A Dynamic Analysis of Egyptian Orange Exports to Russia: A Co-integration Analysis

Assem Abu Hatab and Aimable Nsabimana

The Swedish University for Agricultural Sciences, Sweden:
assem.abouhatab@slu.se and aimable.nsabimana@slu.se

Abstract

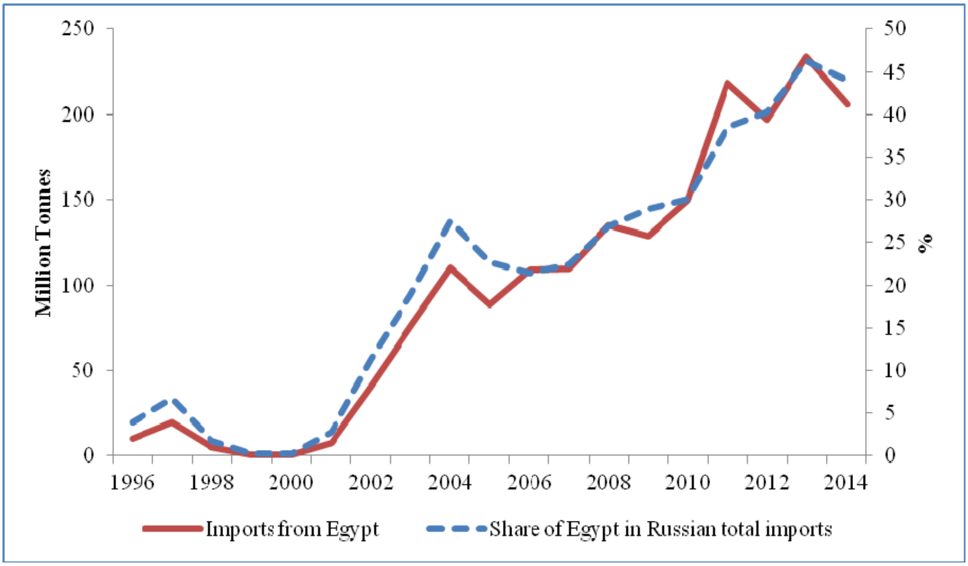
This paper analyzes the determinants of Egyptian orange exports to Russia by applying an autoregressive distributed lag approach to quarterly data covering the period 1996-2014. Our major findings indicate that i) A one percent increase in the Russian GDP would lead to an increase of about 3.7% in Egypt's orange exports to Russia in the long run, ii) Egypt's export price relative to the export prices of other competitors has a negative statistically significant influence on orange exports to Russia, and iii) unlike our expectations, trade liberalization efforts between Egypt and Russia have had a negative influence on orange exports to Russia.

Keywords: Egypt Orange exports, Russia, FMOLS, DOLS and ARDL

Introduction

Egypt has traditionally been known as a world leading producer and exporter of oranges, while it is ranked as the world's sixth top producer and the second largest exporter of oranges in the world (Verdonk, 2014). The Russian market has always been a major destination for Egyptian oranges. Over the past one and half decades, Russian imports of Egyptian oranges have increased substantially form about 7.7 million tons in 2001 to roughly 76 million tons in 2003. During the period 2004-2011, the quantity of Egyptian orange exports to Russia has nearly doubled climbing from 110 million tons in 2004 to almost 219 million tons in 2011. Though Egyptian exports of other agricultural and food commodities sharply declined in post-2011, orange exports to Russia have shown relative stability, averaging about 214 million tons during the period 2011-2014. Concurrently, Egypt has consistently been acquiring larger market shares, in quantity terms, in the Russian market which increased from nearly 3% in 2001 to 30% in 2010 and 46% in 2013.

Such strong performance of Egyptian orange exports into the Russian market is mainly attributed to the special attention that the government of Egypt pays to the development of the citrus sub-sector at different levels of the supply chain and the special attention to the promotion of Egyptian orange exports (Soliman, 2013). At the production level, efforts focus on increasing orange production by adopting enhanced irrigation and fertilization methods, improved pest control and harvest techniques (MTISME, 2015). At the post-harvest level, the government adopted strategies to improve crop quality through the implementation of good agricultural practices as well as by increas-



Source: UN –COMTRADE Database, World Bank, World Integrated Trade Solution (2015)

Figure 1: *Egyptian orange exports to Russia, 1996-2014*

ing farmers' awareness of the importance and benefits of the compliance with the food safety and quality standards for competing on the international markets (Hamza, 2013; AEC, 2014). Together these policies have resulted in increasing orange production from approximately 2000 million tons in 2002 to about 3000 million tons in 2014 (MALR, 2015), This in turn increased the surplus available for export to Russia, as shown in Figure 1, and to the rest of the world importing countries.

Another important factor behind the strong performance of Egyptian orange exports on the Russian market is the "revitalization" of economic and trade relations between Egypt and Russia since 2001 (Trenin, 2005; Parker, 2015). A retrospect of these relations shows that economic and trade cooperation between the two countries were at their peak during the 1950s and 1960s while bilateral trade volume constantly increased making Russia the main trading partner to Egypt (MFA, 2016; Arkhangelskaya and Shubin, 2013; Parker, 2015). During the following three decades (1970s-1990s), Egyptian-Russian trade relations experienced turbulences due to economic and political changes in the two countries which resulted in strained, problematic, and sometimes hostile relations (Neriah, 2013). Since the beginning of the last decade, bilateral trade between Egypt and Russia have been increasing steadily. Particularly, in the wake of the Egyptian revolution (so-called the Arab Spring) in 2011, bilateral trade flows between Egypt and Russia entered a new era of strong performance and Russia emerged as a major trading partner to Egypt (Askary, 2015). For instance, overall value of bilateral trade between the two countries surged from USD 1.7 billion in 2009 to about USD 3.2 billion in 2014. Moreover, in February 2015, the two countries signed a number of trade and investment cooperation agreements including an agreement to establish a free-trade zone with the Russian-led Eurasian Economic Union (EEU), and a Russia industrial zone in the Suez Canal area (SIS, 2016). Within the framework of Egypt's trade agreements and negotiations, the agrifood commodities, especially horticultural crops, have always been cited as a major potential area through which Egypt can promote its exports into the Russian market (Parker, 2015; Torayeh, 2013; Askary, 2015). To this end, Egypt has since 2014 been negotiating with Russia possibilities of facilitating market access conditions for Egyptian agrifood products. This included an agreement to allow custom-free export of Egyptian agricultural commodities to the Eurasian Customs Union led by Russia (SIS, 2016; Wahish, 2014).

