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Full Length Research Paper

Cocoa export tax, producer price of cocoa and exports of Ghana's Cocoa, 1990-2011

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The cocoa export tax has been an indispensable source of revenue to Ghana. Following the Cobweb production model, it is hypothesized that the lags of cocoa export tax and the producer price of cocoa would have significant effects, on cocoa export from Ghana. The study tested the above hypothesis by estimating a system of equations with the three-stage least squares procedure. The system of equations, included the export supply equation, import demand equation and the producer price of cocoa equation. The null hypotheses of homoscedastic and no autocorrelation were not rejected in the model, even at the 10 percent level. The results show that a 1% increase in the lag of export tax cocoa and producer price of cocoa decreases (increases) cocoa bean exports by 1.2% (1.9%). The study recommends that the government of Ghana implements policies and programs that eliminate potential inefficiencies in the marketing of the crop in Ghana (which is state-controlled) so that a stable level of producer price of cocoa could be sustained. It could lead to an increase in Ghana's cocoa exports.

Keywords: Export, Import, Export Tax, Ghana, Cocoa Beans, International Trade.

INTRODUCTION

Ghana is the second largest cocoa producer in the world after Ivory Coast, with market shares of 20.2 percent and 38.3 percent, respectively, Rifin and Nauly (2013). In Ghana, cocoa is produced on smallholder lands, ranging from farm sizes 0.4 to 4.0 ha (Baah & Garforth, 2008). The country exports about eighty percent of its cocoa in the raw form, and approximately 20 percent in the processed form (cocoa butter, cocoa paste, and cocoa shells) (Boansi, 2013). The export destinations of Ghana's cocoa (both raw and processed) are mainly the U.S.A, the European Union, and Asia (Boansi, 2013). Ghana enjoys a price premium on its cocoa exports due to the high quality of its cocoa on the world market compared to exports from other countries (Williams, 2009). The cocoa sector generates about US$2 billion in foreign exchange to the economy of Ghana (World-Bank, 2015). The significant contribution of cocoa to Ghana has earned it the phrase "the lifeblood" of the Ghanaian economy (Osei, 2007).

At the microeconomic level, approximately 800,000 smallholder cocoa farmers in rural Ghana depend on the crop for their livelihoods (Baah & Garforth, 2008). This employment generation could impact positively on rural poverty, especially in southern Ghana where cocoa is exclusively produced (Kolavalli & Vigneri, 2011). Currently, rural poverty headcount ratio (that is the percentage of the rural population living below the national poverty line) is about 38percent (Index-Mundi, 2017).

The cocoa export tax has been one of the primary sources

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of revenue to Ghana (Goode, Lent, & Ojha, 1966; Kolavalli & Vigneri, 2011). However, the tax could have negative impact on the cocoa sector in Ghana (a large country in world cocoa trade) by depressing the domestic price of the crop (Rifin & Nauly, 2013). This could cause cocoa producers to shift to the cultivation of other crops, such as oil-palm and food crops, which promise relatively better prices per unit of output (Bulíř, 2002). Amanor (2005) documents a historical incidence where cocoa producers shifted from the production of cocoa to food crops, because of depressing producer price of cocoa. Therefore, the issue of export tax and Ghana's exports of cocoa (through local production) needs attention, if the significant contribution of cocoa production to the economy of Ghana must be sustained.

