UNIVERSITY OF CAPE COAST

EXCHANGE RATE, PRICE - INCENTIVE TO SMUGGLE AND COCOA BEANS EXPORT IN GHANA

BY

JAMES SEKYI ANNAN

Thesis submitted to the Department of Economic Studies of the School of Economics, College of Humanities and Legal Studies, University of Cape Coast in partial fulfillment of the requirements for the award of Master of Philosophy degree in Economics

FEBRUARY 2019

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature ……. Date ……

Name: James Sekyi Annan

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature: ..... Date: .....

Name: Dr. Camara K. Obeng

Co-supervisor's Signature ..... Date: .....

Name: Dr. Benedict Afful Jr.

ABSTRACT

The study sought to empirically examine the effects of real exchange rate on price-incentive to smuggle and the effect of price-incentive to smuggle on cocoa beans export in Ghana. Autoregressive Distributed Lag model (ARDL) was employed in analyzing the data. The study used secondary data from 1986 to 2016, gathered from sources including the Food and Agricultural Organization, World Development Indicators, Institute of Statistical, Social and Economic Research, and the International Monetary Fund. The study found that price-incentive to smuggle is influenced by the real effective exchange rate. Accordingly, appreciation of the exchange rate reduced the price-incentive to smuggle while depreciation increased it. Also, the study showed that cocoa beans export was negatively influenced by price-incentive to smuggle, implying that, an increase in the price-incentive to smuggle reduced the volumes of cocoa beans export. As depreciation in the exchange rate increased the price-incentive to smuggle, the latter in turn reduced the volumes of cocoa beans exports. The study therefore recommends that COCOBOD must correctly forecast exchange rates movements to avoid wide differences between the prices of cocoa in neighboring countries which creates the incentive to smuggle.

KEYWORDS

Autoregressive Distributed Lag

Real Effective Exchange Rate

Price-Incentive to Smuggle

Cocoa Beans Export

Smuggling

COCOBOD

AKNOWLEDGEMENTS

My sincere gratitude goes to my Principal Supervisor, Dr. Camara K. Obeng and Co-Supervisor Dr. Benedict Afful Jr. for their comments, constructive criticisms, patience, pieces of advice, expert guidance that helped to shape this work.

My special thanks also go to my brother, Ephraim Sekyi-Annan and his wife, Abigail Sekyi- Annan, as well as my parents, Obrana James Sekyi Annan and Emma Sekyi Annan, for their diverse assistance, inspiration and motivation towards the successful completion of my thesis.

I would also like to express my profound gratitude to African Economic Research Consortium (AERC) and the entire staff of the Department of Economics, University of Cape Coast for their support and motivation throughout the program.

.

DEDICATION

To my family

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ADF	Augmented Dickey – Fuller
ADRL	Autoregressive Distributed Lag
AIC	Akaike Information Criterion
CMB	Cocoa Marketing Board
COCOBOD	Cocoa Board
CPC	Cocoa Producing Company
CPI	Consumer Price Index
CPP	Convention People's Party
CUSUM	Cumulative Sum of Recursive Residuals
CUSUMSQ	Cumulative Sum of Squares of Recursive Residuals
DD	Demand
DF	Dickey-Fuller
DW	Durbin- Watson
ECM	Error Correction Model
ECT	Error Correction Term
ERP	Economic Recovery Program
FOB	Free on Board

GCCSFA	Ghanaian Cocoa, Coffee, Sheanut Farmers Associate
GDP	Gross Domestic Product
GSS	Ghana statistical service
ICCO	International Cocoa Corporation
ISSER	Institute of Statistical, Social and Economic Research
LBC	Licensed Buying Company
MOFA	Ministry of Food and Agriculture
NEER	Nominal Effective Exchange Rate
NER	Nominal Exchange Rate
OLS	Ordinary Least Squares
PBC	Produce Buying Company
PNDC	Provisional National Defense Council
PP	Phillip-Perron
PPP	Purchasing Power Parity
PPRC	Producer Price Review Committee
QCU	Quality Control Unit
REER	Real Effective Exchange Rate
RER	Real Exchange Rate

SIC	Schwarz Information Criterion
SS	Supply
SSA	Sub- Saharan Africa
UGFC	United Ghana Farmers Council
UNCTAD	United Nations Conference on Trade and Development

CHAPTER ONE

INTRODUCTION

Background to the Study

Many sub-Saharan African (SSA) countries largely export primary agricultural and other products which they have abundant factor endowments (Verter, 2016). One of the topmost agrarian products produced and exported in four West African countries, namely, Cote d'Ivoire, Ghana, Nigeria and Cameroon is Cocoa (Verter, 2016). According to Wessel and Quint-Wessel (2015), about 70 percent of the world's cocoa output comes from 6 million hectares of cocoa farms in West Africa, where Côte d'Ivoire, Ghana, Nigeria and Cameroon are the leading producers. These West African countries are also the first (Cote d'Ivoire), second (Ghana), fourth (Nigeria) and fifth (Cameroon) largest exporters of cocoa beans in the world (Verter, 2016).

Ghana cannot be thought of without reference to its cocoa sector, because of the sector's immense contribution to the country's export revenue. The Ghanaian cocoa industry is the second largest cocoa producing and exporting country in the world (Verter, 2016). The sector contributes about 23 percent to Ghana's total export and foreign earnings and contributes about 3.9 percent to GDP (Boateng, 2017). According to World-Bank (2015), the cocoa sector generates about US$2 billion in foreign exchange to the economy of Ghana. Furthermore, the sector provides about two-thirds of cocoa farmers' income and supports the livelihoods of approximately 4 million farming households (GSS, 2015). Boateng (2017) also adds that, the sector employs about 800,000 households.

Table 1- *Ghana Cocoa Export Volumes and Value (1986-2016)*

Year	Total Cocoa Beans Export (Tonnes)	Value of Cocoa Beans Export (US$)
1986	195224	467800000
1987	197980	451000000
1988	200904	422300000
1989	225860	381300000
1990	247380	323800000
1991	243040	315600000
1992	223774	276810000
1993	263665	250500000
1994	238269	295000000
1995	237262	361100000
1996	349067	479800000
1997	261251	384800000
1998	327327	538400000
1999	346768	497300000
2000	348031	380900000
2001	310476	316900000
2002	311425	392500000
2003	354775	691600000
2004	620400	984400000
2005	536900	818500000
2006	657200	1041100000
2007	531700	946300000
2008	564000	1225100000
2009	508200	1422400000
2010	529400	1594400000
2011	630200	2027900000
2012	718600	2192700000
2013	654400	1612100000
2014	658000	1618900000
2015	666500	2014100000
2016	621500	1923300000

Source: Author's compilation with data from ISSER Reports

Cocoa is therefore Ghana's main export crop and has become the focal point of most of the debates on development and poverty alleviation strategies since independence in 1957. By virtue of its immense contribution to the agricultural

sector and the economy as a whole, cocoa has been described as the backbone of Ghana's economy (Osei, 2007). Throughout the world the standards against which all cocoa is measured are those of Ghana cocoa (UNCTAD, 2013; Williams, 2009), hence making Ghana an important player in the cocoa sector in the world. As a result of the unique position it holds in the economy of Ghana, several policy measures have been devised and implemented towards developing and ensuring continuous contribution of the cocoa subsector to national development (Boansi, 2013). Some of such policies include the partial liberalization of domestic cocoa marketing, increased share of free on board prices going to farmers etc.