Two major recent developments that provided further export opportunities to Egyptian oranges in the Russian market were the embargos that Russia imposed on imports of agricultural and food commodities from the EU and Turkey, in 2014 and 2015, respectively. Collectively, the EU and Turkey used to supply the Russian market, on average, with almost one quarter of its total orange imports during the period 1996-2014 (WITS, 2016). Accordingly, these Russian import bans represent a window of opportunity to orange exporters in Egypt to make up for the void created by the exclusion of the EU and Turkey from the market (Abu Hatab, 2015; Hamza, 2014). Specially, the exclusion of these suppliers gives Egyptian oranges a greater competitive edge on the Russian market since logistics issues have always been a source of concern for Egypt as rivals, especially Turkey, enjoy easier transport links to Russia due to shipping lanes or geographical location.

In recognition of the ongoing developments in Egypt-Russia trade relations as well as the recent developments in the Russian market for imported oranges, the present paper aims to analyze the determinants of Egyptian orange exports to Russia with the aim to develop in-depth understanding of the emerging opportunities that the Russian market could offer to Egyptian oranges. This paper contributes to the literature in the following ways. First, an examination of the related literature reveals that existing empirical studies on export demand for Egyptian agricultural commodities have mainly concentrated on the EU and the US (e.g. Assem Abu Hatab & Surry, 2015; Helmy, 2010) while not much emphasize has been given to Russia and other Eastern European countries. Thus, this paper attempts to fill this void in the literature by providing evidence based on the analysis of the determinants of Egyptian orange exports to Russia. Second, the bulk of previous studies on external import demand for Egyptian agrifood commodities has been directed towards grains, cotton, and vegetables (Assem Abu Hatab & Romstad, 2014; Assem Abu Hatab & Surry, 2015; Hatab, 2009), yet fruit crops are typically ignored in this arena even though they are increasingly becoming an important component of Egypt's total agricultural exports. Third, from a trade policy point view, the paper addresses a timely issue especially in the light of the mentioned import bans by Russia on agricultural and food imports from the EU, Turkey and other Western countries. Fourth, the paper contributes to the Egyptian efforts aiming to boost agricultural exports to Russia in order to mitigate the trade deficit between the two countries which shot up from USD 0.2 billion in 1994 to USD 2.6 billion in 2014 in favor of Russia. This has raised concerns among Egyptian analysts and policymakers who contend that this unhealthy trade pattern may harm the Egyptian economy on the long run. Therefore, the conclusions from this paper could be useful to Egyptian policy makers to implement trade policy reforms that can rebalance trade with Russia and ensure sustainable bilateral trade relations.

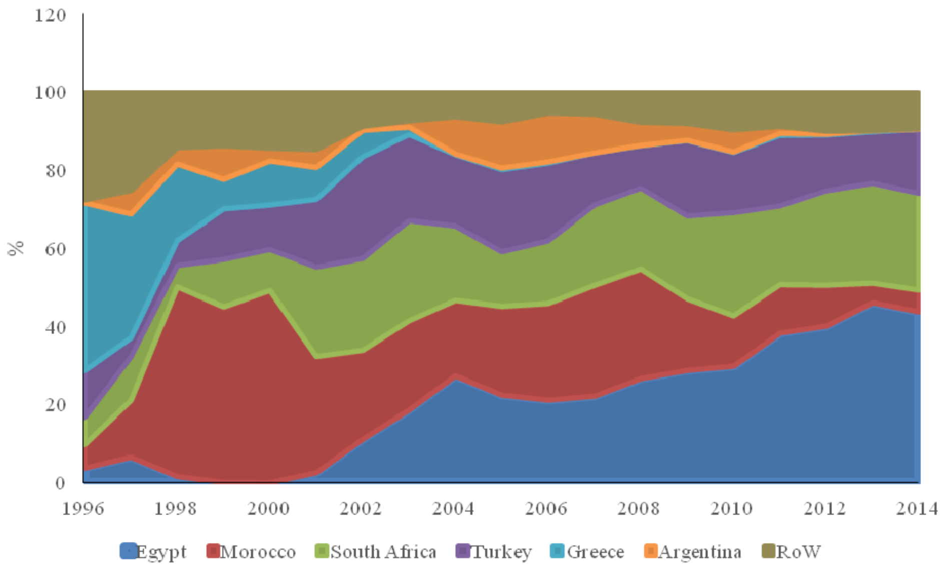
The rest of the paper organizes as follows. The next section provides an overview of the Russian market for imported orange. Section three presents the econometric model applied in this analysis. The fourth section describes the data and data sources and discusses some econometric considerations. The empirical results are presented and discussed in Section five. Finally, sixth section summarizes the paper and draws concluding remarks.

The Russian Market for Imported Oranges

Since 2000, the overall volume of the Russian imports of fruit have more than doubled amounting to about 6 million tons in 2013 (WITS, 2016). Market projections indicate that Russian consumer demand for imported oranges is likely to expand during the coming years for several reasons (GRC, 2012; Hamza, 2015). First, citrus fruit ranks second with a share of 19.3% of the total Russian fruit market. While oranges are not grown in Russia, the domestic market depends entirely on imports which are characterized by a steady upward trend (Ilyina, 2011). Second, the Russian economic growth in recent years has increased real disposable incomes and established a solid foundation for purchasing power growth which stimulated consumer spending on food items (Pesu, 2013; Hamza, 2015). Third, several studies have shown that there is a growing tendency among Russians to eat healthier foods and consume more fresh fruit and vegetables (Kolchevnikova, 2010; Ayala, 2011; Honkanen and Voldnes, 2006). Accordingly, Russian orange imports have generally taken an upward trend during the period 1996-2014, registering an average year-on-year growth, in quantity terms, of about 4.6% (WITS, 2015). Specifically, between 1996 and 2006, orange imports have almost doubled while they increased from 257.7 to about 510 million tons. With an average annual quantity of almost 500 million tons, the Russian imports of oranges continued to grow during the period 2008-2014; though they experienced slight fluctuations partially due to the global financial crisis and supply problems in some exporting markets.