However, studies investigating the empirical quantitative relationship between Ghana's exports of cocoa and cocoa export tax, as well as producer price of cocoa, are limited. Nevertheless, it has received a lot of research attention in many other countries, including Indonesia and Cote D'Ivoire (Arsyad, 2007; Permani, 2013; Permani, Vanzetti, & Setyoko, 2011; Rifin, 2015; Rifin & Nauly, 2013). Arsyad (2007) notes that an imposition of export tax on Indonesian cocoa caused a 21.7% decrease in export volume of cocoa and cocoa products. Burger et al. (2008) showed that in Cote D'Ivoire, cocoa export tax could benefit the country by earning more revenue (because it is the largest exporter of cocoa in the world) in the short run but decrease its competiveness in world cocoa trade in the long-term. Other authors have also shown that countries that impose cocoa export tax could decrease their competiveness on the global cocoa market and ultimately hurt their economies (Nyein, Sirisupluxana & Titapiwatanakun, 2010; Pradiptyo & Hardi, 2011). The information above shows that cocoa export tax could have negative impacts on economies of countries that impose them in the long-term.

Consequently, the primary objective of this study is to explain the determinants of export supply of Ghana's cocoa, especially export tax and producer price of cocoa. The specific aim is to estimate the elasticities associated with the export supply of cocoa with respect to cocoa export tax and producer price of cocoa. Knowledge of these elasticities could help the government of Ghana make informed decisions regarding the enhancement of the contributions of the cocoa sector to the economy of Ghana. For instance, knowledge of the elasticity of export supply concerning cocoa export tax and producer price of cocoa could inform Ghana about the possible trade-off between increased government revenue through cocoa export tax and Ghana's cocoa exports. In this study, it is assumed that the total output of cocoa beans in a production year would be approximately the same as its exports. This is because Ghana exports most of its cocoa beans.

Statement of Hypotheses

The Cobweb production model predicts a time lag between an agricultural producer's decision to produce a commodity and the actual production. Following this model's predictions, it is expected that producers would use previous years export tax and cocoa producer price to plan and execute current cocoa production decisions. Therefore, the working hypothesis in this study is that the lag of cocoa export tax would have a negative impact on the export of cocoa. This is also true for the lag of cocoa producer price.

LITERATURE REVIEW

History of Cocoa Production in Ghana

Kolavalli and Vigneri (2011) provide a detailed description of the history of cocoa production in Ghana. Their study divides Ghana's cocoa history into four main distinct phases: a) the introduction and exponential growth phase (1888-1937), b) stagnation and post-independence phase (1938-1964), c) the downturn phase (1994-1982), and d) the recovery and second expansion phase (1983-2008).

The production of cocoa in Ghana started in the introduction/exponential growth phase, and it became the primary source of government revenue for fiscal expenditures, such as roads and railways in cocoa growing areas in the country. In the stagnation and post-independence phase, the struggle for independence coupled with cocoa diseases and pests (especially swollen shoot disease) had significant adverse impacts on the expansion of the plant (Boansi, 2013). In the downturn stage, the production of the crop was adversely affected by the total collapse of world cocoa prices in the 1964/65. The producer price of cocoa fell significantly in this phase, which contributed to the smuggling of the crop to neighboring producing countries and producers shifting to the production of other crops, mainly oil palm. Structural policies, also called Ghana's Economic Recovery Program (ERP) of 1983 were implemented in the recovery and second expansion phase (after 1982) to increase the production of cocoa (Bulíř, 2002). The Cocoa Rehabilitation Project, which was a particular component of ERP, among others raised the producer price of cocoa, controlled pests, and diseases affecting cocoa nationwide and also encouraged the planting of new and better cocoa varieties. These practices increased the production of the crop from 159,000 tons to 400,000 tons by 1995/96 (Kolavalli & Vigneri, 2011).

An essential component of the history of Ghana's cocoa

has been cocoa export tax (Kolavalli & Vigneri, 2011). It has been the primary source of government's revenue. Cocoa export tax is the difference between the expected international price of cocoa and the cost of marketing the crop, which includes the producer price of cocoa, payments to farmers, and the operating cost of Ghana Cocoa Board (Bulíř, 2002). The Ghana Cocoa Board is the government institution entrusted with buying and exporting of cocoa beans.

