



Export of agricultural products and economic growth in Madagascar

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Abstract

This paper examines the impact of agriculture, especially coffee, vanilla, and clove exports on economic growth of Madagascar using time series secondary data covering 1990-2017. The study used Johansen co-integration and vector error correction model approach to estimate the long run and short run impact. The results showed that agricultural exports have short run mixed result on economic growth in Madagascar. Coffee and vanilla export has a positive effect on economic growth in the long run and in the short run. Though, clove export has also a positive long run effect on economic growth, it has a negative impact in the short run. These results will help the policy makers and investors in Madagascar for the decision making since results reveal increase export of agriculture can increase in GDP.

Keywords: Agricultural export; coffee; cloves; economic growth, Madagascar; vanilla.

1. INTRODUCTION

The main objective of Madagascar economic policy is committed to achieve a high growth economy in national income. The country's exports are either used to extend local market or sell the extra products in the international market due to saturation of local demands. An insufficient local demand in the market promotes a country to sell their products overseas. Indeed, Madagascar trade constitutes 74.7% of GDP, which means that the country still open to world markets. Since the 1990s, the country's export is mostly characterized by primary goods [1]. The export had a positive impact on the Madagascar economic growth as declared by Seraphin and Yinguo [2]. Theoretically, many economists affirmed that increasing exports can lead to raising economic growth [3]-[4]. According to World Bank database, the share of export of goods and services increased by 35.5% on the Malagasy's GDP. The economy growth has consequently improved by 4.7% in 2017 which led to the reduction of poverty to 75.1% in 2018 compared to 77.7% in 2014. The majority of the people still live in rural areas and their livelihood depend on agriculture. Dorosh et al [5] argued that agriculture is an economic tool to reduce poverty. The agriculture sector is reputed as the mainstay of Malagasy's economy since its independence. Based on recent data, agriculture, including forestry and fishery is lower than industry and services with a 19.93% decrease in gross domestic product and the share of agricultural employment provides 68.43% of total employment in 2017 (World Bank database 2019).

Although this sector is critical to the national economy, it will remain continuously one of the most important sources of revenue. Madagascar's export is dominated by agricultural exports which accounts for approximately 36.5% of total exports including 24.68% for vanilla, 8.02% for cloves as major exports and 3.8% for total minor exports (coffee, cocoa, pepper, sugarcane, cinnamon, vegetables, fruits, maize, rice and oil seeds). Madagascar is the world's largest exporter of vanilla with 57.3% and clove with 42.9% of the world's market. The coffee is also one of the main export products. Between 1993 and 1998, coffee ranks the first to agricultural export. France and United States of America are the major export partners of Madagascar with a share of 22.67% and 18.67% respectively. Other export partners are Germany 7.15%, China 6.07%, Netherlands 4.7%, Japan 3.44%, and India 3.16% in 2017 (Trademap database 2019). These indicators obviously emphasize the importance of the agricultural sector in the Malagasy economy. Agricultural products are considered the largest part of exports ahead of textile products. Consequently, the share of export is highly dependent on agriculture production. The aim objective of this research is to analyze scientifically the relationship between agricultural export and economic growth in Madagascar. Specifically, this study examines the impact of coffee, vanilla and clove exports on the growth of Madagascar's economy. This research is meaningful to the Government and all stakeholders in Madagascar to help develop and appreciate the Agricultural sector and its economic impact. This research

is going to help the government put in measures for efficient management of agricultural export since results reveal increase in GDP as export of agricultural products increase.

2. LITERATURE REVIEW

A large number of studies such as Henneberry and Khan [6], Gbaiye et al. [7], Ijirshar [8], Simasiku and Sheefeni [9], Matandare [10], Canchari et al [11], and Bakari and Mabrouki [12] found some evidence that a unit increase agricultural exports have a positive and significant impact on economic growth of a country.

