Does Agricultural Trade promote Chinese economic growth? ARDL Approach

Bakari, Sayef and Sofien, Tiba

Faculty of Economic Sciences and Management of Tunis, University of Tunis El Manar, (Tunisia), Faculty of Economic Sciences and Management of Sfax, University of Sfax, (Tunisia)

February 2019

Does Agricultural Trade promote Chinese economic growth? ARDL Approach

Sayef Bakari[a]

[a] Faculty of Economic Sciences and Management of Tunis, University of Tunis El Manar, (Tunisia)

Email: bakari.sayef@yahoo.fr

Sofien Tiba[b]

[b] Faculty of Economic Sciences and Management of Sfax, University of Sfax, (Tunisia)

Email: sofienetiba@gmail.com

Abstract

Since the beginning of the third millennium, the Chinese agricultural exports increase at a strong pace. In this context, this paper aims to answer the question if the agriculture trade promotes Chinese economic growth by employing the ARDL bounds testing for the study period from 1984 to 2017. In the long-run, our highlights reported that domestic investment and agricultural exports have a positive effect on economic growth. However, agricultural imports have a significant negative impact on growth. In the short-run, our insights reported a positive and significant effect of domestic investment, agricultural imports and agricultural exports on economic growth. The positive impact of agriculture exports on growth is due to the importance of agriculture in terms of creating jobs and opportunities for the economy as a whole. Also, sufficient national investment in the agriculture sector leads to enlarging these opportunities and then improves the Chinese economic growth.

Keywords: Agricultural trade; economic growth; ARDL bounds testing.

JEL classification: F11, F14, O47, O53, Q17, Q18

1. Introduction

The globalization is considered as one of the most controversial issues in the economic literature, where it's seen as a double-edged weapon due to its benefits and costs. Indeed, there are two approaches that defined the globalization in the literature: The first point of view leads to considering the trade strongly linked to productivity growth, and improved economic performance. However, the second one has viewed its effects on equity and local development (See. Carter et al., (1996); Estrades and Terra (2012)).

Without any doubt, several studies reveled that trade openness contributes to the growth of an economy. Indeed, through its externalities through facilitating the technology transfer and spillovers the economic performance improves (See. Tiba et al. (2015); Tiba and Frikha (2018)). Indeed, the trade freedom constitutes a fundamental element in the growth processes through its effects on productivity and then economic growth. The relationship between economic growth and exports is justified by two theoretical assumptions: The first assumption is the export-led growth, where it assumed that an increase in the export leads to generating an increase in the demand for a country's coupled with an increase in the real economic activity. In addition, the increase in the exports volume increases the specialization in exporting goods that leads to increasing the economies of scale and gaining in terms of productivity. Also, the rise of the volume of exports makes easier the domestic-capital formation. However, the growth-led exports assumption implies the rise of the income level is linked to the rise of the technology which boots the productivity. Consequently, the production process gained momentum in terms of skills and technology that contributes to comparative advantage, and then the growth in exports. The second one is the import-led growth assumption, which assumes the importance of the import in the economic sphere through facilitating the access to foreign technologies, knowledge, and R&D, which improves productivity and as a result the economic growth (See. Awokuse (2008)).

The most of previous studies studied the impact of trade on agricultural productivity through the use of the cross-country sample pointed out that an economy with fewer trade barriers shown rapid productivity growth (See. Coe et al. (1997), Edwards (1998), and Badinger (2007)). In addition, through the use of the individual countries analysis, the results found a positive impact of trade on the productivity (See. Tybout et al. (1991), Hay (2001), Jonsson and Subramanian (2001), Pavcnik (2002), Ferreira and Rossi (2003), and Amiti and Konings (2007)). As one of the greatest agricultural trade economy, China has many opportunities in terms of the trade of agricultural products. Since the beginning of the third millennium, the Chinese agricultural exports increase at a strong pace. The share of Chinese total agricultural exports passed from 9.70% in 2000 to 21.18% in 2016. This implies the momentum gained by the trade of agricultural goods in the Chinese economy during the past two decades.