In Ghana, the cocoa sector is heavily regulated by government through its organized institution called Ghana Cocoa Board (COCOBOD), established in 1947 and tasked with the responsibility of exporting cocoa beans and other cocoa products (Mulangu et al, 2017). Prior to the structural reforms in 1983, the cocoa sector was characterized by complete monopoly (Leith & Söderling, 2003). Cocoa marketing was therefore in the hands of the government which, through the Cocoa Marketing Board (CMB), was the only authorized domestic buyer and exporter of cocoa. However, as part of the structural reforms in the cocoa sector during the Economic Recovery Programme in 1983, cocoa marketing was partially liberalized in 1992 (Abenyega & Gockowski, 2003). This liberalisation of internal marketing introduced private Licensed Buying Companies (LBCs) as competitors to the state-owned Produce Buying Company (PBC) that had a monopoly on buying cocoa from farmers (Oomes et al, 2016). These Licensed Buying Companies (LBCs) are privately owned companies that are allowed to purchase cocoa from farmers at the

fixed producer price and sell, for a fixed margin of the FoB price (Free on Board), to the COCOBOD subsidiary, Cocoa Marketing Company (CMC), which retains the monopoly of selling to the international market (Kolavelli et al. 2012). As at 2014, there were 41 Licensed Buying Companies (Ghana Cocoa Board, 2014).

The objective of the liberalization reform was to enhance the operational and financial performance of the country's cocoa marketing system and to further introduce competition on the internal market, to open up for the possibility of paying higher competitive producer prices (Ministry of Manpower, Youth and Employment, 2008). However, according to Kovalli et al (2012), there is an absence of any price-based competition mechanism among the LBCs because they claim that margins are so low that it does not make sense for them to compete on prices. Also, Abenyega and Gockowski (2003) adds that, one distinguished feature of the internal market is that the LBCs do not compete on prices but rather offer competitive weapons based on cash payment, non-economic motivations and/ or different incentive packages instead of paying farmers a top up to the producer price. Further, Oomes et al (2016) confirms by adding that, because of the fixed farm-gate prices, intermediaries cannot (legally) compete for supply on price and instead compete by offering services to farmers, including pre-finance, quick payments or facilitating access to inputs. In addition, Laven (2007) notes that, although LBCs may not compete on prices, they do offer token gifts such as exercise books, cakes of soap, salt, as well extend credit to producers. Furthermore, Zeitlin (2005) notes that, buying companies cannot compete through price differentiation because a floor price is set by COCOBOD for the cocoa season.

Cocoa marketing company (CMC), a subsidiary of COCOBOD is the sole organization responsible for the external trading of cocoa beans. In order to hedge against the risk of world cocoa price volatility, CMC under the current marketing system sells about 70 percent of the upcoming season's crop on forward basis and the remaining 30 percent on spot basis (Aiden environment, 2018). According to (Schofield, 2011), future contract fixes the price today for delivery of a commodity in the future. This mechanism guarantees the proceeds from trade hence reducing price uncertainty in the market (Schofield, 2011 &ICCO, 2007). Therefore, regardless of fluctuations on the world market, the price for farmers remains the same throughout the season. According to Mulangu et al. (2015), farmers sometimes even get additional bonuses on their produce from the stabilization fund if the world price decreases. Based upon the realized prices of the forward sales and price forecasts, COCOBOD then estimates the export price for the next season (Oomes et al, 2016).

The fixed price at which LBCs purchase the cocoa beans from farmers is determined by Producer Price Review Committee (PPRC), a multi-stakeholder platform with the sole responsibility of fixing cocoa producer prices and other related rates and fees in cocoa purchases and marketing (Darkwah & Verter, 2014). The PPRC consists of representatives of the Ministry of Finance and Economic Planning, COCOBOD, Bank of Ghana, Quality Control Commission, Cocoa Marketing Committee, LBCs, Cocoa Hauliers Association and Ghanaian Cocoa, Coffee, Sheanut Farmer Association (GCCSFA) (Quartey, 2013). The producer price is derived from an estimate of the projected cocoa revenue using the projected

FoB in US dollars, the projected exchange rate of the Ghana cedi to the US dollar and the projected crop sizes (Kovalli et al, 2012). The PPRC then determines the percentage of the implied FoB price that farmers receive as well as the buyers' margin and other rates and fees. The fixed farm-gate price is announced at the start of the cocoa harvesting season in October and maintained for the period of one year (Oomes et al, 2016). Currently, the farm-gate price is annually fixed at 70% of FoB price by forward sales by COCOBOD (Oomes et al, 2016).

There is also the establishment of a stabilization fund which saves extra fund when world cocoa prices increase during the cocoa harvest and used to compensate farmers in the form of bonuses when prices decline (Quarmine et al, 2014; Mulangu et al., 2015). Farmers are therefore guaranteed a fixed annual farm-gate price for cocoa hence increasing stability by protecting farmers against any short-term price volatility or sharp exchange rate fluctuations during the year in which the price is fixed. Also, the fixed price protects farmers against abuse of market power since a minimum cocoa price can help to prevent excessively low farm-gate prices (Oomes at al, 2016).

It is worthy to note that, in the regulated system like Ghana cocoa sector, average farm-gate price is usually lower than the completely liberalized countries such as Nigeria and Cameroon (Oomes et al, 2016). This is mainly because cocoa export taxes are high, as the national boards take a high percentage of the FoB export price (Oomes et al, 2016). In Ghana, tax revenues finance disease and pest control, subsidized fertilizers, seeds/ hybrid seedlings distribution, rehabilitation and replanting programs, jute bags and related items as well as various social

programs including investments in road infrastructure, child labour program, a farmers' housing program, and a farmers' pension fund scheme (Quartey, 2013).

It is imperative to note that, the current marketing and pricing system in Ghana's cocoa sector which results in the fixed price for farmers has inherent problems which can be detrimental to the production, supply and export of cocoa (Steijn, 2016). The partial liberalization of the internal marketing of the cocoa beans coupled with the fixed price from COCOBOD eliminates the possibility of price competition or product differentiation, hence disincentivizing investment in quality (Kovalli et al, 2012). According to Asante-Poku and Angelucci (2013), the prevailing cost structure in the value chain of cocoa in Ghana results in farmers receiving disincentives which are a result of levies and taxes on exports, coupled with the cumbersome regulating framework and high transportation costs. Further, depreciation of the Ghana cedi, according to Ghana Cocoa Board (2014), tends to erode the fixed price paid to farmers rendering it uncompetitive compared to neighbouring countries, and this makes farmers explore better price for their cocoa elsewhere, leading to the smuggling of cocoa to Côte d'Ivoire or Togo. The depreciation of the exchange rate creates an incentive to smuggle when the cedi value of producer price in neighboring country, Cote d'Ivoire, is higher than that of Ghana (Bulir 2002). According to Bulir, producer prices signal changes in the expected returns on cocoa and therefore affect planting and crop outputs, as well as farmers' decisions to sell domestically, smuggle or even not to collect the current crop if the offered producer prices are low.

According to Liefert and Persaud (2009), exchange rates are a key determinant of the domestic prices for agricultural goods and therefore affect the quantity of these goods produced for domestic consumption and export. Exchange rate pass-through therefore refers to the degree to which changes in the exchange rate are reflected in the destination currency prices of traded goods (Liefert & Persaud). According to Adu-Gyamfi (2017), when competitive domestic market is completely integrated with foreign markets, changes in the country's exchange rate are completely reflected in the domestic currency prices of traded goods. However, agricultural policies and mechanisms such as state trading, import tariffs and export subsidies or taxes tend to insulate domestic markets, thus impeding market integration and full exchange rate and price transmission, this creates a price gap between the domestic prices and world prices of traded commodities, hence distorting the market incentives to produce and export these goods (Abdulai, 2000 and Gardner, 1975). Exchange rate links domestic prices to world prices by facilitating spatial price transmission between markets such that domestic producers can fully benefit from increased international demand as signaled by high world prices which promote production and exports (Liefert &Persaud).

However, in Ghana, exchange rate and world price transmissions to the domestic prices of agricultural commodities such as cocoa are usually impeded by trade policies and intervention mechanisms thus creating a price gap between prices in the domestic and world markets hence adversely affecting the price incentive to produce and export these commodities (Adu-Gyamfi, 2017). Producers therefore

resort to price comparisons with neighboring countries to decide whether to sell domestically or to smuggle.