Determinants of Export Supply of Ghana's Cocoa

Some factors are essential in the production and export of cocoa in Ghana. At the fundamental level, the output of the crop is hindered negatively by pests and diseases. The most important diseases of the crop are blackpod disease and swollen shoot disease (World-Bank, 2013). Between 2008 and 2010, Ghana loss about US$300 million and US$84 million due to cocoa blackpod disease and cocoa swollen shoot disease, respectively (World Bank, 2013). Losses from capsid also called Mirids, which is the most important pest of the crop, is estimated to be about US$172 million annually (World Bank, 2013). Moreover, the sector is constrained by low yields, which for example is 37 percent below that of Cote d'Ivoire, the largest exporter of cocoa in the world (Boansi, 2013).

Theoretically, the imposition of an export tax policy in Ghana (which is a significant country in the world cocoa market) is expected to negatively affect the exports of cocoa from Ghana (Rifin & Nauly, 2013). The exact reduction in the quantity traded on the world market, depends on the elasticity of the excess supply curve and the excess demand curve, as well as the extent of shift of the excess supply curve, after the imposition of the export tax. However, producers are expected to respond to the lag of cocoa export tax in planning their current production activities.

The producer price of cocoa in this study will be a derived price. It is the primary determinant of producers' cocoa production decisions, and consequently cocoa exports (Fosu, 1992; World Bank, 2013). The producer price is a proportion of world price of cocoa (always less than the world price of cocoa beans). The difference between the world price of cocoa beans and the producer price of cocoa is mostly export tax revenue. Bulíř (2002) found that some farmers even decide not to harvest their current crop if government offered producer prices are too low. It shows that real producer price is a crucial factor in the supply decision of farmers, and setting it too low may have a depressing effect on cocoa exports. Again, it is expected that producers would use the lag of producer price of cocoa in planning future production activities.

As expected from trade theory, the devaluation of the Ghana Cedis relative to the US$ causes cocoa beans to be cheaper for importers who are mostly from the US and Europe (Majeed, Ahmad, & Khawaja, 2006). Fosu (1992), have also shown that exchange rates have asignificant effect on the production and export of the cocoa in Ghana. Moreover, The World Bank (2013) in a supply chain risk assessment to the Ghana Cocoa Board (COCOBOD), emphasized that, among others, exchange rate volatility is a critical factor that could shape the success of the cocoa sector in Ghana. Verter (2016) has shown that a 1% increase in real exchange rate increases cocoa exports in Cote d'Ivoire by 1.1%. On the contrary, Samuel (2011) documents an inverse relationship between exchange rate and cocoa exports in Nigeria.

A peaceful political climate can help improve the performance of the cocoa sector in Ghana. Stryker, Dumeau, and Mundial (1990) showed that military coups between the late 1960s and early 1980s, and the deterioration of the countries' road and rail systems that followed, had a negative impact on the growth of the cocoa sector. Expansion of cocoa exports from Ghana in period t-1, ceteris paribus, is expected to have a positive effect on exports in the subsequent year (Fosu, 1992).

Regarding the import of Ghana's cocoa, it is expected from trade theory that improvements in the world's economy, which in this study is captured by world gross domestic product, would impact positively on Ghana's cocoa imports. Demand theory also posits a negative relationship between the world price of cocoa on the world market and Ghana's cocoa imports. Oil palm is a substitute for cocoa beans in the manufacturing of chocolates. Therefore, as suggested by demand theory again, the world price of oil palm would be expected to have a positive relationship on the imports of cocoa from Ghana.

