several researchers in this field who have used only the two variables export and import in the function of production to express their relations with economic growth such as Baharumshah and Rashid (1999); Din (2004); Akbay (2011); Kubo (2011); Hamdi (2013); Velnampy and Achchuthan (2013); Hussain (2014); Turan and Karamanaj (2014); Mohsen (2015); Yüksel and Zengin (2016).