It is against this background that we are interested in studying how the exchange rate, in the mist of the marketing and pricing mechanism in cocoa sector and the fixed producer price, creates the price-incentive to smuggle cocoa beans to neighboring countries and to further establish how the price-incentive to smuggle affects the production and export of the cocoa beans in Ghana.

Statement of the Problem

Cocoa is Ghana's second leading foreign exchange earner and the highest export crop earner. The sector contributes about 23% percent to total export and foreign earnings and contributes about 3.9 percent to Ghana GDP (Boateng, 2017). The sector provides about two-thirds of cocoa farmers' income and supports the livelihoods of approximately 4 million farming households (GSS, 2015).

In a wake to improving the efficiency and effectiveness of the cocoa sector, several reforms or structural adjustment programs were instituted in the form of Ghana cocoa sector liberalization (Laven, 2007). This was meant to enhance competition in the internal marketing of the cocoa beans, pass on a significant share of export prices to farmers and to reduce taxes in many programs and strategies (Ministry of Manpower, Youth and Employment, 2008). According to Oomes et al (2016), current farm gate price is set at 70 percent of FoB in Ghana, as against 60 percent in Cote d'Ivoire. However, the sector still grapples with the issue of

smuggling of the cocoa beans to neighboring countries, particularly Cote d'Ivoire, hence reducing the country's export supply.

Anang, (2015) recognized the sector's inability to meet its total annual cocoa export supply target and attributed it to, among other factors, cocoa smuggling. Also, COCOBOD (2014) noticed that the depreciation of the Ghana cedi eroded the fixed prices paid to farmers and rendered it uncompetitive compared with prices in neighboring countries and that encouraged smuggling of cocoa beans to neighboring countries and reduced Ghana's expected crop size in 2013/14. The Managing Director of Cargill Ghana Ltd, Kojo Amoo-Gottfried also hinted that "the rate at which the cedi was depreciating against other foreign currencies was becoming a threat to Ghana's cocoa sector as more people were smuggling cocoa beans to neighboring Ivory Coast" and added that most cocoa farmers around border towns were smuggling the cocoa beans to the various neighboring countries to get value for their cocoa rather than selling them in Ghana ("Cocoa smuggling rises as cedi falls," 2014).

In 2014, according to Ecobank Group report, it was recorded that, about 100, 000 metric tonnes of cocoa were smuggled from Ghana to Ivory Coast ("Cedi depreciation instigating smuggling to Ivory Coast," 2014). According to records from ISSER (2016), cocoa beans export has declined in recent years from 718600 tonnes in 2012 to 621500 tonnes in 2016. This brings to bare the role that exchange rate plays in creating the incentive to smuggle. According to Fosu (2002), when the cedi value of the producer price of a given agricultural export commodity in a

neighboring country is higher than the producer price of the same commodity in Ghana, an incentive is created for smuggling.

Thus, the question that readily agitate the mind are as follows: Are there any relationships between the volumes of cocoa beans exported and the producer price of cocoa? In other words, will a change in the producer price cause any significant change in the volume of cocoa beans export supply? What is the effect of changes in the exchange rate on cocoa producer price, thus creating the incentive to smuggle? And finally, what is the effect of price-incentive to smuggle on cocoa beans export.

This has, however, not gained much research attention in recent years. The few similar works sighted so far include Bulir (1998), Akiyama and Ducan (1982), Fosu (1992) and May (1985). This study develops on these works with a more current data. Also, in their study, there could be a measurement problem. Price-Incentive to smuggle in their studies was derived by the ratio of the cedi value of cocoa producer price in Cote d'Ivoire to the cedi value of cocoa producer price in Ghana. This measurement presupposed that, values equal to or less than one were all captured as incentive to smuggle, which in actual sense are disincentive to smuggle since they imply that, either the cedi value of cocoa producer price in Cote d'Ivoire is equal to that of Ghana or even lesser to that of Ghana respectively. This study therefore develops on their measurement and captures the actual incentive to smuggle by subtracting one from the ratio and equating all negative values to zero (disincentive to smuggle).

Further, their study did not examine the effect that exchange rate has on the price-incentive to smuggle. This study further narrows the gap by examining the effect of exchange rate on the price-incentive to smuggle and the effect the price-incentive to smuggle has on the cocoa beans export in Ghana.

Research Objectives

The general objective of the study was to investigate the effect of exchange rate on price-incentive to smuggle and the latter on cocoa beans export in Ghana. Specifically, the study seeks to:

a) Estimate the effect of real exchange rate on the price-incentive to smuggle.

b) Estimate the effect of price-incentive to smuggle on cocoa beans export.

Hypotheses of the Study

a) H_0: There is no significant effect of exchange rate on price-incentive to smuggle.

   H_1: There is a significant effect of exchange rate on the price incentive to smuggle.

b) H_0: There is no significant effect of price-incentive to smuggle on cocoa beans export.

   H_1: There is a significant effect of price-incentive to smuggle on cocoa beans export.

Significance of the Study

The study is intended to empirically study the magnitude of the effect of exchange rate on the price-incentive to smuggle and to further investigate how the price-incentive to smuggle affects Ghana's major export crop, cocoa, to guide policy makers in the adoption of favorable policies. The study is relevant for the following reasons:

First, the findings from this study will bring to bare the magnitude of the effect that exchange rate has in creating the incentive for farmers to smuggle. This will alert COCOBOD and the Producer Price Review Committee (PPRC) during the determination of the producer price, and that not only an increase in the share of FoB price to farmers can guarantee domestic sales of the beans, but the cedi value of the price compared to neighboring countries also matters.

Further, findings from this works will give COCOBOD an idea about the magnitude of the effect that price-smuggling has on our cocoa beans export, to alert them on tighter measures to adopt to curb this menace.

Delimitation

Cocoa export is the backbone of the economy of Ghana. There, however, exist some effects of exchange rate on the incentive of farmers to smuggle the beans to neighboring countries through the producer price, also, the price-incentive to smuggle affects the cocoa export performance in Ghana, hence the need to empirically examine such effects.

The study focuses on the export of cocoa beans and dwells on annual time series data from 1986 to 2016. The data set contains the following variables: cocoa beans exports, cocoa output, domestic consumption, world price of cocoa, real producer price, real effective exchange rate, price-incentive to smuggle, world cocoa export, and cocoa implicit tax.

The focus is on Ghana cocoa industry though some comparisons were made with major producer like Cote d'Ivoire.

Limitations of the Study

One major issue the study encountered has to do with unavailability of data, which has always been a major challenge confronting previous works, particularly in developing countries such as Ghana. As a result, some of the variables suggested by literature to influence cocoa export were not obtained. This led to the exclusion of some variables in the empirical model, with the risk of an omitted variable bias.

Also, the analysis of this study was made under the assumption that there was no cost involved in smuggle which might not be the case. In addition, the study assumed that farmers have perfect information about producer prices in Cote d'Ivoire, which might not be the case. Finally, it was assumed that the exchange rate if the CFA Franc to the US dollar remains constant, this might not actually hold.

Organization of the Study

This study is divided into five (5) chapters. Chapter One is the introduction of this research which represents background of study, statement of problem, objectives of research, significance of study, statement of hypothesis, delimitation and limitation of the study. Chapter Two reviews both theoretical and empirical literature available for this research work. The literature review examines related article and older texts to provide information in relation to this study. Chapter Three discusses the methodology together with the estimation techniques, and issues relating to data measurement and analysis of the study. Chapter Four formulates the estimated model, analyses and presents the empirical results. Finally, Chapter Five deals with the summary, conclusion, policy recommendations, and directions for future research.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter reviews literature of the core issues with regards to exchange rate, price-incentive to smuggle and cocoa beans exports in Ghana. The chapter is organized into three sections. The first section provides some History of the Ghanaian Cocoa Sector, Ghana Cocoa Marketing and some Structural Reforms and Exchange Rate Development in Ghana. The second section explores the theoretical literature and the final section reviews the related empirical work on real exchange rate, price-incentive to smuggle and cocoa beans exports.