A breakdown of Russia's orange imports by major countries of origin during the period 1996-2014 is portrayed in Figure 2. In quantity terms, Morocco followed by Egypt topped the list of major orange suppliers to Russia with average market shares of about 22.3% and 20.8%, respectively. South Africa ranked third (18.5%) and Turkey came in the fourth position with an average market shares of about and 15.4%. Greece and Argentina lagged behind other suppliers with average market shares of about 7% and 5%, respectively. Together these countries supplied the Russian market with almost 85% of its total orange imports, while the remaining 15% were imported from the rest of the world countries.

Taking a closer look at Figure 2, particularly in post-2000 years, reveals that the market shares of Russia's orange suppliers have experienced dramatic changes. For instance, Morocco's market shares declined from about 49% in 2000 to only 5.4% in 2014. Albeit from much lower starting points, Egypt's market share has, in contrast, greatly increased from nearly 3% in 2001 to around 44% in 2014. In particular, Egypt's shares have largely surpassed those of other major orange suppliers to Russia during the period 2007-2014, averaging roughly 40%. With respect to market shares of other suppliers, figure 3 shows that they have been largely unchanged with both minor increases and decreases over the period 2000-2014.



Source: UN – COMTRADE Database, World Bank, World Integrated Trade Solution (2015)

Figure 2: *Trends in the market share of major orange suppliers to the Russia*

With regards to the competitiveness of Egyptian oranges in the Russian market, several studies have shown that Egyptian oranges have gained an increasing comparative advantage in recent years on the Russian market, in comparison to other competitors (e.g. Abu Hatab, 2011; Torayeh, 2013). Hassan et al. (2010) compare the relative export prices of Egyptian oranges in comparison with major Mediterranean competitors namely, Spain, Israel, Morocco and Turkey. They conclude that Egyptian export prices of oranges are lower by 48%, 27%, 25%, and 5% than the prices of these competitors, respectively. Moreover, Hamza (2015), points out that Egyptian oranges traditionally enjoy a set of characteristics which contribute to their competitiveness on the Russian market, including: suitable climactic, soil and production conditions, low labor costs, well-established supply chains, an early harvest compared to other major producers in the region (the export season starts during the middle of November and lasts until late August). Soliman (2013) shows also that Egyptian oranges, especially the Valencia variety, have higher competitiveness in foreign markets compared to competitors including Spain, where this variety was established. Climatic conditions, particularly humidity and temperature, in some major competing countries work together to break down the color dyes which give oranges their color and leads to a re-greening phenomenon, i.e. returning back to green chlorophyll A and B. In contrast, the Egyptian Valencia summer oranges do not experience this phenomenon and thus they are highly demanded in importing markets including Russia (Soliman, *ibid*).

Determinants of Egyptian Orange Exports to Russia

To investigate the determinants of the Russian demand for Egyptian oranges, we follow the export demand function initially suggested by Wilson and Takacs (1979) which can be specified as follows:

$$lnX_t = \propto + \beta lnGDP_{Rt} + \omega lnEX_{EGP/RUB} + \theta lnXPRatio_t + u_t \quad (1)$$

Where lnX_t is the natural logarithm of real Egyptian (orange) exports; $lnGDP_{Rt}$ denotes for the natural logarithm of the Russian GDP (in constant prices 2005), capturing the Russian demand conditions; $lnXPRatio_t$ is the price ration between Egypt's export price of oranges and the weighted average of orange export prices of its major competitors on the Russian market, namely Morocco, South Africa, Turkey, Greece and Argentina; $lnEX_{EGP/RUB}$ is the logarithm of the real bilateral exchange rate between the Egyptian pound and the Russian Ruble, and finally u_t is an error term. Presenting equation (1) in logarithmic format allows us to interpret parameters β and θ as income and relative price elasticities of orange exports demand, respectively.

With respect to the expected coefficient signs, we expect a positive sign for GDP_{Rt} as an increase in the Russian income would raise the demand for orange imports. Likewise, a depreciation of the Egyptian Pound against the Russian Ruble is projected to stimulate Egyptian orange exports to Russia, and therefore we expect a positive sign on the $EX_{EGP/RUB}$. In contrast, we expect a negative sign on $XPRatio_t$ since an increase in the Egyptian export price of oranges to Russia relative to the weighted average export price of other competitors is expected to adversely influence Egyptian orange exports into the Russian market.

While Bahmani-Oskooee (1986) points out that exports do not adjust instantaneously to their long run equilibrium level following a movement in any of their adjustments, this implies that the level of observed exports in any period (lnX_t) is considered as a distributed lag function of the exogenous variables (De Jong, 2013). To capture the dynamic behavior among the observed variables, we follow Wilson and Takas (1979) and Bahmani (1986) by imposing lag conditions on the responses of Egyptian oranges' export flows to relative export prices of other competitors on the Russian market as well on the exchange rate variations between the Egyptian Pound and the Russian Ruble. Accordingly, Equation (1) could be re-written as follows:

$$lnX_t = \propto + \beta lnGDP_{Rt} + + \sum_{i=0}^{n1} \theta_i lnXPRatio_{t-k} + \sum_{i=0}^{n2} \omega_i lnEX_{EGP/RUB} + u_t \quad (2)$$

Generally, the steady state implications resulted from equation (1) are derived originally from the estimations by equation (2) as the sums of lag coefficients.

Data and Estimation Procedures

Quarterly time series data covering the period 1996-2014 were used to estimate our empirical models. Data on Egyptian orange exports to Russia were sourced from the Egyptian Ministry of Trade, Industry, and Investment, and also from the World Bank World Integrated Trade Solutions Database (WITS). Data on the GDP of Russia were collected from International Financial Statistics of the International Monetary Fund (IMF). Exchange rates of the Egyptian Pound against the Russian Ruble were collected from the Central Bank of Egypt (Quarterly Economic Reviews). Moreover, a dummy variable was introduced to capture the effect of Egypt-Russia bilateral trade reform and developments since 2001, to which we referred in the introduction section of this article, on Egyptian orange exports to the Russian market. Descriptive statistics of the variables included in our model are presented in the following Table 1.