The objective of this paper is to answer the question if the agriculture trade promotes Chinese economic growth. For this purpose, we employed the ARDL bounds testing for the study period from 1984 to 2017. To the best of our knowledge, this is the first paper which attempts to treat the agriculture trade contribution to the economic growth, by considering the agriculture trade as a determinant factor of the Chinese growth model.

The algorithm of the paper is as follow: Section 2 contains a brief literature overview. Section 3 portrays the data and methodology. Section 4 discusses the empirical results. And concludes the paper is in Section 5.

2. Agriculture trade and economic growth literature survey

It is striking that experimental research on the contribution of agricultural trade to economic growth has been somewhat ignored in the literature, despite its role in the development process that has long been recognized (See: Echevarria (1997); Gardner (2005); Kogel and Prskawetz (2001); Gollin, Parente, and Rogerson (2002); Tiffin and Irz (2006), Bakari and Abdelhafidh (2018)). But many economists argue that agricultural trade plays a crucial role in economic growth and sustainable development.

Sanjuàn-Lopez and Dawson (2010) examined the impact of agricultural exports on economic growth for 42 developing countries over the period 1970-2004. They used cointegration analysis and the FMOLS model. Empirical results have shown that agricultural exports have a positive effect on economic growth.

Faridi (2012) studied the agricultural exports and economic growth during the period 1972–2008 in Pakistan. He concluded by using Johansen test and granger causality test that agricultural export has not significant effects on economic growth.

Forgha and Aquilas (2015) investigated the relationship between agricultural exports and economic growth in Cameroon during the period 1980-2014 by applying cointegration analysis and the vector error correction model (VECM). They found that agricultural exports have no effect on economic growth in the short term. On the other hand, in the long run, they found that agricultural exports have a positive impact on economic growth.

Ijirshar (2015) investigated the impact of agricultural exports on economic growth by using Johansen co-integration and error correction model (ECM) for empirical investigation in Nigerian economy for the time period of 1970–2012. He found that agricultural exports have a positive effect on economic growth in the long run.

Alam and Myovella (2016) applied an estimate based on cointegration analysis and Granger-type Causality tests to explore the relationship between agricultural exports and economic growth in Tanzania over the period 1980 - 2010. The empirical results indicate that agricultural exports have a positive impact on economic growth.

Uremadu and Onyele (2016) examined the impact of total agricultural exports, cocoa exports and rubber exports on Nigeria's economic growth from 1980 to 2014. They found that only total agricultural exports have a positive effect on economic growth.

Toyin (2016) examined the causal link between agricultural exports and economic growth in South Africa for the period 1975 to 2012. Using the VAR model and the Granger causality test, he found that there was no causal relationship between agricultural exports and GDP.

Bakari (2017a) studied the impact of vegetable exports on economic growth in Tunisia for the period 1970 to 2015. Using cointegration analysis and the vector error correction model, he found that vegetables had a positive effect on long-term and short-term economic growth. In the same context concerning the impact of agricultural exports in Tunisia, Bakari (2017b) examined the impact of olive oil exports on economic growth; He found that olive oil exports had a positive impact on Tunisia's economic growth in the long term and in the short term. In the same context, Bakari (2018) analyzed the effect of citrus exports on economic growth for the periods 1970 and 2016. He found that citrus exports have no influence on economic growth in the long run, but the results show that citrus exports have a positive effect on economic growth in the short run. His study indicates that citrus exports are not considered a source of economic growth in Tunisia.

Bakari and Mabrouki (2017) have studied the effect of agricultural exports on the economic growth of the countries of South-East Europe for the period 2006-2016. Using the static gravity model, they found that agricultural exports have a positive impact on economic growth.

Mahmood and Munir (2017) studied the relationship between agricultural exports and economic growth in Pakistan using Johansen cointegration and Granger causality tests for 45 canceled time series from 1970 to 2014. Empirical results show that exports have a positive effect on economic growth, but this effect is insignificant. However, the results show that economic growth has a positive effect on economic growth. These can be explained by the inability of agricultural exports to compete in international markets because of the high competitiveness and low quality of exported agricultural products.