History of Cocoa in Ghana

According to history, cocoa beans were first introduced in Ghana by the Dutch missionaries at the beginning of the 19thcentury. But unfortunately, the missionaries gave up on cocoa farming after the seedlings they planted died due to attacks from beetles and worms. However, Tetteh Quarshie, a Ghanaian blacksmith of Osu in Accra, upon his return to Ghana in 1879 from Fernando Po where he lived and worked for several years, brought with him the Amelonado Cocoa pods (Hill, 1963). He then established a farm at Akwapim Mampong in the Eastern Region which turned into a nursery for all pioneering cocoa farmers in Ghana. This contributed to its widespread cultivation in Ghana. Cocoa cultivation, after Tetteh Quarshie, assumed commercial dimensions and spread to all forest areas of the country. Now, cocoa is grown in six out of ten regions in Ghana comprising

Western, Ashanti, Brong-Ahafo, Central, Eastern and Volta regions (Barrientos & Asenso-Okyere, 2012).

History of Ghana's Cocoa Marketing System and Structural Reforms

Ghana's cocoa marketing board was part of the initial British marketing boards and became an independent unit, called the Cocoa Marketing Board (CMB), in 1947. Ghana was the world's largest cocoa producer as at independence in 1957, and relatively, the most prosperous nation when compared with the rest of Africa, because of its strong cocoa production and the relatively high world prices for cocoa (Woods 2004; Frimpong-Ansah 1991). Ghana's promising beginnings soon turned sour, with political elites chronically exploiting the cocoa industry and its revenues from independence until the 1980s, with claims of pursuing industrialization and redistributing resources, while price stabilization was down the list of priorities as to be inconsequential (Frimpong-Ansah 1991; Woods 2004).

Over taxation and politicization of the cocoa sector under Ghana's first president, Kwame Nkrumah, in the mist of inflation, rendered Ghana's cocoa farmers as the lowest paid in the world (Frimpong-Ansah 1991). Ghanaian cocoa farmers received about 30 to 50 per cent of the free on board from independence to the early 1980s, compared to producer prices of 60 to 80 per cent in Brazil, Malaysia, Cameroon and Cote d'Ivoire (Bulir 2002; Commander et al. 1989; Dzorgbo 2001).

The cocoa revenues motivated and facilitated politicization, which began as early as 1952, where Nkrumah's pre-independence government set up the Cocoa

Purchasing Company (CPC). This was a government-sponsored cocoa buying company that quickly became a political tool for Nkrumah's Convention People's Party (CPP), mainly to provide patronage resources for party loyalists, and a political vehicle in Ghana's cocoa producing Ashanti regions, where Nkrumah's support was most tenuous (Frimpong-Ansah 1991; Dzorgbo 2001; Woods 2004). In 1957, the CPC was liquidated after an investigation revealed corruption within its ranks (Bing 1968; Kotey & Gyekye 1974; Arhin 1985), but that did not end the practice of overt politicization in the cocoa sector.

In 1961, the state-funded United Ghana Farmers' Council (UGFC) was created by Nkrumah and was given a monopoly over cocoa purchasing within Ghana. The UGFC fueled patronage activities and effectively became the 'political arm' of the CPP in the cocoa industry (Frimpong-Ansah, 1991). Cocoa marketing jobs became a reward for political loyalty, with government employees accounting well over 100,000 in 1985, a central manifestation of politicization in the cocoa sector (Commander et al.1989).

The CMB developed a unique notoriety within Ghana, and even within Africa (Williams, 2009). According to Herbst (1993), though other state-owned enterprises in Ghana were corrupt and inefficient, none could claim quite the extravagance of waste that the Cocoa Board achieved. As a result of its exploitative antics in the cocoa sector, Frimpong-Ansah (1991) described the Ghanaian government as a 'vampire state', depleting the country's economic lifeblood to support patronage networks for political elites. Decades of over taxation, corruption, and inefficiency drove down producer prices to reached a low of 29 per

cent of the FoB price and, correspondingly, production from 557,000 to 159,000 tons in the 1983/84 season (Tiffen et al.2004; LMC 1996). This moved Ghana from being the world's leading cocoa producer in 1964/65, to being a distant third behind Cote d'Ivoire and Brazil (Woods, 2004).

In 1983, the government of Ghana, under the leadership of Jerry Rawlings' Provisional National Defense Council (PNDC) initiated the Economic Recovery Program (ERP) which aimed at addressing the general imbalances in Ghana's macroeconomy, and spelled major changes for the cocoa sector (Tangri, 1999; Aryeetey &Tarp, 2000). The Crux of the cocoa rehabilitation efforts was to increase producer prices by freeing up resources from the inflated cocoa public sector (Osei-Akom, 1983; Commander et al.,1989).

As a result of this, in 1984, the staff and costs of the CMB, renamed Cocoa Board (COCOBOD for short), were drastically reduced through divestment of non-essential roles, such as building roads, processing cocoa, and running plantations (Keeling 1989). Also, other retrenchments eliminated tens of thousands of 'ghost' workers and unnecessary staff, as well as some high-ranking officials (Gyimah-Boadi & Rothchild, 1990). This led to a drastic reduction in the COCOBOD's wage roll from over 100,000 employees in 1985 to about 60,000 by 1986 (COCOBOD, 2000).

After the reforms, production began a clear increasing trend and the COCOBOD made a much-needed return to profitability (Gyimah-Boadi & Rothchild, 1990; Waldmeir, 1985). Also, Ghana's cocoa farmers have also gotten

an increasing share of cocoa revenues over time (currently 70 per cent of the FOB price), in line with the reforms 'original objectives.

Another important change introduced during the reforms was the opening of the internal marketing system to private competition in 1992/93, following almost 15 years of a government monopoly on internal purchasing under the Produce Buying Company (PBC) (Shepherd & Onumah, 1997). With the listing of the PBC on the Ghana stock exchange in 2000, Ghana's internal cocoa buying system officially became fully liberalized, with privately-owned Licensed Buying Companies (LBCs) conducting the internal purchase and transport of Ghana's cocoa.

Cocoa Marketing in Ghana Today

In Ghana today, the cocoa marketing process begins with the farmers and ends with government, who through the CMC is responsible for export, with COCOBOD overseeing each step along the way (Williams, 2009). The entire supply chain is made up of input suppliers, farmers, collectors/cooperatives, Licensed Buying Companies (LBCs), Haulers, Cocoa Marketing Company (CMC) (the wholly-owned subsidiary of the COCOBOD with the sole responsibility to market and export Ghana cocoa beans to local and foreign buyers), local processors, local retailers, global marketers/manufacturers and international and local consumers.

First, suppliers, through marketing of agrochemical (including fertilizers, pesticides, and insecticides) and farm equipment, supply all inputs that farmers

need for the farming process. In the supply chain, the role of farmers is primarily to ensure the availability of cocoa beans through a year-round production. According to (COCOBOD, 2012), over 90% of Ghana's cocoa production is based on smallholder farmers relying on the traditional methods such as the hoe and cutlass method for farming and cultivate on smallholdings with an average size of two to three hectares.

After the cocoa is harvested, the beans are dried and fermented to help develop the unique flavor and other attributes that attract premium for Ghana cocoa beans on the world market (Boansi, 2013). After performing all the necessary post-harvest treatments, the beans are sold through either individual collectors or producer cooperatives to cocoa buying centers established in major cocoa producing areas. Purchasing clerks of the Licensed Buying Companies at these centers then purchase the beans from the farmers at the minimum price set by a Producer Price Review Committee (PPRC), which comprises COCOBOD officials, a farmer's representative, government representatives and representatives of the Licensed Buying Companies (LBCs). Revenue of the LBCs by this, is not based on prices differentials, but rather on volumes of cocoa marketed. LBC's therefore maximize their profits under this condition, by minimizing "turnaround" times (thus, the period from purchase of the beans at farm gate to the selling of them at the takeover centers) (Boansi, 2013).