Gilbert et al., [13] analyzed the impact of coffee, banana and cocoa exports on economic growth in Cameroon by employing Engle granger analysis and vector error correction model. The findings of the study indicate banana and Coffee exports have a positive effect on economic growth. While, cocoa export has negative impact on economic growth. In addition, there is no direction of causality between cocoa export and economic growth, while there is unidirectional causality running from GDP towards banana export and bidirectional causal relationship between coffee export and economic growth. Gutema et al. [14] investigated the causality between agricultural exports and gross domestic product. The granger causality test was employed to observe the direction of causality by using time range 1973 to 2013. The findings of the study indicated that there are two ways causality relationships between coffee export, oilseed export and economic growth while one way relationship was found running from pulses export to economic growth. Hafeez and Haq [15] used Johansen co-integration approach and Error correction model to investigate the long run and the short run effect of cotton and rice crops exports on economic growth in Pakistan. They found out that in both long run and short run, export of cotton and rice have a positive relationship impact on economic growth. Uremadu and Onyele [16] examined the effect of some selected agricultural exports on economic growth in Nigeria. Their study applied ordinary least squares multiple regression method. The results showed that cocoa export has a positive impact on economic growth, while rubber export has a negative impact. Additionally, total agricultural exports also have a positive impact on Nigeria economy. Bakari [17] found evidence that vegetable exports are a source of economic growth. In both long run and short run, vegetable exports have a positive effect on economic growth in Tunisia. Bakari [18] evaluated the impact of citrus export on economic growth in Tunisia covering the period 1970-2016. By using Error correction model, the analysis indicated that citrus exports have no effect on economic growth in the long run and a positive unidirectional causality in the short run moving from citrus exports to economic growth. Siaw et al. [19] used Autoregressive Distributed Lag to estimate the effect of cocoa, banana and pineapple export on GDP growth in Ghana. The empirical result showed that cocoa export has a positive and significant effect on economic growth, pineapple and banana export has a negative effect on economic growth in the long run as well short run. Also, the study reported no causality between pineapple export

and economic growth, unidirectional causal effect moving from banana export to economic growth, and bi-directional causality between cocoa export and economic growth. Nora et al. [20] emphasized the impact of avocado and grape export. They found that avocado exports have a positive unidirectional causal impact on Peru's economy; grape exports have a negative impact.

Basically the literature about the impact of agricultural exports on economic growth can be concluded that there are mixed results due to the time periods, data and methodologies used in all these previous studies. Some studies revealed a positive effect between agricultural exports and output growth and others the opposite way.

3. DATA AND METHODOLOGY

3.1. Data source

To study the effect of agricultural exports (referring to coffee, vanilla and cloves export) on economic growth in Madagascar, we used secondary time series data. The data were obtained from Uncomtrade 2019 and World Bank database (world development indicators (WDI) 2019) covering a small sample size of 28 years (1990-2017). Five variables are used in order to analyze the empirical findings of this paper and clarify correctly the relationship between cash crops exports and economic growth in Madagascar as described in the table below.

Table 1: Description of variables

Indicators	Description	Unit of measure	Source
Dependent: GDP	Gross domestic product	USD	WDI
Independent: GFCF	Gross fixed capital formation	USD	WDI
COFX	Coffee export	tons	Uncomtrade
VANX	Vanilla export	tons	Uncomtrade
CLOX	Clove export	tons	Uncomtrade

3.2. Econometric model

In order to investigate the relationship of agricultural exports on economic growth, this study uses time series econometrics such as unit root test, co-integration analysis, and vector error correction model. First of all, the unit root test is used to test whether or not variables are stationary through Augmented Dickey-Fuller [21]. Then determine co-integration test when the variables are integrated in the same order I (1). A co-integration test developed by Johansen and Juselius [22] will be used to analyze the long run causal effect on economic growth and the vector error correction model will be finally applied to find out the short run causal effect on economic growth.

The model specification is estimated as follows:

$$\ln GDP_t = \beta_0 + \delta_1 \ln GFCF_t + \delta_2 \ln COFX_t + \delta_3 \ln VANX_t + \delta_4 \ln CLOX_t + \lambda ECT_t \quad (1)$$

δ_1 to δ_4 indicate coefficient of variable independent to be estimated;

λ = speed of adjustment, ECT = error correction term and t = time trend, β_0 = constant;

4. RESULT AND DISCUSSION

4.1. Unit root test

Table 2 shows the unit root result using ADF test. The null hypothesis that the series has a unit root is rejected if the p-value is less than 0.05% level of significance. On level form I (0), the variables of GDP, GFCF, COFX and VANX indicate that they are non stationary contrary to CLOX that is stationary. At first difference I (1), GDP, GFCF, COFX and VANX become stationary. CLOX is always stationary even at first difference I (1). However, GDP, GFCF, COFX, VANX and CLOX are integrated in the same order I (1).

Table 2: Augmented Dickey fuller test

Variables	Level form I(0)		First dif. I(1)		Order
	t-stat	Prob.	t-stat	Prob.	
lnGDP	-0.3304	0.908	-6.69051	0.000	I (1)
lnGFCF	-0.9297	0.763	-5.22527	0.000	I (1)
lnCOFX	-1.4919	0.522	-7.81032	0.000	I (1)
lnVANX	-2.4318	0.143	-5.70061	0.000	I (1)
lnCLOX	-4.5577	0.001	-7.89503	0.000	I (1)

4.2. Johansen co-integration

The null hypothesis is that there is co-integrating equation if test statistics is lower than the critical value. Trace and max-eigen test revealed that there is one co-integrating equations at the 5% level of significance. Due to the fact that the calculated value of trace statistic as well as maximum eigenvalue value is greater than critical value at 0.05% level of probability, the null hypothesis of none co-integrating equation is not accepted against alternative hypothesis and the null hypothesis of at most 1 co-integrating equation is accepted against alternative hypothesis. These results prove that there exists a long-run relationship between the variables.