Ahmed and Sallam (2018) examined the long and short-term relationship between agricultural exports and economic growth in the agricultural sector from 1970 to 2013 using cointegration analysis models, error correction model (ECM) and generalized autoregressive conditional heteroscedasticity (GARCH). They found that there was a positive relationship between agricultural exports and economic growth in the long and short terms.

3. Data and Methodology

The data sample covers the period from 1984 to 2017 and is collected from the World Bank database (World Development Indicators, WDI 2018). The data includes GDP (in constant 2010 US$), gross fixed capital formation (in constant 2010 US$), agricultural exports (in constant 2010 US$) and agricultural imports (in constant 2010 US$).

The aggregated form of the empirical equation is modeled as follows:

$$\mathbf{Y_t = f\ (K_t AX_t AM_t)} \quad \textbf{(1)}$$

Now, we are converting all series into logarithms to get at the direct elasticities. The empirical equation is formed as follows:

$$\mathbf{LogY_t = C_0 + \beta_1 LogK_t + \beta_2 Log\, AX_t + \beta_3 LogAM_t + \varepsilon_t} \quad \textbf{(2)}$$

As specified by Pesaran et al., (2001), the ARDL bounds testing approach may be realized in three stages. The initial stage is to esteem Eq. (1) by ordinary least squares, in order to experiment for the existence of a long-run relationship among the variables, by running an F-test for the joint significance of the coefficients of the lagged level variables, which points out no cointegration relationship between them. Eq. (1) may be recorded as follows:

$$\mathbf{\Delta Log\ Y_{(t)} = C + \sum_{i=1}^{m} \beta_{1i} \Delta Log\ Y_{(t-i)} + \sum_{i=0}^{n} \beta_{2i} \Delta Log\ K_{(t-i)} + \sum_{i=0}^{o} \beta_{3i} \Delta Log\ AX_{(t-1)} + \sum_{i=0}^{p} \beta_{4i} \Delta Log\ AM_{(t-1)} + \delta_1 Log\ K_{(t-1)} + \delta_2 Log\ AX_{(t-1)} + \delta_3 Log\ AM_{(t-1)} + \varepsilon_{(t)}} \quad \mathbf{(3)}$$

Where Log is the natural logarithm, Δ indicates the variable in the first difference, Y is the variable referring to the real gross domestic product, K is the variable referring to the gross fixed capital formation, AX is agricultural exports, AM is agricultural imports, C is an intercept, t refers to the time period in years from 1984 – 2017, and ε_t is a white –noise error term. Lags (m,n,o,p) are determined using the VAR optimal model, which means that the lag minimizes the Akaike (AIC), Schwarz (SIC) and Hannan-Quinn (HIC) information criteria.

As soon as Eq. (1) has been estimated, the attendance of a cointegration acquaintance among the variables has to be examined by taking advantage of the bounds test. Indeed, the cointegration test is rooted predominately on the Fisher test (F-stat) for the joint significance of the coefficients of the lagged level variables, i.e., H0: $\delta_1 = \delta_2 = \delta_3 = 0$, which marks that there is integration. After assimilating the F-stat value with asymptotic critical value bounds studied by Pesaran et al. (2001), the null hypothesis of no cointegration is rejected when the value of the F test surpasses the upper critical bounds value, inculpating that there is a cointegration relationship between the studied variables.

When the null hypothesis of no cointegration is rejected, and cointegration is scheduled, in the second stage, the conditional ARDL long-run model that assumes the long-run dynamic where the orders of the ARDL (m, n, o, p) model are chosen by employing AIC. Finally, the end stage attempts to esteem the error correction model for the short-run by involving the ordinary least squares technique and the AIC and SIC to choose the order of the ARDL (n, m, o, p). Diagnostic tests and stability tests are also painstaking to experiment the quality of suitable for the ARDL model.