The LBCs, after purchasing the cocoa, then invite the Quality Control Division to grade and seal the cocoa at a fee determined by the PPRC. The Quality Control Unit (QCU) is a subsidiary of COCOBOD that checks happenings both at

the farm level and before the cocoa is exported (Williams, 2009). Its core functions include the grading, sealing and disinfestation of cocoa (COCOBOD, 2014). Throughout the crop year, the company inspects and certifies the storage spaces of Cocoa CMC, and Licensed Buying Companies warehouses at both up-country and take-over centers across the country in accordance with Cocoa Industry Regulations 1968/LI 598 (COCOBOD, 2014). In addition, the company, as part of its responsibilities, educates cocoa farmers on good agronomic practices which helps in maintain the premium quality of Ghana's cocoa.

After the activities of the QCU, the graded and sealed cocoa is then evacuated by the LBCs, using private cocoa haulers to designated take over points at Tema, Takoradi and an inland port at Kaase (in Kumasi) at a fee also determined by the PPRC. Upon reaching the take-over points, the graded and sealed cocoa is then taken over by officials of the Cocoa Marketing Company. The Cocoa Marketing Company (Ghana) Limited (CMC) is a wholly-owned subsidiary of the Ghana Cocoa Board and responsible for the sale and export of Ghana cocoa beans. It major responsibilities include procurement of graded and sealed cocoa beans from the LBCs at the take-over points, stocking of cocoa prior to shipment, securing optimal prices and maximizing foreign exchange revenues, managing sales and collecting receipts, and settling of any disputes via direct arbitration (World Bank, 2011).

From this point until the cocoa is finally exported, management of cocoa becomes the responsibility of the CMC. Prior to shipment however, the Quality Control Division inspects and fumigates all shipping vessels and cocoa

consignments. A greater share of purchased cocoa beans is exported in the raw form with some however being processed. Usually, the smaller sized (light crop) beans are sold to processing industries in the country at a discount. Light crop beans are smaller in volume than the main crop variety exported in the raw form, although the quality of the bean is the same.

The cocoa marketing process in Ghana is therefore summarized in diagram 1 below.

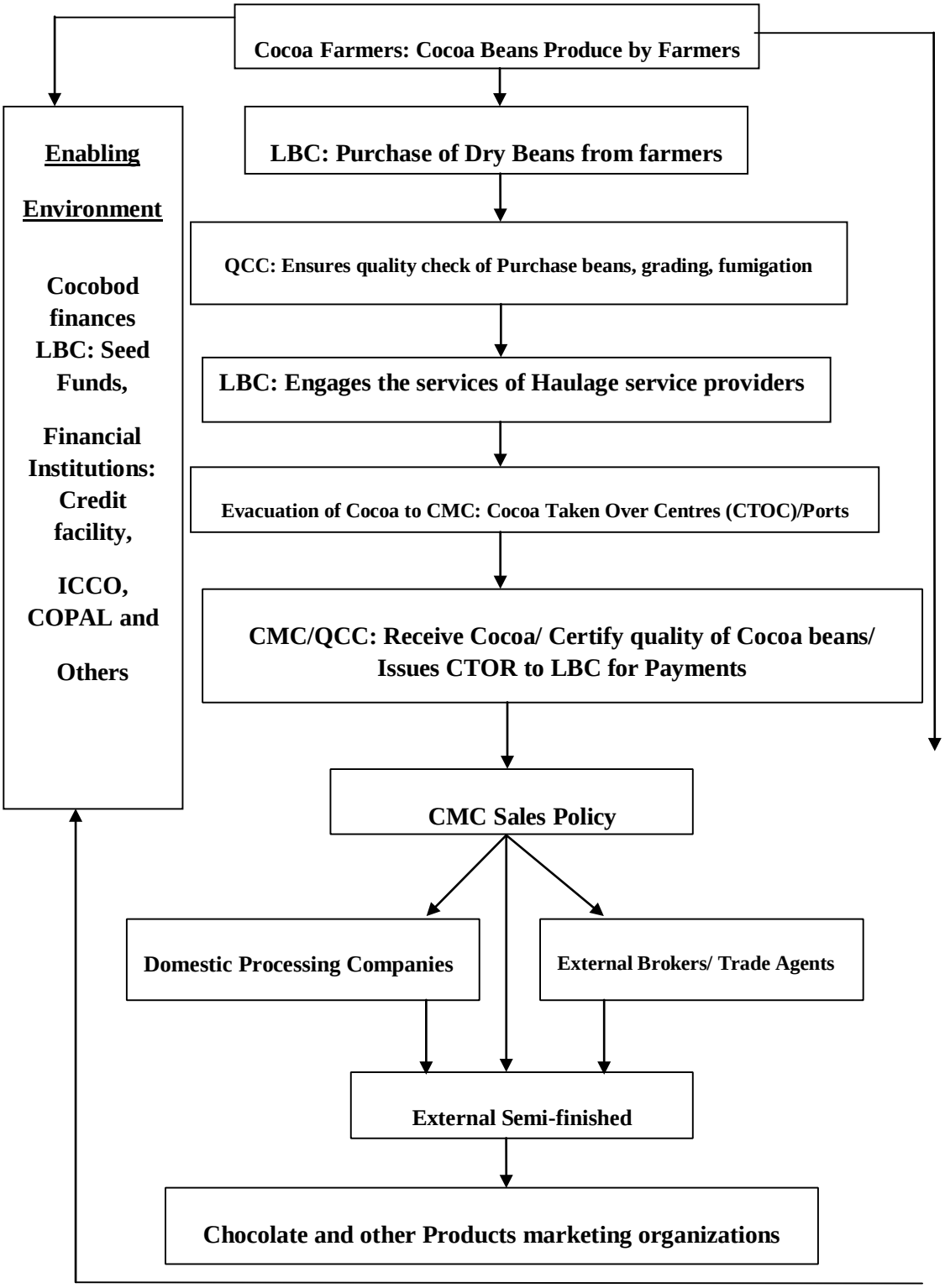


Figure 1: Marketing Channels for Ghanaian Cocoa

Source: Osei (2007). Cocoa Supply Chain Process in Ghana

Exchange Rate Developments in Ghana

Ghana has experienced different exchange rate regimes, from the fixed exchange rate system to the managed floating exchange rate regime which is in existence now. Exchange rate therefore can be defined as the price at which a country's currency can be exchange for another country's currency. The exchange rate affects the price of every country's imports and exports and also the value of every overseas investment. It is therefore incumbent on any government to search for an exchange rate regime that will enhance the stabilization of their economies. This is because a free fall exchange rate has a serious deleterious effect on economic development and welfare of the population. The policies on exchange rate in Ghana are influenced by contrasting political regimes that have existed since independence in 1957. Table 2 gives a summary of the various exchange rate regimes adopted by Ghana.