METHODOLOGY

Econometric Model

In this study, the three-stage least squares procedure is proposed to be used to simultaneously estimate a system of equations, which include the cocoa export demand equation, the cocoa import demand equation and the cocoa producer price equation. The equations in the system are:

Export Supply (ES):

$$(1) LnES_t = \beta_0 + \beta_1 \ln(ES_{t-1}) + \beta_2 \ln(Tax_t) + \beta_3 \ln(Tax_{t-1}) + \beta_4 \ln(PP_{t-1}) + \beta_5 \ln(PP_t) + \beta_6 \ln(Fland_t) + \beta_7 \ln(RER_t) + k_t$$

Import Demand(ID):

$$(2) LnID_t = \beta_0 + \beta_1 \ln(RER_t) + \beta_2 \ln(WPC_{t-1}) + \beta_3 \ln(WPC_t) + \beta_4 \ln(WGDP_t) + \beta_5 \ln(WOP_t) + v_t$$

Producer Price of Cocoa (PP):

$$(3) LnPP_t = \beta_0 + \beta_1 \ln(PP_{t-1}) + \beta_2 \ln(Tax_t) + \beta_3 \ln(WPC_{t-1}) + \beta_4 \ln(WPC_t) + u_t$$

Equilibrium Condition:

$$(4) LnES_t = LnID_t$$

where, ES_t denotes exports of cocoa beans in tons in time t; ES_{t-1} denotes the lag of export supply in time t; ID_t denotes import demand in tons in time t; WPC_t denotes the world price of cocoa on the international market; WPC_{t-1} denotes the lag of world price of cocoa; Tax_t denotes export tax in time t in percentages; Tax_{t-1} denotes the lag of export tax of cocoa; PP_t denotes real producer price of cocoa in time t in Ghana Cedis; PP_{t-1} denotes the lag of producer price of cocoa; WOP_t denotes world price of oil palm in time t; $Fland_t$ denotes forest land in acres in time t; WGDP denotes world GDP in US$ in time t; RER_t (Ghana Cedis/US$) denotes real exchange rate in time t; k_t, v_t, and u_t are the stochastic error terms associated with the ES, ID and PP equations, respectively.

Econometric Model Estimation

This study acknowledges that using non-stationary series (variables that have unit roots) for statistical analysis could produce spurious estimates and wrong inferences (Cameron and Trivedi, 2005). Dickey-Fuller test is used to test for stationarity of the variables that are used to estimate the system of equations. Non-stationary variables are transformed using differencing with the hope that they would be stationary (the differenced variables will again be reviewed for stationarity). Given that the final variables are stationary, the system of equations is estimated simultaneously using the three-stage least squares estimator (3SLS). The reg3 STATA package is used to conduct the 3SLS procedure in STATA 14. A detailed description of the reg3 package is found in (STATA, 2018).

Moreover, according to Cameron and Trivedi (2005), the presence of heteroscedasticity could cause the 3SLS estimates to be inconsistent. Therefore, the LMHREG3 procedure developed by (Shehata, 2011a) is used to test the null hypothesis that the overall system of equations is homoscedastic. Also, the LMAREG3 routine developed by (Shehata, 2011b), is used to test the null hypothesis that there is no autocorrelation in the system. Heteroscedasticity and (or) autocorrelation would cause unreliable inferences from the estimated parameters in the system of equations (Cameron & Trivedi, 2005). When both cases arise, a heteroskedastic and autocorrelation consistent (HAC) estimator would be used to estimate the system of equations. The null hypothesis of homoscedasticity, as well as the null hypothesis of no autocorrelation, are tested at the 5 percent significance level.

Data Sources

Data on exports of cocoa beans from Ghana and world price of cocoa beans were obtained from The World Bank (2015) and IMF (2017a), respectively. Also, data on world GDP was derived from The World Bank (2017a). Nominal exchange rates (Ghana Cedis/US$), consumer price index (CPI) for Ghana and US, the world price of oil palm were obtained from The University of Pennsylvania (2017), World Bank (2017b and 2017c), IMF (2017b), respectively. The real exchange rate is obtained from the nominal exchange rate by using the formula below:

$$(5) \quad RealExchangeRate = \frac{NominalExchangeRate * AnnualInflationRate\ (US)}{AnnualInflationRate\ (Ghana)}$$

The data on cocoa export tax for the period 1997 to 2005 and producer price of cocoa was obtained from Ghana Cocoa Board, through an employee in the institution. The data from 1990 to 1997 and from 2006 to 2011 were predicted from an estimated export tax trend equation (export tax was regressed on time). As expected, there is a negative relationship between export tax and Ghana's cocoa exports. But, there are definite relationships between the world price of cocoa, real exchange rate, and the producer price of cocoa with Ghana's exports of cocoa.