Table 1: *Summary Statistics*

Variables	Observations	Mean	Median	Maximum	Minimum	Std. Dev.
$OrangX_t$	76	24323.70	26580.88	59953.90	75.25800	19518.65
GDP_{Rt}	76	1.89E+11	1.91E+11	2.50E+11	1.20E+11	4.63E+10
$EX_{EGP/RUB}$	76	0.233449	0.235937	0.295553	0.183985	0.024711
$XPRatio$	76	1.258130	1.234292	2.067922	0.367977	0.430035

Source: Authors own calculations

For a long run association between the variables in a system to exist, the variables included in the econometric estimation are expected to be integrated in the same order. To test for integration order of the variables, the literature suggests several approaches to ascertain the order of integration of variables including the Dickey-Fuller (DF) test, Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test, Ng-Perron modified unit root test, unit root test with structural breaks, Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) unit root test (Andrew et al., 2002; Wang and William, 2007). In our analysis, we utilize of ADF and PP tests which have been widely used in the literature to test for stationarity (Glynn et al., 2007; Paresh and Stephan, 2010).

The Dickey and Fuller (1979) assumes that the data generating process is autoregressive to the first difference and it could also include the first difference lags so that the error term is distributed as white noise. Technically, the ADF test can be defined as:

$$\Delta X_t = \alpha + \beta T + \theta X_{t-1} \sum_{i=1}^{p-1} \gamma_j X_{t-j} + \varepsilon_t \tag{3}$$

Where the delta symbol (Δ) represents the first difference operator, X_t is the variables that is tested for unit root, α is the constant, T is the time trend variable, and p is the number of lags included in order to control for the problem of autocorrelation in residuals. The null hypothesis of the ADF test claims that the series is non-stationary. If the null hypothesis is accepted, further considerations are needed (differences) for co-variance stationarity.

Our second unit root test, PP, is basically a modified version of the standard ADF test (Phillips & Perron, 1988). Yet, it has an advantage over the ADF teat as it modifies the t-ratio of the unit root coefficient so that the series correlation does not affect the test statistic (Phillips & Perron, 1988).

In order to estimate long run elasticities of Egyptian orange exports' demand function and compare the robustness of our results, we estimate our model using three different methods, namely: the Fully Modified OLS (FMOLS) (Phillips and Hansen, 1990), the Autoregressive distributed lag technique (ADRL) (Pesaran, Shin, and Smith, 2001) and finally the Dynamic OLS (DOLS) (Stock and Watson, 1993). FMOLS is a user-friendly approach that allows for estimating and testing for co-integrating vectors of the dynamic series and for deriving asymptotically consistent estimators on co-integrating regressions (Pedroni, 2000). Since the study aims to empirically test the long run relationships in trended stationary series, ARDL was utilized to ensure consistent estimation and inference of the long-run relationships because the underlying variables are *I*(1) (Duasa, 2007; Rushdi et al., 2012). Furthermore, we employ DOLS procedure of Stock and Watson (1993) as it allows for variables integrated of alternative orders and tackles the problem of simultaneity amongst regressors (Tsounta, 2008).

The discussion of our estimation results will be however based mainly on the ARDL results. According to Pesaran et al. (2001), the ARDL technique enjoys several advantages over other co-integration tests including: *i)* unlike other co-integration test methods which concentrate on cases in which the variables are integrated order of one, the ARDL could be implemented irrespective of whether the variables are purely *I*(0), purely I(1), or mutually integrated, and *ii)* the ARDL performs better in small-sized samples yields consistent estimates of the long-run parameters. We can define a vector of data generating process vector $G_t = (x_t, z_t)'$ where x_t is the dependent variable and z_t is the vector of regressors. In order to analyze the cointegration, it is worthwhile that Δx_t is modeled as conditional error correction model (ECM):

$$\Delta x_t = \alpha_0 + \vartheta_{xx} x_{t-1} + \vartheta_{xz} GDP_{Rt-1} + \sum_{i=1}^{p} \theta_i \Delta x_{t-i} + \sum_{j=1}^{q} \varphi_j \Delta GDP_{Rt-j} + \gamma w_t + u_t \quad (4)$$

Where ϑ_{xx} and ϑ_{xz} are the long run multipliers; α_0 is the drift while w_t is vector of exogenous components such as dummy variables. The short run dynamic structure is modeled through lagged values of Δx_t, current and lagged values of ΔGDP_{Rt}. To ensure whether there is long-run relationship, a bounds test based on F-statistics or Wald test is carried out (Pesaran et al., 2001). The asymptotic distribution of F-statistics is non- standard for the null hypothesis of no co-integration relationship among variables, regardless of whether exogenous variables are no-differenced or simply undertaken a difference (Hamuda, Šuliková, Gazda, & Horváth, 2013). Therefore, the null hypothesis is tested by using the Unrestricted Error Correction Model (UECM) in orange export Equation (4), joint significance tests with null and alternative hypotheses are given as:

$$H_0 = \vartheta_{xx} = \vartheta_{xz} = \gamma = 0 \quad (5)$$

$$H_1 \neq \vartheta_{xx} \neq \vartheta_{xz} \neq \gamma \neq 0 \quad (6)$$

The upper bound critical values of I(1) series and lower bound critical values to I(0) series are analyzed and compared to F-statistics. If the latter falls outside the critical bound, the null hypothesis of no co-integration is rejected and a conclusive inference can be made without considering the integration of explanatory variables (Narayan, 2004). . However, when the values F-statistics fall between the bounds, this implies that there would be no conclusive inference. Moreover, a DOLS method is used to estimate long-run relationship with the aim to correct for potential simultaneity bias among the regressors (Stock & Watson, 1993). The method involves regressing one of the *I*(1) variables on other *I*(1) variables, or on *I*(0) variables including lags and leads of the first difference of I(1) variables. The process is crucial to prevent the simultaneity bias and small sample bias among regressors. Finally, the FMOLS technique was employed to correct for endogeneity and serial correlation effects and eliminate sample bias.

Empirical Results

Before we proceed to the presentation and discussion of the results, we provide an illustration of the process and outcome of the data verification through a unit root test so as to ascertain the order of integration of the respective data series, lag order selection and test of co-integration.