Table 2- *Exchange Rate Regimes in Ghana (1957-Date)*

Episode	Period	Policy
1	1957-1966	Fixed to the British Pound
2	1966-1982	Fixed to the America Dollar
3	1983-1986	Multiple exchange rate system
4	1986-1987	Dual exchange rate system-auction determined, dual retail auction rate.
5	1987-1988	Dutch auction system
6	1988-1989	Foreign exchange bureau.
7	1989-1992	Wholesale and inter-bank auction system.
8	1993- 2004	Average daily retail rate of commercial banks
9	2005- to date	Managed Float System

Source: Bank of Ghana, IMF

In Ghana, the fixed exchange rate system was adopted from 1957 to 1982 where the cedi was fixed to the British pound from 1957 to 1966 and subsequently to the US dollar until 1982. Following the launch of the Economic Recovery Program (ERP) in 1983, exchange rates were liberalized. This resulted in a series of devaluation of the cedi between 1983 and 1986. The currency was devalued from GH¢ 2.75 to the US$1.00 to GH¢ 90.00 per $1.00 by the third quarter of 1986. Under the new foreign exchange policy, a scheme of bonuses on exchange receipts and surcharges on exchange payments was introduced. Moreover, a multiple exchange rate system of two official rates of GH¢23.38/$1.00 and GH¢ 30.00/$1.00 were applied to specified receipts and payments. This transitory scheme continued until October 1983 when exchange rates were unified at GH¢ 30.00 to $1.00. Also, the real foreign exchange cost in Purchasing Power Parity (PPP) was implemented

between 1983 and 1984. The system necessitated adjustments of exchange rates on a quarterly basis, in conformance with comparative inflation rates of the main trading partners of Ghana.

Further, during the latter part of 1984, a policy of intermittent foreign exchange devaluations was adopted by government to replace the adjustments made on a quarterly basis, because the exchange rate was perceived to be overvalued (Harrigan & Oduro,2000). In addition, in 1986, the government adopted the auction market approach to enhance the adjustment of exchange rates and to achieve the objective of trade liberalization. At this point, the forces of demand and supply were partially determining the cedi/dollar exchange rate. Furthermore, this new approach introduced the dual exchange rate system which consisted of two windows. The first window maintained the fixed, but amendable, exchange rate pegged at ₵90.00: US$1.00 while the second window employed the weekly auction system organized by the Bank of Ghana, which allowed the forces of demand and supply to determine the exchange rates. But however, these two arrangements were later unified by February 1987.

By 1988, the exchange rate was completely liberalized with the legislation that allowed forex bureau to operate legally (Bhasin, 2004). This was established in an attempt to absorb the parallel market into the legal foreign exchange market. In March 1990, the weekly retail auction was substituted by the interbank wholesale system, which made it possible for a composite exchange rate system namely the inter-bank exchange rate to operate. In 1992, the system of wholesale auctioning was then abolished and substituted with the inter-bank market. From this date, both

the commercial and forex bureaus operate in a competitive environment. In June 2007, there was a redenomination of the cedi by the Bank of Ghana. This exercise led to the initiation of the new Ghana cedi, mainly to deal with the high numerical values of prices and to enhance book and statistical record keeping. The value of the cedi relative to a dollar before the redenomination was in the range of ¢9,300 - ¢10,000 but this became ¢0.93 - ¢1 to $1 after the redenomination.

Thus, it is clear from table 1 and the discussion above that the Bank of Ghana has been following a managed float exchange rate policy since 1986. The Bank of Ghana's intervention in the foreign exchange market is solely at its discretion and is only to smooth wide fluctuations in the foreign exchange market. One of the objectives of this policy has been to reduce the gap between the official rate and the parallel rate. Since major foreign exchange transactions take place at the inter-bank level, the official exchange rate is first determined by the demand and supply conditions. Later on, the forex bureaus add a premium to this official exchange rate and cater for the needs of travelers and traders who trade with other countries.

Exchange Rate Fluctuations

The issue of exchange rate changes (fluctuations) came into existence when countries adopted the flexible exchange rate system after the collapse of the Bretton wood system of fixed exchange rate. Since then, the development of some economies has been threatened by such changes in the exchange rate with some believes that exchange rate fluctuations have negative impacts on countries

especially developing countries with underdeveloped capital market and lack of stable economic policies (Prasad et al, 2005).

Changing exchange rate can be defined as an international monetary exchange system in which prices of currencies are determined by competitive market forces. It is an exchange rate system in which the rate of each currency is determined by interaction of market forces of supply and demand. This is also referred to as floating or flexible foreign currency rate (Otieno & Mudaki, 2011). The concept of exchange rate changes brings to bear two concepts: exchange rate appreciation (currency depreciation) and exchange rate depreciation (currency depreciation).

Currency appreciation occurs when there is an increase in value of one currency with respect to another currency. For instance, when the Ghana Cedi appreciates, it means that the Cedi has become more valuable. On the other hand, the depreciation of a country's currency refers to a decrease in value of that country's currency. It occurs when there is loss of value of one currency with respect to another currency (Bah & Amusa, 2003). In Ghana, the changes of exchange rate have often been attributed to macro-economic instability. Therefore, understanding the trend and causes of exchange rate changes and its historical pathways is necessary towards formulation of practical policies that enhances stability.

Nominal and Real Exchange Rate

The nominal and real exchange rates can both be referred to as Bilateral exchange rate because they involve a currency pair. The nominal exchange rate (NER) is the relative price of currencies of two countries. For instance, the current nominal exchange rate of Ghana to the US$ is GH¢ 4.5 to US$1. This means when a US$1 is converted to the Ghana Cedi, on will have GH¢ 4.5.

Real exchange rate (RER) is the purchasing power of two currencies relative to another. It is based on a deflator measurement of the price level in the domestic and foreign countries which are arbitrarily set equal to one (1) in a given base year. Therefore, the level of the RER is arbitrarily set, depending on which year is chosen as a base year for the deflator of two countries. The changes in the RER are instead informative on the evolution over time of the relative price of a unit of a commodity in the foreign country in terms of a unit of a commodity of the domestic country. If all goods were freely tradable, and foreign and domestic residents purchased identical baskets of goods, purchasing power parity would hold for the deflator of the two countries, and the RER would be constant.

Nominal Effective Exchange Rate and Real Effective Exchange Rate

The effective exchange rate is weighted average of a basket of foreign currencies and it can be viewed as an overall measure of the country's external competitiveness. A nominal effective exchange rate (NEER) is weighted with the inverse of the asymptotic trade weight. A real effective exchange rate (REER) adjusts NEER by appropriate foreign price level and deflators by home country

price level. Compared to NEER, a GDP weighted effective exchange rate might be more appropriate considering the global investment phenomenon. The real effective exchange rate is an index estimated as follows:

$$REER_t = \sum_{i=1}^{\theta} \left[w_{it} * \left(\frac{e_{it} * p_{it}}{p_{dt}} \right) \right] \quad (1)$$

Where REER is the real effective exchange rate, e_{it} is the bilateral nominal exchange rate, w_{it} is the ith trading partner trade weight, and p_{it} and p_{dt} are the trading partners consumer price index and the domestic consumer price index respectively. A decline in REER can be interpreted as appreciation in exchange rate (depreciation in domestic currency).

Theoretical Literature

International trade theory deals with the activities of exchange of goods and services across the global boundaries. The basic aim of trade is to enhance the gains from trade for the countries engaged in the exchange of goods and services. International trade theories are used to explain why a particular country will engage in the trade of a particular good or service. For instance, Ghana trade in cocoa as a result of the favorable climatic condition it has for it cultivation. This section therefore reviews some theories and concepts of international trade and price determination.

Absolute Advantage Theory

A classical economist, Adam Smith (1776), was the first person to formalize a model of international trade. In his work "Wealth of Nations", postulate that trade

is both an "engine of growth" and a "vent for surplus". According to the classical economists, nations participating in trade enjoy the benefits of specialization and through it more efficient production. Smith defined absolute advantage as a process by which a country can produce a particular good at a lower cost of production. He figured out that if countries specialized in producing those items in which they have absolute advantage (e.g. country A could produce food using less labor than country B and country B could produce furniture using less labor than country A), then it would be mutually beneficial for the countries to trade with each other. He assumed that every country had an absolute advantage over the other, and that with trade, both countries would gain simultaneously. Hence, under this theory, a country with an absolute advantage in the production is expected to use smaller amount of real resources in its production process when compared to another country.