4. Results and discussions

Before we maintained with the ARDL bounds test, we put to test for the stationarity status of the picked time series data to plot their order of integration. This is to keep that the variables should not be stationary at an order of I(2) because the computed F-statistics assuming by Pesaran et al. (2001) are applicable only when the variables are I(0) or I(1).

The Dickey-Fuller (DF) test, augmented Dickey-Fuller (ADF) test, and the Phillips and Perron (PP) test methods are normally common to the unit root test adopted by many researchers, so the same methods were followed in this study.

Table 1: Tests for units roots

	ADF		**PP**	
	C	CT	C	CT
Log (Y)	0.553793	3.140932	1.210406	1.724755
	2.944346	2.934072	2.969580	2.956315
Log (K)	2.000200	2.563393	0.800249	1.721702
	3.602577	3.548965	3.349277	3.249131
Log (AX)	1.680767	2.499199	2.767064	2.320106
	5.161190	5.493414	5.169945	5.720202
Log (AM)	0.411143	5.009256	0.277028	2.787715
	5.319606	5.308762	6.160105	5.771966

Note: *, ** and * denote significances at 1% , 5% and 10% levels, respectively;**
( ) denotes stationarity in level;
[ ] denotes stationarity in first difference;
'C' denotes Constant;
'CT' denotes Constant and Trend;

The results of the unit roots tests are reported in Table 1 and indicate that all the variables of interest are integrated of order one or I(1) except Log(AM) is integrated of order I(0) and I (1). The ARDL bounds test is then applied to the model.

The bound test was performed to verify the existence of a long-term relationship between the variables by performing an F-test to determine the joint significance of the coefficients of the shifted levels of the variables. The null hypothesis of no cointegration will be rejected if the computed F statistic is greater than the critical value of the upper bound. If the calculated F statistic is less than the critical value of the lower limit, we cannot reject the null of no cointegration. Finally, the result is not conclusive if the calculated F statistic is between the critical values of the lower and upper limit.

Table 2: ARDL Bounds Test

ARDL Bounds Test		
Test Statistic	Value	K
F-statistic	7.524547	3
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.72	3.77
5%	3.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61

Table 2 reports the results of calculated F-statistics. The bound test confirms the existence of a long-run relation. So the ARDL Model can be returned. For the determination of the number of delays, we adopt the criterion of Akaike Information Criteria (AIC).

Fig.1 Akaike Information Criteria (top 20 models)