Data Verification Using Unit Root Test

Table 2 summarizes the results of ADF and PP unit root tests. With the exception of the *GDPRU* variable, the ADF and PP statistics for other variables are lower in absolute terms than the corresponding critical values, implying the non-stationarity of these variables at level, i.e. they are not integrated of order or $I(1)$. Consequently, these variables are assumed a priori endogenous in the vector-error correction (VAR) specification for lag order selection and VECM should co-integrating vectors be confirmed.

Table 2: *Results of Unit Root Test*

Variables	ADF Statistics	1% Critical Value	5% Critical Value	PP Statistics	1% Critical Value	5% Critical Value	Conclusion
lnX_t	-0.668	-3.545	-2.910	-1.167	-3.545	-2.910	Unit Root
ΔlnX_t	-8.937	-3.548	-2.912	-8.929	-3.548	-2.912	Stationary
$lnGDP_{Rt}$	-0.953	-3.545	-2.910	-0.808	-3.545	-2.910	Unit Root
$\Delta lnGDP_{Rt}$	-4.196	-3.548	-2.912	-3.065	-3.546	-2.911	Stationary
$lnEX_{EGP/RUB}$	-3.083	-3.545	-2.910	-2.607	-3.545	-2.91	Stationary
$\Delta lnEX_{EGP/RUB}$	-4.553	-3.548	-2.912	-4.723	-3.548	-2.912	Stationary
$lnXPRatio_t$	-1.12	-3.545	-2.91	-1.995	-3.545	-2.910	Unit Root
$\Delta lnXPRatio_t$	-4.511	-3.548	-2.912	-4.770	-3.548	-2.912	Stationary

Source: Authors' own calculations

Optimal Lag Selection

Several selection-order statistics can be used to identify the appropriate lag order for VECM models including the final prediction error (FPE), Akaike's information criterion (AIC), Schwarz's Bayesian information criterion (SBIC) and the Hannan and Quinn information criterion (HQIC) by Nielsen (2001). Table 3 provides a summary of these four information criteria as well as the likelihood ratio (LR) test. As the results show, the four criteria with no exception as well as the sequential modified LR test statistic selected lag order two. Therefore, we selected lag order two for our VAR model.

Table 3: *Lag Order Selection Criteria*

Lag	LL	LR	df	P	FPE	AIC	HQIC	SBIC
0	80.2653				1.5e-06	-2.06122	-2.01154	-1.93668
1	623.972	1087.4	16	0.000	9.6e-13	-16.3236	-16.0752	-15.7008
2	835.874	423.8*	16	0.000	4.8e-15*	-21.6182*	-21.1711*	-20.4973*

* *Indicates lag order selected by the criterion.*
Endogenous variable: lnX_t. $lnGDP_{Rt}$. $lnEX_{EGP/RUB}$. $lnXPRatio_t$. *and* $lnXPRatio_t$ *, Exogenous variables: C, Sample: 1998-2014, Quarterly, Included observations: 74Source: Authors' own calculations*

Result of the Co-Integration Test

Co-integration relationship among the variables was investigated using the Johansen technique and the results are reported in Table 4. It is obvious that the values of trace statistic are lower than the critical values suggesting that we cannot reject the null hypothesis (there is no co-integration among our five variables). This implies that that there is at least one co-integrating vector among our variables, and thus a long-run association among the variables in our model exists.

Table 4*: Results of Johansen test for co-integration*

Max. rank	Parms	LL	Eigenvalue	Trace statistic	5% critical value
0	20	782.02963	.	107.6883	47.21
1	27	809.95867	0.52991	51.8302	29.68
2	32	823.46562	0.30584	24.8163	15.41
3	35	833.72967	0.24225	4.2882	3.76
4	36	835.87378	0.05630		
Maximum rank	Parms	LL	Eigenvalue	max statistic	5% critical value
0	20	782.02963	.	55.8581	27.07
1	27	809.95867	0.52991	27.0139	20.97
2	32	823.46562	0.30584	20.5281	14.07
3	35	833.72967	0-24225	4.2882	3.76
4	36	835.87378	0.05630		
Trend: constant, Sample: 1996q4-2014q4, Number of Observations = 74, Lags= 2					

Source: Authors' own calculations

Results and Discussion of Export Responses

Based on the results of the co-integration test, we derived the long-run estimates using the following specification:

$$\ln X_t = \alpha_0 + \sum_{i=1}^{m} \alpha_1 \ln X_{t-i} + \sum_{i=0}^{n} a_2 \ln GDPRU_{t-i} + \sum_{i=0}^{p} a_3 \ln EXR_{t-i} + \\ + \sum_{i=0}^{q} a_4 \ln XPRAIO_{t-i} + DBilateralER + \mu_t \quad (7)$$

For each of the estimated models, a maximum of two lags was used. The estimation results of ARDL, FMOLS and DOLS methods are summarized in Table 5. According to the reported squared R values, the variables included in our estimated models explain between 87% and 99% of the variations in the volume of Egyptian orange exports into the Russian market during the period 1996-2014. Moreover, a deeper look at the results of the three estimation methods indicates that they yield quite similar estimates the thing that confirms the robustness of our results.

***Table 5**: Long-run results for Egyptian orange export demand (1996-2014)*

Deprendent variable lnX_t	FMOLS	DOLS	ARDL
$lnGDP_{Rt}$	3.780079 (0.4057)**	3.57788 (0.3219)**	1.161027 (0.2794)**
$lnEX_{EGP/RUB}$	-0.0804 -0.1169	-0.089454 -0.1201	-0.00088 -0.0492
$lnXPRatio_t$	-0.727144 (0.3614)*	-1.01476 (0.3666)**	-0.37174 (0.1446)*
Dummy	-1.477951 (0.1401)**	-1.598452 (0.1370)**	-0.48891 (0.0743)**
Constant	-39.39227 (4.7353)**	-37.51715 (3.8855)**	-12.2339 (3.0618)**
$lnX_t(-1)$			0.675871 (0.0488)**
Observations:	75	73	75
R-squared:	0.9501	0.9892	0.9883
F-statistic:			1162.839 (0.000)**

*Note: Numbers within parentheses are the standard errors. *and** Significant at 0.10 and 0.05 percent levels, respectively. FMOLS: Fully Modified OLS; DOLS: Dynamic OLS; and, ARDL: Autoregressive Distributed Lag*