Comparative Advantage Theory

The comparative advantage theory was propounded by David Ricardo (1817) and pointed out a flaw in the absolute advantage model. He emphasized that comparative advantage is the way for a country to specialize in the efficient production of a good, that is, a country can produce those goods which it can produce comparatively better than the other country. In the real world, specialization according to comparative advantage, leads to increased global production and means better living standards for everyone. David Ricardo elaborated the theory of Adam Smith and identified that countries should produce products that they are comparatively better at than other countries. Ricardo was not

in favor of tariffs and other restrictions of trade and based the theory on, among other assumptions; only two countries, for instance, Ghana and USA involve in trade; and on only two products e.g. cocoa and wheat. According to Chang (2009), "the concept of comparative advantage is one of the few concepts in economics that is more than common sense. He further stated in the same article that the beauty of this theory is that it illustrates how even a country having no absolute cost advantage in any sector can benefit from trade by specializing in industries at which it is least bad.

Factor Endowment Theory (Heckscher–Ohlin Trade Theory)

Eli Heckscher and Bertil Ohlin (1991) developed the international trade theory which is known as the Heckscher-Ohlin or Factor Endowment model. The Heckscher-Ohlin (H-O) or the factor proportion model tries to expand the Ricardian model and explains why certain countries have comparative advantages for certain goods. The theory is also called the factor endowment theory because it stressed that the pattern of production and trade across the national borders would depend on the factor endowment. The theory maintained that international trade takes place due to the differences in the comparative costs of factors of production that arise, due to the abundant or insufficient resources within countries. Therefore, countries should produce and export products that it has cheap factor(s) of production and import products or inputs that are scarce locally.

Ghana has therefore taken advantage and concentrated on the production and export of cocoa due to its favorable tropical climate condition which is a significant endowment factor for cocoa farming.

Macro-Dynamic Export-Based Growth Models

According to this model, export trade widens the total market for a country's producers, especially if they are operating at levels of increasing returns to scale. It enables the producers to move to higher points in the production possibility frontier or shift to higher curves. An increase in foreign demand for commodities will encourage better use of under-employed and unutilized resources; cause expansion of economy of scales, reduce unit cost of production, raise income, savings, and capital accumulation and engender growth (Park, 1981; Lee, 1971). These are dynamic gains. Myint was one of those that tried to explain the dynamic gains of trade. Myint (1982) in his 'vent for surplus' theory also identified trade as an outlet for a country's surplus commodities. The theory contends that there is gain from trade only if the 'surplus' export resources have no alternative uses and cannot be switched to domestic uses. He further argued that the vent for surplus theory provides more plausible explanation to the rapid expansion of export production in most countries in the 19th Century. He argued that, if unutilized resources were not existing, the expansion process would have stopped; comparative cost theory has no answers to why, when two countries possess similar endowments, one would have developed export sector and the other would not and that vent for surplus is more reasonable explanation for the start of trade.

In line with the foregoing, Thirwall (1978) noted that there is a difference between the question of the "type of commodity traded and basis for trade, in the sense of what gets trade started". He believes that "vent for surplus explains better the original basis for trade, while comparative cost theory explains the type of commodity traded. It is, therefore, widely believed among economist that in addition to the static gains from trade, there are dynamic gains too.

Furthermore, another theory of trade called the Staple Theory of Growth was propounded by Meier (1984). The theory postulates that if a staple economy discovers a primary product, production of which it has comparative advantage and which enjoys rising demand, then it can stimulate overall economic growth. It is believed that the export commodity discovered will provide the leading sector as enunciated in Rostow's growth process (Meier, 1984). This export commodity will have economy-wide impact as previously idle resources are brought into use, and underemployment and unemployment are reduced, increased rate of domestic saving and investment is induced, factor inputs are imported and linkages are established with other sectors.

General Price Determination

In economics and business, price is defined as the assigned numerical monetary value of a good, service or asset. According to Lipsey and Chrystal (1999), the concept of price is central to microeconomics and it is one of the most important variables in resource allocation theory. The price of a good is determined on the basis of the demand for that good and the available supply of that good. In

the case of cocoa, the price of cocoa beans changes according to the market perception of supply (i.e. how many cocoa beans the market believes are harvested) and demand (i.e. how many are needed by manufacturers of cocoa products).

In general terms, price is determined through the interaction of the broad forces of demand and supply, as illustrated in Figure 2. The forces of demand (DD) and supply (SS) interact to determine a unique price (OP) and quantity (OQ) for a given commodity.

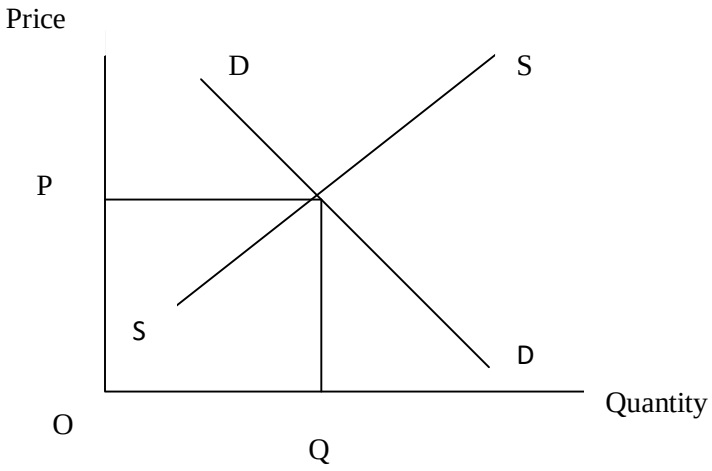


Figure 2: Equilibrium Market Price Determination
Source: Author's own construction

The price system has two important functions. It rations scarce output among competing users; and prices also determine how productive resources are allocated Lipsey and Harbury (1992). Rationing of goods and services occurs because of scarcity. According to Lipsey and Chrystal (1999), rationing operates to differentiate between those "willing and able to buy from those who are able and are no longer willing to buy.

However, this theory is not directly applicable to our study because of the regulated nature of cocoa domestic price determination. The PPRC determines a fixed domestic price of cocoa, and this is mainly to shield farmers against world price volatility. Therefore, producer price is not freely determined in the market through operations of demand and supply but controlled.

Theory of Price Control

Price control refers to the various regulations put forward by government to control the domestic prices of particular goods in a country. According to Krugman (2008), it is a market-oriented law and policy whose main aim is to surpass the main machination of the market. There are two ways in which price control is done. Firstly, it is done through reduction of prices of commodities in order to make the buyers with lower reservation price have access to the commodities. This type is referred to as price ceiling, and it is set below the price that would prevail if the market was left unregulated. Secondly, it is also done by increasing the buying price of other commodities in order for the sellers to get the most from their commodities. This type is referred to as price floor, it sets the lowest legal price that a good can be sold at and prevents governments from setting prices too low.

Minot (2010) states that, the main aim of price control is to supersede the market rule of supply and demand mostly for political or social-economic reasons. Nicolas Minot, starts by defining competition law as; "Law passed by the government which dictates a price for a good or service and adds that, price control is therefore a way in which government decides how much companies should sell

their goods or buy them. Hence in both instances it is the direct way of controlling prices without following the market rules of demand and supply. According to Minot, unlike Krugman, there are different types of price control. He does not limit himself to the two that Krugman stated but he goes further to provide other types of price controls that include: Ceiling prices (upper limit), Floor prices (lower limit), Price band (upper and lower limit) and Fixed price. Minot further adds that each of the price control types is created in a different way and has a different method of implementation, indicating that price controls is a wide topic that encompasses every activity or action whose main intention is to deal with the issue of price without depending on competitive conduct in the market such as supply and demand.

According to Minot, the different ways of enforcing price control include the following: First, he indicates that, price control can be enforced through legal enforcement (e.g. fines). He adds that this is the main traditionally recognized way of effecting price control regimes, and in this form, the government set prices and expects everyone to abide by them, failure to which, sanctions are meted to the offender of the law. Secondly, price control can be implemented through government purchases and sales (buffer stock). Through this the government takes an active role in mitigating effects of price controls by cushioning the market from price controls regime. When the government starts to implement price control legislations and policies, certain negative effects tend to accrue in the market. Hence, the government participates in the market to mitigate this.