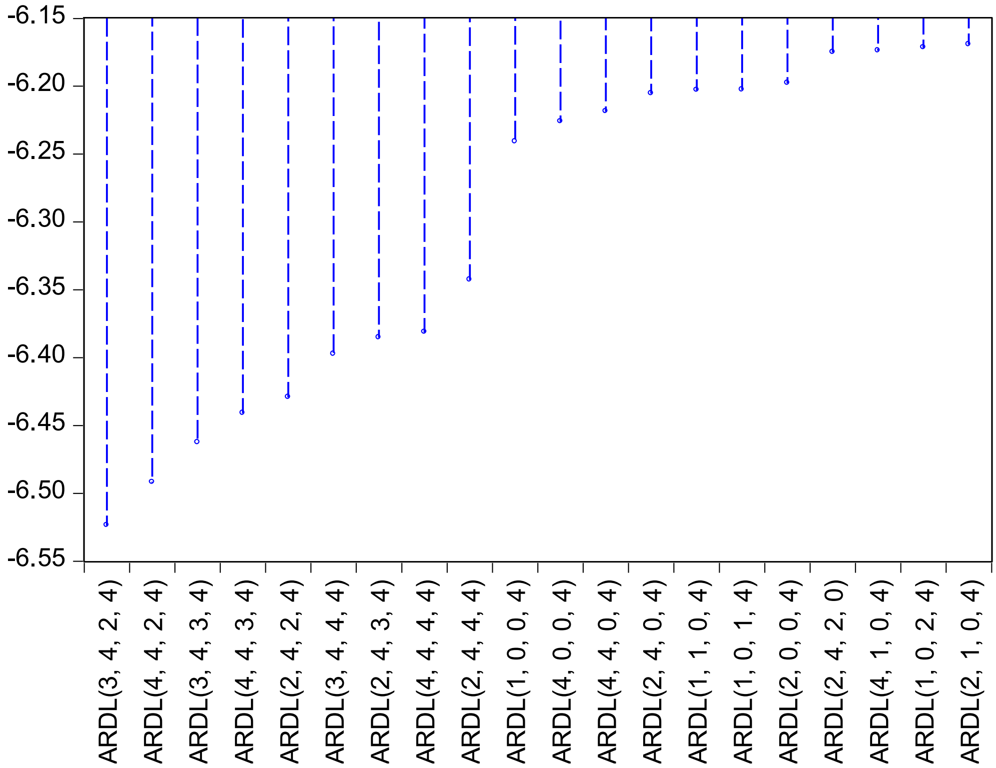


Fig. 1 shows the best 20 models according to the Akaike Information Criteria (AIC). The numbers of delays for China is (3, 4, 2, 4).

According to Banerjee et al (1998), the statistical significance of lagged error term i.e.$\boldsymbol{ECT_{t-1}}$ is further substantiation of the existence of a constant long-run relationship between the series. The statistically significant estimate of lagged error term i.e. $\boldsymbol{ECT_{t-1}}$with negative sign corroborates our established long-run relationship between domestic investment, agricultural exports, agricultural imports, and economic growth.

The empirical proof announced in Table 3, which pointed out that the coefficient of $\boldsymbol{ECT_{t-1}}$ is -1.107886 which is statistically significant at 1 percent level of significance (With a P value equal to 0.0011). In this case, we can say that the equilibrium cointegration equation is significant and that there is has a long-term relationship between the variables.

The long-run analysis is reported in Table 3. Our empirical evidence indicates that domestic investment and agricultural exports have a positive effect on economic growth and it is statistically significant at 1 percent level of significance. The impact of agricultural imports is negative and statistically significant at 1 percent level of significance.

Table 3: ARDL Cointegrating and Long Run Form

Dependent Variable: DLOG(PIB) Selected Model: ARDL(3, 4, 2, 4) Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(Y(-1), 2)	0.729792	0.242899	3.004509	0.0110
DLOG(Y(-2), 2)	0.285290	0.195355	1.460367	0.1699
DLOG(K, 2)	0.152188	0.036364	4.185164	0.0013
DLOG(K(-1), 2)	-0.095522	0.041229	-2.316899	0.0390
DLOG(K(-2), 2)	-0.114191	0.040888	-2.792773	0.0163
DLOG(K(-3), 2)	-0.099069	0.034597	-2.863467	0.0143
DLOG(AM)	-0.003715	0.012899	-0.287986	0.7783
DLOG(AM(-1))	-0.043514	0.015669	-2.777062	0.0167
DLOG(AX, 2)	-0.010157	0.038019	-0.267158	0.7939
DLOG(AX(-1), 2)	-0.019182	0.021651	-0.885982	0.3930
DLOG(AX(-2), 2)	-0.021507	0.017953	-1.197974	0.2541
DLOG(AX(-3), 2)	-0.049448	0.016690	-2.962767	0.0119
ECT_{t-1}	-1.107886***	0.258400	-4.287478	0.0011
$\text{Cointeq} = \text{DLOG(Y)} - (0.4999 * \text{DLOG(K)} - 0.0002 * \text{LOG(AM)} + 0.0275 * \text{DLOG(AX)} + 0.0441)$				
ECT denote Error Correction Term				
***** denote significance at 1% level**				

If we find evidence of a long-run relationship between domestic investment, agricultural exports, agricultural imports, and economic growth, then we estimate the short-run coefficients by employing WALD test which is including in the ARDL Model. Table 4 represents the short-run relationship between variables.