RESULTS AND DISCUSSION

The null hypotheses of unit roots (non-stationarity) of all the original variables (in logs) in the system of equations is not rejected at the 10 percent significant levels (using the Dicker Fuller test), except export tax of cocoa. The Dicker Fuller test rejected the null hypothesis that cocoa export tax has unit root at the 10 percent significance level. Also, the analysis of the first-differenced variables (first difference of the original variables with unit roots), rejected the null hypothesis that the variables have unit roots, all at the 1 percent significance levels. The Dickey Fuller test for stationarity and subsequent use of first differenced variables in estimating the system of equations were important to avoid unreliable model results.

Moreover, according to the Breusch-Pagan LM Test, the null hypothesis that the overall system is homoscedastic is not rejected at the 10 percent significance level, with a Chi-square value of 3.03 and 3 degrees of freedom. It is significant because a rejection of the null hypothesis would have led to the estimator producing inconsistent estimates (Cameron & Trivedi, 2005).

Also, by the Harvey LM test, the null hypothesis that the system is not auto-correlated is not rejected at the 10 percent level, at a chi-square value of 6.22. This study expects the three-stage least squares estimates to be consistent, and also produce reliable inferences. Therefore, the heteroscedastic and autocorrelation consistent (HAC) estimator was not necessary in this study.

This study has shown that a 1 percent increase in cocoa export tax leads to a 1.3 percent increase in cocoa exports contemporaneously, at the 5 percent significance level. This is contrary to what is expected in a priori and results from other studies (see Arsyad, 2007 and Arsyad et al. 2011). However, consistent with the Cobweb production modela 1 percent increase in the previous years' cocoa export tax leads to a 1.2 percent decrease in cocoa exports in the subsequent year, at the 5 percent significant level. Again, as expected a priori, a one percent increase in the lag of producer price of cocoa per bag of cocoa (in Ghana Cedis) leads to a 1.9 percent increase in subsequent exports of Ghana's cocoa, at the 10 percent significance level. The results that producers respond to the lag of export tax and producer price of cocoa are consistent with the Cobweb model. This is new information regarding the relationship between producer price of cocoa and cocoa exports. The dominant position has been that, contemporaneously, there is a positive relationship between producer price of cocoa and cocoa exports (see Abdulai and Reider, 1995 and Boansi, 2013).

Moreover, a 1 percent increase in the world price of cocoa would have a 0.2 percent positive effect on the producer price of cocoa. This is not surprising because world price of cocoa is one of the key determinants of producer price of cocoa set each year by the government of Ghana. For instance, the producer price of cocoa fell significantly in 1964/65 following a near total collapse of cocoa price of cocoa (Kolavalli and Vigneri, 2011).The above results show that producer price of cocoa has a more significantimpact on Ghana's cocoa exports. The government of Ghana could use this information to counteract the adverseeffect of the cocoa export tax on Ghana's cocoa exports, primarily as the world price of cocoa increases.

Again, a 1 percent decrease in the previous year's exports of cocoa beans leads to a 0.4 percent increase in the exports of cocoa, at the 1 percent significance level. Declines in last years' cocoa exports could be due to decreased cocoa yields and cocoa smuggling to neighboring countries like Ivory Coast. If producers derive their income and livelihood mainly from cocoa farming, they would have the incentive to do whatever is possible to reverse their declining cocoa yields. Also, government's policies to stop cocoa smuggling, such as increased surveillance in the country's border, could lead to increased exports in subsequent years. However, Musinguzi and Obwona (2000) has shown that in Uganda, export growth in the previous year has a significant positive effect on export growth in subsequent year.