Source: Authors' own calculations

Among the four regressors used in our export models, the estimated Russian income coefficient is significant and positive. This suggests that an increase of one percent in the Russian GDP would lead to an increase ranging from 1.2% to about 3.7% in Egyptian orange exports to Russia. This finding goes in line with Abu Hatab *et al.* (2010) who show that Egyptian agricultural exports follow a GDP pattern concentrating on the production and export of quantity-based products and depending on overall size of the importing markets. All the parameters for relative export price have the expected sign and are statistically significant at 5% level of confidence. A one percent decline in relative export prices between Egyptian and its competitors is likely to increase the export demand for Egyptian oranges in Russia between 0.4% and 1%. This implies that Egyptian orange exports to Russia are sensitive to competitors' export prices. Previous studies pointed out that the Export prices of Egyptian agrifood commodities represent a major determinant of exports accessibility and competitiveness in foreign importing markets (Soliman & Bassiony, 2012; Torayeh, 2013).

The estimated exchange rate coefficient has the expected negative sign indicating that exchange rate volatility exerts negative impact on Egypt's orange exports to Russia. However, in the three estimated models, the estimated coefficients of the exchange rate variable are statistically insignificant. Previous studies which used similar estimation methods have shown different findings, both negative and positive effect, with regard to the impact of exchange rate on the export demand. Moreover, several studies tended to find insignificant relationship between export and exchange rate movements, suggesting that exchange rate movements have a minimal effect on export volume (Abbott, 2004; Doyle, 2001; Todani & Munyama, 2005).

Interestingly, the estimated coefficient of the dummy variable which was introduced to capture the impact of agricultural trade liberalization between Egypt and Russia has negative sign and is statistically significant at the 5% level. This signifies that Egyptian orange exports to Russia have not significantly benefited from trade liberalization efforts with Russia. Previous studies have shown that Egypt's trade liberalization with foreign countries has minimal effect on the volume of Egyptian exports due to the mis-communication between the government agencies which signed these trade agreements and the exporters who are intended to benefit from them, and the limited ability of Egyptian exporters to match quality criteria in foreign markets (Abu Hatab and Hess, 2013). Several authors have also cited other factors to explain the insignificant effect of trade agreements on Egyptian agrifood trade, including: the lack of qualified personnel who can deal with emerging export opportunities, the failure of Egyptian growers to produce exportable quantities of the desired quality and the outdated communication and information techniques that Egyptian exports rely on to explore export opportunities and communicate with importers in target markets (Ghoneim, 2008; Refaat, 2000; Abu Hatab, 2011).

Table 6: *Short-run results for Egypt orange export demand (1996-2014)*

Deprendent variable	Without Dummy		With Dummy	
lnX_t	Coefficient	Standard Error	Coefficient	Standard Error
$\Delta lnGDP_{Rt}$	0.662260*	0.340662	1.161027**	0.279413
$\Delta lnEX_{EGP/RUB}$	-0.073244	0.060724	-0.000882	0.049184
$\Delta lnXPRatio_t$	-0.535242**	0.180459	-0.371739*	0.144615
Dummy	-	-	-0.488907**	0.074286
$\eta\ (\varepsilon_{t-1})$	-0.104023*	0.045035	-0.324129**	0.048811
Observations	75		75	

*Note: Numbers within parentheses are the standard errors. *and** Significant at 0.10 and 0.05 percent levels, respectively.*
Source: Authors' own calculations

The estimation results of the short-run model are presented in Table 6. Results of the diagnostic tests showed that the corresponding residuals are normally distributed, non-serially correlated and homoscedastic which confirms the validity of our model. Analogous to previous studies, the estimates of the short-run models are generally smaller in magnitude in comparison to the long-run results. With the exception of the exchange rate variable other regressors exert a statistically significant effect on the export demand for Egyptian orange in the Russian market and they also have the expected signs. Interestingly, the parameter η for the lagged error term has negative and statistically significant coefficient implying the existence of a long-tern relationship among the variables. This also indicates that approximately 10% to 32% of deviations from long-run equilibrium in volume of Egyptian orange exports to Russia are corrected for in the current period.

Summary and Concluding Remarks

Russia has always been a major destination for Egyptian orange exports. Particularly since 2001, Egypt has consistently been acquiring larger market shares in the Russian market which increased from nearly 3% in 2001 to 30% in 2010 and 46% in 2013. A major recent development that is expected to offer further export opportunities to Egyptian oranges in the Russia market is represented by the embargos that Russia imposed on agricultural and food imports from the EU and Turkey in 2014 and 2015, respectively. Several studies have shown that these import bans represent a window of opportunity to agricultural and food exporters in developing countries including Egypt to make up for the void created by the exclusion of the imports from these countries.

To capture these potential opportunities that the Russian market may offer to Egyptian orange exports, the paper used quarterly data covering the period 1996-2014 and employed three different co-integration methods, namely FMOLS, DOLS and ARDL, to analyze the determinants of Egyptian orange exports to Russia. Our empirical results suggest that Egyptian orange exports are strongly influenced by the level of Russian economic activity. Specifically, a one percent increase in the Russian GDP would result in an increase ranging from 1.2% to about 3.7% in Egyptian orange exports. According to Kolchevnikova (2010) and Ayala (2011), Russian consumers' demand for oranges is likely to expand due to Russia's economic growth which increased real disposable incomes and stimulated consumer spending on food items. Moreover, Honkanen and Voldnes (2006) point out to a growing tendency among Russians to eat healthier foods and consume more fresh fruit and vegetables. Linking these projections with our results, Egyptian agricultural policy makers should further explore and analyze these expected export opportunities in the Russian market and to enhance the competitiveness of Egyptian orange exports through upgrading production and postharvest techniques, implementing training and capacity building to exporters, and providing market information and other export incentives.

Our long-run results also showed that a one percent decline in the export price of Egyptian oranges relative to the export prices of other competitors is likely to increase the demand for Egyptian oranges in Russia by between 0.4% and 1%, implying that Egyptian orange exports to Russia are sensitive to the changes in their own prices. This finding suggests that promoting the competitiveness of Egyptian oranges in the Russian market is likely to be achieved by lowering production cost through improving production efficiency in order to reduce the orange export prices.