Table 4: WALD Test/Short run in ARDL Model

	Dependent Variable: DLOG(Y)
Log(K)	0.0174**
Log(AM)	0.0955*
Log(AX)	0.0823*
Note: *, ** and * denote significances at 1% , 5% and 10% levels, respectively;**	

Results in Table 4 indicate the positive and significant effect of domestic investment, agricultural imports and agricultural exports on economic growth in the short run. The impact of agricultural imports and agricultural exports on economic growth are characterized by a weak significant in the short-run.

The estimated ARDL models have passed a series of diagnostic tests to ascertain the robustness of our empirical results. The diagnostic tests are comprised of serial correlation, heteroskedasticity tests, the normality of residual term, Durbin-Watson test; R-squared and Adjusted R-squared are all associated with the empirical equation.

Table 5: Diagnostics tests

Residual Diagnostics Tests	Dependent Variable: LOG(Y)
Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.9353
Heteroskedasticity Test: Harvey	0.1076
Heteroskedasticity Test: Glejser	0.6531
Heteroskedasticity Test: ARCH	0.8312
Breusch-Godfrey Serial Correlation LM Test:	0.2951
Test of Normality	0.136979
R-squared	0.952393
Adjusted R-squared	0.888917
F-statistic	15.00392
Prob(F-statistic)	0.000015
Durbin-Watson stat	1.930499

Table 5 reported the results of residual diagnostic tests. Heteroskedasticity tests, Serial correlation LM test, test of Normality, R^2, Adjusted R^2, Fisher statistic, and Durbin-Watson test indicate that the adopted specification is globally satisfying. The stability test of long-and-short run estimates is tested by using the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares (CUSUMsq) of recursive residuals. Figs. 2 and 3 show the results of stability tests such as CUSUM and CUSUMsq.

Fig.2 CUSUM Test

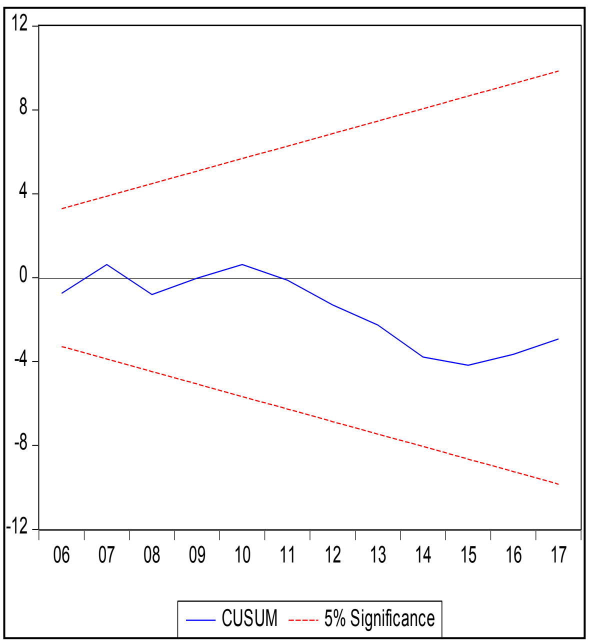
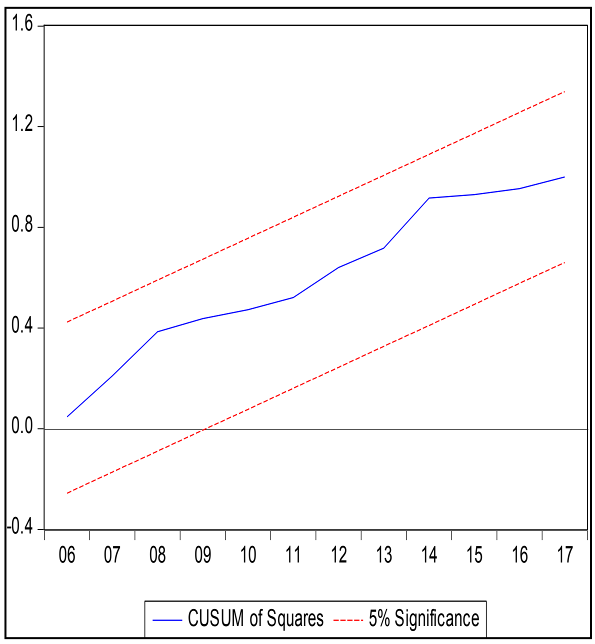


Fig.3 CUSUMsq Test



The results of CUSUM and CUSUMsq tests indicate that graphs of both are between the critical bounds at 5% level of significance. This confirms that the ARDL parameters are stable and efficient.