As expected, a one percent increase in the devaluation of Ghana's real exchange rate (Ghana Cedis/US$) leads to a 0.3 percent increase in cocoa exports, at the 1 percent level. It has been shown in other studies that exchange rate devaluation has positive impact on the export of agricultural commodities (Fosu, 1992; Abdulai and Reider, 1995; Majeed & Ahmad, 2006). A one percent increase in the lag of the world price of oil palm leads to a 0.6 percent decrease in the exports of Ghana's cocoa. It is possible because cocoa producers might shift from cocoa production to oil palm production if world price of oil palm increase relative to the world price of cocoa beans. There is a historical precedence in Ghana, where declining producer price of cocoa caused producers to shift to the production of oil-palm (Kolavalli, 2011).

For the import demand equation, the results (Table 1) show that a one percent increase in the real exchange rate and the world GDP would cause a 0.27 percent and a 3.44 percent increases in import demand for Ghana's cocoa, respectively, all at the 1 percent significance levels. These results are consistent with the expectations of this study. But, contrary to the expectation of this study, a one percent increase in the lag of the world price of cocoa beans leads to a 4.2 decrease in the import demand for Ghana's cocoa.

CONCLUSION

This study used a three-stage least squares procedure to estimate a system of equations, including export supply of cocoa equation, import demand of cocoa equation and a cocoa producer price equation. Consistent with the Cobweb production model, the results of the study showed that producers respond to the lag of producer price of cocoa (positively) and the lag of export tax (negatively). Moreover, compared to the lag of cocoa export tax, the results show that producers respond relatively more to the lag of producer price of cocoa than the lag of export tax.

The government of Ghana could use the results of this study to make appropriate policies to shore up cocoa production and exports in Ghana. For instance, the government of Ghana could be encouraged to eliminate the inefficiencies in the marketing of the crop (which is mainly controlled by the government through the Ghana Cocoa Board), so that a significant level of producer price of cocoa can be set to increase Ghana's exports.

A limitation of the study is inadequate data on export tax of cocoa. Data on export tax was for just ten years. Another ten years' data was predicted for this study.

Table 1. Ghana Cocoa Trade Model Results.

	Export Supply	Export Demand	Producer Price
Lag (log Export Supply)	-0.460***		
	(0.177)		
Log Export Tax	1.285**		0.002
	(0.601)		(0.018)
Lag (Log Export Tax)	-1.20**		
	(0.545)		
Log Real Exchange Rate	0.291***	0.271***	
	(0.117)	(0.103)	
Log Producer Price of Cocoa	0.084		
	(1.468)		
Lag (Log Producer Price of Cocoa)	1.85*		0.026
	(1.07)		(0.240)
Log World GDP		3.442***	
		(1.091)	
Lag (Log World GDP)		-4.157***	
		(1.010)	
Log World Oil Palm Price	-0.555*	0.138	
	(0.301)	(0.226)	
Log World Price of Cocoa		-0.202	0.200**
		(0.367)	(0.082)
Lag (Log World Price of Cocoa)		-0.022	
		(0.279)	
Constant	-0.158	0.026	0.028
	(0.287)	(0.082)	(0.057)
Number of Observations	18	18	18
Overall Model Sig. (Chi-square)	26.6***	40.87***	7.75*
R-square	0.67	0.85	0.97
Overall Heteroscedasticity	Breusch-Pagan LM Test: Chi-square (3 df) = 3.03		
Overall Autocorrelation	Harvey Lm Test: Chi-square (3 df) = 6.22		

***, **, * denotes significance at 1, 5 and 10 percent levels, respectively; standard errors are in parenthesis.

Future studies are encouraged to seek to get more data regarding export taxes and see if the results obtained in this study change significantly.

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