Interestingly, the results showed that agricultural trade liberalization between Egypt and Russia has a statistically negative effect on Egyptian orange exports to Russia. Several previous studies have indicated that Egypt's trade policy reforms had a minimal effect on agricultural exports due to a set of institutional and infrastructural barriers. In this respect, Egypt may learn from other competitors' experiences with boosting orange exports to the Russian market. For example, Turkey (prior to embargo) implemented a strategy to promote orange exports to Russia which focused on expanding the supply season, improving exported oranges' quality through upgrading post-harvest and packaging services, and putting out promotional commercials on Russian media. Morocco, another major competitor to Egypt on the Russian market, adopted an orange export strategy focusing on decreasing the transportation time and cost to Russia, by launching a direct maritime line to Russia in 2010 which reduced the transit time between the two countries to around ten days. Equally important, market access issues of Egyptian oranges should be given priority in the current negotiations on trade liberalization between Egypt and Russia.

Our short-run model provided more or less similar estimates to the long-run results conforming to previous studies which pointed out that the estimates of the short-run models are generally smaller in magnitude in comparison to long-run results. The parameter η for the lagged error term had negative and statistically significant coefficient confirmed the existence of a long-term relationship among the variables and indicated that approximately 10% to 32% of deviations from long-run equilibrium in volume of Egyptian orange exports to Russia are corrected for in the current period.

References

ABBOTT, A. 2004. The impact of exchange rate volatility on UK exports to EU countries. *Scottish Journal of Political Economy,* 51, 62-81.

ABU HATAB (2011). Determinants of Egyptian Agricultural Exports with Special Reference to Potential Opportunities in the Chinese Market. Northwest A&F University, PhD dissertation, June 2011.

ABU HATAB, A. & HESS, S. 2013. Opportunities and Constraints for Small Agricultural Exporters in Egypt. *International Food and Agribusiness Management Review,* 16**,** 75-100.

ABU HATAB, A. & ROMSTAD, E. 2014. Competitiveness analysis of Egyptian cotton exports with special focus on the Chinese market. *China Agricultural Economic Review,* 6**,** 248-263.

ABU HATAB, A. & SURRY, Y. 2015. The Determinants of Import Demand for Egyptian Potatoes in the European Union. *The XVIII International Symposium on Horticultural Economics and Management*, Alnarp, Sweden, May 31-June 3, 2015.

ABU HATAB, A. 2009. Performance of Egyptian cotton Exports in International Market. *Agricultural Economics Research Review,* 22**,** 225-235.

ABU HATAB, A., ROMSTAD, E. & HUO, X. 2010. Determinants of Egyptian agricultural exports: A gravity model approach. *Modern Economy,* 1**,** 134-143.

ABUL-NAGA, A.M. (2009). Egypt Sustainable Agricultural Development Strategy towards 2030. CIHEAM Analytical Notes N ° 5 3, December 2009. Available at: http://ciheam.org/images/CIHEAM/PDFs/Observatoire/NAN/nan53.pdf

AEC (Agricultural Export Council of Egypt) (2014). AEC Monthly Bulletin, No. 15, December 2014, Cairo: AEC.

ANDREW L., CHIEN-FU L., CHIA-SHANG J.C. (2002). Unit root tests in panel data: asymptotic and finite-sample properties, *Journal of Econometrics*, 108: 1-24,

ARKHANGELSKAYA, A., and SHUBIN, V. (2013). Is Russia Back? Realities of Russian Engagement in Africa." C. Alden, Emerging Powers in Africa, LSE Ideas report.

ASKARY, H. (2015). Egypt Joins The BRICS Dynamic. *Executive Intelligence review*, 42, February 20, 2015

AYALA, D. 2011. Fresh Deciduous Fruit Annual Demand Drices Russian Fruit Imports Up. USDA Foreign Agricultural Service, Global Agricultural Information Network.

BAHMANI-OSKOOEE, M. 1986. Determinants of international trade flows: The Case of Developing Countries. *Journal of Development Economics,* 20**,** 107-123.

DE JONG, E. (2013). Exchange rate determination and optimal economic policy under various exchange rate regimes. Vol. 359. Springer, 2013.

DICKEY, D. A. & FULLER, W. A. 1979. Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American statistical association,* 74**,** 427-431.

DOYLE, E. 2001. Exchange rate volatility and Irish-UK trade, 1979-1992. *Applied Economics,* 33**,** 249-265.

DUASA, J. (2007) Determinants of Malaysian trade balance: An ARDL bound testing approach. *Global Economic Review* 36: 89-102.

GHONEIM, A. F. 2008. To What Extent Should Egypt do Deep in its Free Trade Area with the United States: If Any. *J. World Investment & Trade,* 9**,** 163-186.

GLYNN J., PERERA N., and VERMA R. (2007). Unit Root Tests and Structural Breaks: A Survey with Applications, *Revista de Metodos Cuantitativos para la Economia y la Empresa*, 3: 63–79.

GRC (Global Reach Consulting) (2013) Russian and World Fresh Fruit Market, Fresh Fruit Market, Issue 3. GRC. Available at: http://www.proecuador.gob.ec/wp-content/uploads/2015/02/PROECU_PPM20112_-FRUTAS_RUSIA.pdf

HAMUDA, A. M., ŠULIKOVÁ, V., GAZDA, V. & HORVÁTH, D. 2013. ARDL investment model of Tunisia. *Theoretical and Applied Economics,* XVIII (2013)**,** 57-68.

HAMZA, M. (2015). Egypt- Citrus Annual 2015: Egypt is Likely to Remain World's Orange Largest Exporter, USDA Foreign Agricultural Service, Global Agricultural Information Network. December 2015. Available at: http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Citrus%20Annual_Cairo_Egypt_12-14-2015.pdf

HAMZA, M. (2014). Egypt's Orange Exports Benefiting from Russia's Ban on EU Imports. Global Agricultural Information Network, USDA Foreign Agricultural Service.

HASSAN, A.A. et al. (2010) Economic Analysis of the Current Situation for the Production, Export and the Competitiveness of Egyptian Oranges in Global Markets, *Australian Journal of Basic and Applied Sciences*, 4, 5797-5804.