3. Conclusion

The agriculture sector plays a key role in the economy in terms of satisfying the domestic and foreign demand which leads to creating more jobs and opportunities. As one of the greatest agricultural trade economy, China has many opportunities in terms of the trade of agricultural products. Since the beginning of the third millennium, the Chinese agricultural exports increase at a strong pace. In this context, this paper aims to answer the question if the agriculture trade promotes Chinese economic growth by employing the ARDL bounds testing for the study period from 1984 to 2017. To the best of our knowledge, this is the first paper which attempts to treat the agriculture trade contribution to the economic growth, by considering the agriculture trade as a determinant factor of the Chinese growth model.

The long-run findings recorded that domestic investment and agricultural exports have a positive effect on economic growth. However, agricultural imports have a significant negative impact on growth. In the short-run, our highlights revealed a positive and significant effect of domestic investment, agricultural imports and agricultural exports on economic growth. The positive impact of agriculture exports on growth is due to the importance of agriculture in terms of creating jobs and opportunities for the economy as a whole. Also, sufficient national investment in the agriculture sector leads to enlarging these opportunities and then improves the Chinese economic growth. Also, the negative impact of agriculture imports on growth is justified by the absence of a real contribution of imports to growth, even more, China is an exporter economy.

References

Ahmed, O and Sallam, W (2018). "Studying the Volatility Effect of Agricultural Exports on Agriculture Share of GDP: The Case of Egypt". *African Journal of Agricultural Research*. Vol. 13(8), pp. 345-352, 22 February, 2018.

Alam F and Myovella G (2016). "Causality between Agricultural Exports and GDP and its Implications for Tanzanian Economy". *Journal of Economics, Finance and Accounting*. Volume 3, Issue:1, 1-18.

Amiti, M., Konings, J., (2007). Trade liberalization, intermediate inputs, and productivity: evidence from Indonesia. *American Economic Review* 97, 1611–1638.

Awokuse, T.O., 2018. Trade openness and economic growth: is Growth Export-Led or Import-Led? *Applied Economics* 40, 161-73.

Badinger, H., 2007. Market size, trade, competition and productivity: evidence from OECD manufacturing industries. *Applied Economics* 39, 2143–2157.

Bakari, S (2017b). “The Impact of Olive Oil Exports on Economic Growth: Empirical Analysis from Tunisia”. *MPRA Paper 82812,* University Library of Munich, Germany, revised Oct 2017.

Bakari, S (2017a). The Impact of Vegetables Exports on Economic Growth in Tunisia. *Economic Research Guardian,* Weissberg Publishing, vol. 7(2), pages 72-87, December.

Bakari, S (2018). "The Impact of Citrus Exports on Economic Growth: Empirical Analysis from Tunisia". *International Journal of Food and Agricultural Economics.* Vol. 6, No. 1, 2018, pp. 95-112.

Bakari and Abdelhafidh (2018). “Structure of Agricultural Investment and Economic Growth in Tunisia: An ARDL Cointegration Approach”. *The Economic Research Guardian* – Vol. 8(2)2018

Bakari, S and Mabrouki, M (2017). "The Effect of Agricultural Exports on Economic Growth in South-Eastern Europe: An Empirical Investigation Using Panel Data". *Journal of Smart Economic Growth.* Volume 2, Number 4, Year 2017.

Banerjee, A., Dolado, J.J., Mestre R., (1998). Error-correction mechanism tests for cointegration in a single-equation framework. *Journal of Time Series Analysis* 19, 267–283.

Carter, M., Bradford, B., Mesbah, D., (1996). Agricultural export booms and the rural poor in Chile, Guatemala, and Paraguay. *Latin American Research Review* 31, 33–65.