Table 3: Unrestricted co-integration rank test (Trace)

No. of CE(s)	Eigenval.	Trace Statistic	0.05 Critical Value	Prob.
None *	0.73398	70.99061	69.81889	0.0402
At most 1	0.49465	36.56160	47.85613	0.3685
At most 2	0.37230	18.81633	29.79707	0.5062
At most 3	0.21439	6.708517	15.49471	0.6118
At most 4	0.01659	0.434870	3.841466	0.5096

*denotes rejection

Table 4: Unrestricted co-integration rank test (Max-eigen)

No. of CE(s)	Eigenval.	Max-eigen Statistic	0.05 Critical Value	Prob.
None *	0.73398	34.42901	33.87687	0.0429
At most 1	0.49465	17.74527	27.58434	0.5164
At most 2	0.37230	12.10781	21.13162	0.5370
At most 3	0.21439	6.273646	14.26460	0.5784

At most 4	0.01659	0.434870	3.841466	0.5196
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*denotes rejection

Table 5: Johansen normalization

variables	Co-integrating coefficient	Standard error	t-statistics
LNGDP(-1)	1.000000	-	-
LNGFCF(-1)	-0.680391	(0.07063)	[-9.63249]
LNCOFX(-1)	-0.109124	(0.05484)	[-1.98971]
LNVANX(-1)	-0.048665	(0.05527)	[-0.88043]
LNCLOX(-1)	-1.016527	(0.12093)	[-8.40587]
C	2.552944	-	-

According to Forgha and Aquilas [23] in their study, the normalized result is interpreted by reversing the signs of co-integrating coefficient. The result indicated that gross fixed capital formation, coffee export, clove export and vanilla export have a positive effect on economic growth in Madagascar, on average, ceteris paribus (OLS estimate). This implies that 1 percent change on gross fixed capital formation will lead to 0.68 percent increase on GDP growth, 1 percent change on export of coffee will rise to 0.11 percent on economic growth, a unit change in vanilla export will cause to 0.05 increases in GDP and 1 percent increase on export of cloves will strongly augment GDP by 1.02 percent.

4.3. Vector error correction model (VECM)

It can be seen that the coefficient of error correction terms is -0.36 which has the appropriate sign and statistically significant at the 5% level of probability. This indicates that the disequilibrium from previous period deviation will be restored to the long run equilibrium in the current year with an adjustment speed of 36% approximately. Moreover, the coefficient of gross fixed capital formation and clove export was found to have a negative impact on GDP growth. In addition, the export of coffee and vanilla have positive on effect economic growth contrary to export of cloves with a negative impact on economic growth.

Table 6: Short run coefficient of VECM

Variables	Coefficient	Std. Error	T-statistic	Prob.
ECT	-0.364726	0.143782	-2.536650	0.0201
DlnGDP	0.037466	0.303138	0.123592	0.9029
DlnGFCF	-0.257628	0.164784	-1.563427	0.1345
DlnCOFX	0.087269	0.044598	1.956795	0.0652
DlnVANX	0.066993	0.048880	1.370575	0.1865
DlnCLOX	-0.132079	0.081533	-1.619954	0.1217
Constant	0.076219	0.024409	3.122563	0.0056

4.4. Diagnostic test

Table 7 describes the residual diagnostic through serial correlation LM and heteroskedasticity tests. Firstly, the hypothesis of serial correlation LM test is that the residuals have no serial correlation if the p-value is higher than the 5 percent level. The test has indicated that the probability value (65%) is statistically up to 5% level of significance. Therefore, the null cannot be rejected. This means that there is no evidence of serial correlation in the model. Secondly, the null hypothesis of heteroskedasticity tests

through Breusch Pagan Godfrey is that residuals are homoscedastic if the p-value is upper than the 5% level. The test has also confirmed that the probability value (27%) is statistically upper than 5% level of significance. Thus, the null hypothesis is accepted and we can conclude that residuals are homogenous.

Table 7: Residual diagnostics

Diagnostics	Obs *R-squared	P-value
Breusch-Godfrey Serial correlation LM test	1.277002	0.6518
Heteroskedasticity test: Breusch-Pagan-Godfrey	12.52625	0.2715

Normality test of residuals is indicated in the graph below based on Jarque-Bera. The null hypothesis of normality test is that residual is normally distributed if the probability value is greater than 5% level of significance. However, the probability value (57%) respects the hypothesis and indicates that the distribution of residuals is normal.