HELMY, O. (2010). Competitiveness of Egypt in the EU market for Fruit and Vegetables. *ECES Working Paper, no. 154.* Cairo, Egypt: The Egyptian Center for Economic Studies (ECES).

HONKANEN P. and VOLDNES G. (2006). Russian consumers' food habits: Results from a qualitative study in Moscow. Fiskeriforskning report 27/2006. Norwegian Institute of Fisheries and Aquaculture Research. Tromso, Norway.

ILYINA S (2011) Russians Love Citrus But U.S. Share Tiny: USDA Foreign Agricultural Services, Global Agricultural Information Network, USDA: Washington

KOLCHEVNIKOVA, O. (2010). Russian Retail Food Sector Nears Rebound. USDA Foreign Agricultural Service, Global Agricultural Information Network.

MFA (The Ministry of Foreign Affairs of the Russian Federation), the Embassy of Russian Federation to Egypt (2016). History of Russian-Egyptian Relations. Available at: http://www.egypt.mid.ru/eng/hist/Index.html (Accessed on May 14, 2016)

NARAYAN, P. K. (2004). Fiji's tourism demand: the ARDL approach to cointegration. *Tourism*

Economics, 10, 193-206.

NERIAH, J. (2013). Egypt's Turn to Russia. Jerusalem Center for Public Affairs, Blog post on October 30th, 2013. Available at: http://jcpa.org/egypts-turn-to-russia/ (Accessed on April 18, 2016).

NIELSEN, B. 2001. Order determination in general vector autoregressions. *Working paper,* Department of Economics, University of Oxford and Nuffield College. *http://ideas.repec.org/p/nuf/econwp/0110.html*.

PARESH K.N. and Stephan P. (2010). A new unit root test with two structural breaks in level and slope at unknown time, *Journal of Applied Statistics*, 37, 1425-1438

PARKER, J.W. (2015). Understanding Putin through a Middle Eastern Looking Glass. Institute for National Strategic Studies Strategic Perspectives, No. 19, National Defense University Press: Washington, D.C.

PEDRONI, P. (2000). Fully modified OLS for heterogeneous co-integrated panels, *Advances in Econometrics* 15, 93–130

PESARAN, M. H., SHIN, Y. & SMITH, R. J. 2001. Bounds testing approaches to the analysis of level relationships. *Journal of applied econometrics,* 16**,** 289-326.

PESU, S. (2013). Consumer Behavior in Russia. A presentation at Awara Group, Available at: http://www.awaragroup.com/upload/pdf/Awara-Group-Consumer-Behaviour-in-Russia.pdf.

PHILLIPS, P. C. & HANSEN, B. E. (1990). Statistical inference in instrumental variables regression with *I* (1) processes. *The Review of Economic Studies,* 57**,** 99-125.

PHILLIPS, P. C. & PERRON, P. 1988. Testing for a unit root in time series regression. *Biometrika,* 75, 335-346.

REFAAT, A. (2000). Egypt: an assessment of recent trade policy developments. *Hoekman." In Trade Policy Developments in the Middle East and North Africa, edited by H. Bernard and H. Kheir-el Din***,** 113-140.

RUSHDI, M., JAE H.K. and PARAM S. (2012) ARDL bounds tests and robust inference for the long run relationship between real stock returns and inflation in Australia. *Economic Modelling* 29: 535-543.

SIS (State Information Service, Egypt) (2016). Economic relations: Russia, Available at: http://www.sis.gov.eg/En/Templates/Articles/tmpArticles.aspx?CatID=4072#.VzcUiPl97RZ (Accessed on April 21, 2016).

SOLIMAN, I. & BASSIONY, H. (2012). Egyptian agricultural exports competitiveness. *Journal of Egypt Contemporary, Egyptian Association of Political Economics, Legislation and Statistics* 104, 5-40.

SOLIMAN, I. (2013). Oranges Sector in Egypt: Performance and Policies. In "Policy for Competitiveness of the Fresh Orange Export Sector in Mediterranean Partner Countries". SUSTAINMED Project (Sustainable agri-food systems and rural development in the Mediterranean Partner Countries), report number D20. Available at: http://www.iamm.fr/ressources/opac_css/doc_num.php?explnum_id=11000 (Accessed on May 13, 2016).

SOLIMAN, I., and GABER, M., (2004) Analytical Study for Market Performances of the Major Egyptian Vegetables and Fruits Exports, *L Égypte Contemporaine, Société Egyptian d' Économie politique de Statistique et de legislation*, 75, 23-60.

STOCK, J. H. & WATSON, M. W. 1993. A simple estimator of cointegrating vectors in higher order integrated systems. *Econometrica: Journal of the Econometric Society*, 61, 783-820.

TODANI, K. & MUNYAMA, T. 2005. Exchange rate volatility and exports in South Africa. *manuscript available online at Trade and Industries Policy Strategies website:* *http://www. tips. org. za/files/773. pdf.*

TORAYEH, N. M. (2013). The Competitiveness Of The Egyptian Agricultural Export In The Eu Market; Should Egypt Diversify Its Trade Pattern? *Applied Econometrics and International Development,* 13**,** 129-148.

TRENIN, D. (2005). Russia's Policy in the Middle East: Prospects for Consensus and Conflict with the United States. A Century Foundation Report. The Century Foundation; New York.

TSOUNTA, E. (2008). What attracts tourists to paradise? IMF Working Papers, No WP/08/277. Washington D.C.: IMF.

VERDONK, R. (2014). Egypt's Orange Exports Benefiting from Russia's Ban on EU Imports. Washington: USDA Foreign Agricultural Services, Global Agricultural Information Network.

WAHISH, N. (2014). Russian opportunities. Al-Ahram Weekly, Issue no. 1212, September 4, 2014. Available at: http://weekly.ahram.org.eg/News/7133/18/Russian-opportunities.aspx (Accessed on May 4th, 2016)

WANG D. and WILLIAM G.T. (2007). Commodity prices and unit root tests." *American Journal of Agricultural Economics*, 89, 873-889.

WILSON, J. F. & TAKACS, W. E. 1979. Differential responses to price and exchange rate influences in the foreign trade of selected industrial countries. *The Review of Economics and Statistics***,** 61**,** 267-279.

WITS, World Integrated Trade Solution. 2012-2015. Trade database. World Bank. http:// wits.worldbank.org/wits/.