Coe, D., Elhanan, H., Hoffmaister, A., (1997). North–south R&D spillovers. *Economic Journal* 107, 134–149.

Echevarria, C. (1997). “Changes in sectoral composition associated with economic growth”. *International Economic Review* 38 (2): 431–52.

Edwards, S., 1998. Openness, productivity and growth: what do we really know? The *Economic Journal* 108, 383–398.

Estrades, C., Terra, M.I., 2012. Commodity prices, trade and poverty in Uruguay. *Food Policy* 37, 58–66.

Faridi M.Z. (2012): Contribution of agricultural exports to economic growth in Pakistan. *Pakistan Journal of Commerce & Social Sciences*, 32: 133–146.

Ferreira, P., Rossi, J., 2003. New evidence from Brazil on trade liberalization and productivity growth. *International Economic Review* 44, 1383–1405.

Forgha N.G and Aquilas N.A (2015) "The Impact of Timber Exports on Economic Growth in Cameroon: An Econometric Investigation", *Asian Journal of Economic Modelling*, Vol. 3, No. 3, pp. 46-60.

Gardner, B. (2005). "*Causes of rural economic development". In Reshaping Agriculture's Contribution to Society"*, edited by D. Colman and N. Vink, pp. 21–41. Proceedings of the 25th International Conference of Agricultural Economists. Durban, Oxford: Blackwell.

Gollin, D., Parente, S. and Rogerson, R. (2002). "The role of agriculture in development", The *American Economic Review* 92(2): 160 - 164.

Hay, D., 2001. The post-1990 Brazilian trade liberalization and the performance of large manufacturing firms: productivity, market share and profits. *The Economic Journal* 111, 515–529.

Ijirshar, V.U (2015). The empirical analysis of agricultural exports and economic growth in Nigeria. *Journal of Development and Agricultural Economics*, 7(3): 113–122.

Jonsson, G., Subramanian, A., 2001. Dynamics gains from trade: evidence from South Africa. *IMF Staff Papers* 48, 187–224.

Kogel, T. and Prskawetz, A (2001). "Agricultural productivity growth and escape from the Malthusian trap". *Journal of Economic Growth* 6: 337–57.

Mahmood, K. and Munir, S. (2017). Agricultural exports and economic growth in Pakistan: an econometric reassessment. *Qual Quant*. https://doi.org/10.1007/s11135-017-0534-3.

Pavcnik, N., 2002. Trade liberalization, exit, and productivity improvements: evidence from Chilean plants. The Review of Economic Studies 60, 245–276.

Pesaran, M.H., Shin, Y., Smith, R.J., 2001. Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics* 1, 289–326.

Sanjuan-Lopez, A.I. and Dawson, P.J. (2010). Agricultural Exports and Economic Growth in Developing Countries: A panel Co-Integration Approach. *Journal of Agricultural Economics*, 61(3), 565-583.

Tiba, S., Omri, A., Frikha, M., 2015. The four-way linkages between renewable energy, environmental quality, trade and economic growth: a comparative analysis between high and middle-income countries. *Energy Systems* 7, 103-144.

Tiba, S., Frikha, M., 2018a. Income, trade openness and energy interactions: Evidence from simultaneous equation modeling. *Energy* 147, 799-811.

Tiffin, R. and X. Irz. (2006). "Is agriculture the engine of growth?" *Agricultural Economics* 35: 79–89.

Toyin, M.E (2016). "Causality Relationship between Agricultural Exports and Economic Growth: Evidence from South Africa." *Journal of Social Sciences*, 48(1,2): 129- 136 (2016).

Tybout, J., De Melo, J., Corbo, V., 1991. The effects of trade reforms on scale and technical efficiency: new evidence from Chile. *Journal of International Economics* 31, 231–250.

Uremadu, S. O., Onyele, K. O. and Ariwa, F. O. (2016). "The Impact of Selected Agricultural Exports on the Growth of the Domestic Economy." *Prime Journal of Business Administration and Management*, 6(3), 2035-2046.