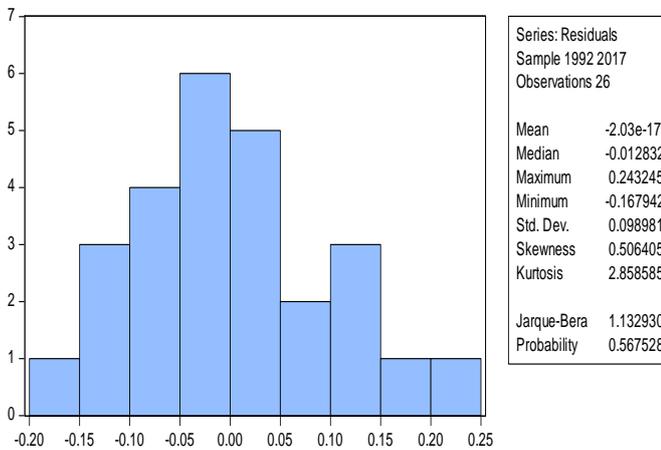


Fig. 1: Histogram of normality test

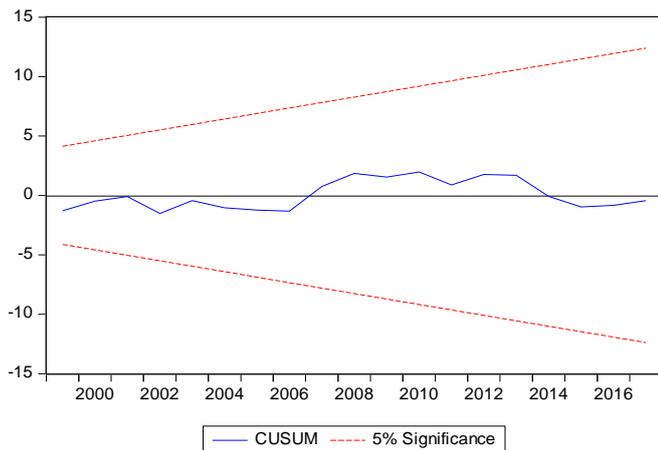


Fig. 2: Cumulative sum test

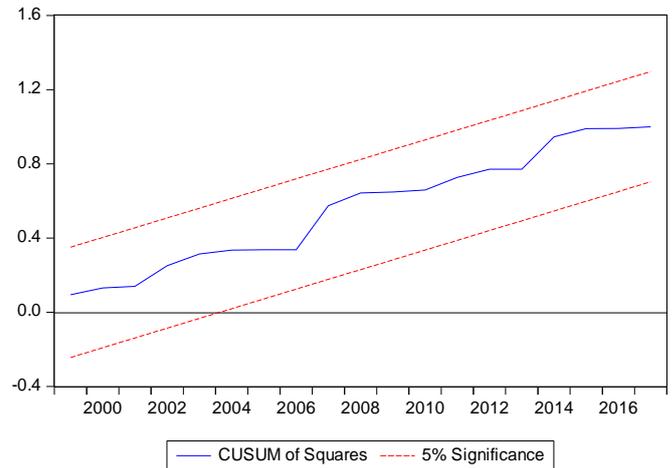


Fig. 3: Cumulative sum of squares

The figures (2 and 3) indicate the stability of model employing cumulative sum (CUSUM test) and cumulative sum of squares (CUSUMSQ test). By observing CUSUM and CUSUMSQ test, the trend lines are inside of the boundaries. These conclude that the model is dynamically stable at the 5% level of significance.

5. CONCLUSION

The main purpose of this study is to seek the impact of agricultural export on economic growth using annual time series data for the period from 1990-2017 in Madagascar by employing Augmented Dickey Fuller (ADF), Johansen co-integration, and vector error correction model. We decomposed agricultural exports into its components such as coffee, vanilla, and clove exports. The variable of gross fixed capital formation is employed as an additional variable.

In this study, ADF showed that the variables were found to be integrated in order I (1). The fact that the series are integrated in the same order allowed this study to apply Johansen co-integration test and the test found evidence of long run relationship among the variables. In the long run, gross fixed capital formation, coffee export, vanilla export, and cloves export have a positive effect on economic growth. From VECM result, we found that gross fixed capital formation and cloves export have a negative impact on economic growth in the short run. On the other side, coffee and vanilla exports have a short run positive impact on economic growth in Madagascar. Finally, the diagnostics results demonstrated that the residual has no serial correlation, homogeneous, normally distributed and stable.

According to the empirical results, this study will help government and policy makers a road map to make better decisions towards the agricultural sector that will impact the growth of the economy. Coffee, vanilla, and clove exports are much more important in the international market. However, the Malagasy government should review the economic policies and strategies to enlarge agricultural exports as a development issue for rapid growth in the economic expansion.

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