This theory of price floor is applicable in this study, as the government, through COCOBOD and the Producer Price Preview Committee set the producer price at which all purchases of the cocoa beans from the farmers should be traded. This is done to protect farmers against lower producer prices from the LBCs. By this fixed price, LBCs are unable to purchase the cocoa beans from farmers at a price lower than the fixed price. As a result of this mechanism, the producer price movements become unrelated to the world price movement and therefore protects the income of the farmers.

Empirical Literature

This section reviews some of the empirical works done on the effects of price-incentive to smuggle on cocoa beans export and the effects of exchange rate on the producer price of cocoa (which causes the incentive to smuggle). To provide a clearer view of various suggestion by various researchers, literature is first reviewed on the effects of price-incentive to smuggle on cocoa export, followed by literature on effects of exchange on producer price and finally, literature on determinants of cocoa export.

First, Bulir (1998), studied "the price incentive to smuggle and cocoa supply in Ghana" with data from 1950 to 1996. The study used a cointegration and a dynamic error-correction model of cocoa supply for the analysis. Findings from the study showed that smuggling, stimulated by the Ghana-Cote d'Ivoire price differential, played an important role in explaining the decline in Ghana cocoa export supply.

In a similar study, Akiyama and Duncan (1982) regressed cocoa output on real prices (both in first-order differences) and a rainfall variable to show how price-incentive to smuggle impacts cocoa supply. The estimation equation included three variables lagged one year: cocoa output, real producer prices, and the Ghana-Cote d'Ivoire price differential (all in level). Results from estimation showed that both short-run and long-run domestic producer price elasticities were low and statistically insignificant. But however, the results showed the strong impact of price development in Cote d'Ivoire: raising the price differential by one percent lowered the Ghanaian supply of cocoa by one-quarter of a percent. The findings showed that, fluctuations in the official sales of cocoa to COCOBOD/Ghana might be as a result of smuggling rather than changes in cocoa output growth.

Further, Fosu (1992), in his study on "Real Exchange Rate and Agricultural Export in Ghana", estimated the elasticity of Ghana's cocoa export with respect to the Ghana-Cote d'Ivoire price differential (that is, price-incentive to smuggle). He found that cocoa smuggling to Côte d'Ivoire tends to exert a negative effect on the volume of Ghana's cocoa exports. Therefore, a 10 per cent increase in the cedi value of the Côte d'Ivoire cocoa producer price relative to the corresponding price in Ghana resulted in a 1.7 per cent decline in the volume of Ghana's cocoa exports.

In addition, May (1985), in estimating the regional motivation to smuggle cocoa to neighboring countries, found that as much as 50 percent of the crop in some regions were smuggled either to Cote d'Ivoire or to Togo. As a result, he found that virtually all new cocoa plantings in Ghana in the 1970s and 1980s were

made in areas adjacent to Cote d'Ivoire and Togo in order to minimize the cost of transporting smuggled cocoa.

In the above studies on Price-Incentive to smuggle and cocoa supply, there could be a measurement problem. Price-Incentive to smuggle was derived by the ratio of the cedi value of Cocoa Producer Price in Cote d'Ivoire to the cedi value of Cocoa Producer Price in Ghana. This measurement presupposed that values equal to or less than one were all captured as incentive to smuggle, which in actual sense are disincentive to smuggle since they imply that, either the Cedi value of Cocoa Producer Price in Cote d'Ivoire is equal to that of Ghana or even lesser to that of Ghana respectively. This study therefore develops on this measurement with a more specific one.

Transmission of World Price to Domestic Prices

In a study by Akiyama and Duncan (1982) on "Analysis of World Cocoa Market" conducted for various countries selecting periods between 1960 and 1978, findings showed that, among other estimations, although producer price is dependent on world prices, different exchange rate regimes and inflationary rates in the various countries yielded different real producer prices which invariably affect production. They also recognized the influential role government plays in the behavior of domestic price of cocoa and concluded that the declining production of cocoa in Ghana and Nigeria in the 1960s and 1970s appeared to have been the result of declining real producer prices.

Similarly, Baffes and Gardner (2003) in their research of price transmission, where they used the error correction model to estimate the responsiveness of the domestic prices to fluctuations on the world market for 10 commodities, found out that those changes in the world price accounted for only a small share of variation in domestic prices. Also, structural essence of structural breaks (SAP) were incorporated into their research and concluded that structural changes (reforms) in most countries had a limited effect on price transmission. Precisely, in Ghana, they found that before reforms, cocoa indicated no sign of long run integration as both adjustment and short-run effect were not significantly different from zero. The cointegration parameter for cocoa from the logarithmic regression in levels, however, was 0.40 and highly significant, with both stationarity statistics well below 3.00 implying that there was some co-movement with a long run transmission elasticity well below unity. But after policy reforms which he pecked at 1983, the 3-year adjustment of domestic to international price increased from 0 to 39% indicating a long run integration.

Further, Mundlak and Larson (1992) investigated the relationship between world price and domestic price of agricultural product. A simple logarithmic specification of the relationship between internal and world market prices and the exchange rates was used to estimate the price transmission elasticities for 58 countries with data spanning from 1968 to 1978. In the study, domestic prices were regressed on world prices, considering the possible effects of exchange rate and inflation. Findings from the study showed almost perfect price transmission, that

is, most of the variations in world prices were transmitted to domestic prices and that they constituted the dominant component in the variations of domestic prices.

Hazell et. al. (1990) also examined whether the volatility in the world market prices were passed through to producer prices in developing countries. The study sort to investigate whether price instability has increased over time and whether fluctuations in domestic markets followed the variability of the world prices. Findings from the study showed that world market prices indeed grew more volatile over time, but that price variation was explained more by declining average prices than by absolute variability. Also, results showed that fluctuations in world market prices were in general transmitted to countries' export unit values, but not to producer prices, since the real exchange rates and government intervention in agriculture played a buffering role. However, in the case of coffee, the results showed high correlation between producer prices and export prices, but as with other commodities there was no evidence of greater integration between domestic and export prices.

A study by Morriset (1998) on the gap between world price and domestic commodity prices for major markets for industrial countries for the period of 1975 to 1994 showed that, upward movements in world prices were clearly passed on to domestic prices but the declines in world commodity prices were not transmitted or were transmitted imperfectly to domestic consumer price. The study further added that, such asymmetry does not seem to be caused by changes in trade and tax policies or factors such as transport, processing and market cost.

The above studies clearly show inconsistent results. As studies by Coleman, Akiyama and Varangis (1993) and Mundlak and Larson (1992) found almost a perfect transmission of world prices to domestic prices, the study by Baffes and Gardner (2003) only found a small transmission of the variations in the world price to domestic prices. However, Hazell et. al. (1990) found that world price variations are not transmitted to producer prices whilst Morriset (1998) found a transmission to domestic price only when world price increases but no transmission when world price declines. The differences in the transmissions, will result in different producer prices in different countries. This therefore necessitates the study on how the world price also creates the incentive for cocoa farmers to smuggle.

Determinants of Cocoa Exports

Boansi (2013) examined competitiveness and determinants of cocoa exports from Ghana. The Revealed Comparative Advantage, Revealed Symmetric Comparative Advantage and multiple regression were employed as analytical tools using secondary data from 1964 to 1969, 1983 to 1992 and 2000 to 2010. The results showed a statistically significant relationship between export of cocoa beans and lagged output, depreciation in value of the domestic currency, real producer price and real-world price to real producer price ratio of cocoa. The findings however showed a statistically negative relationship between export of cocoa beans and increases in real producer price of cocoa for Côte d'Ivoire, lagged domestic consumption and lagged export of cocoa beans.

In a similar study, Verter (2014), investigated the drivers of cocoa export from Ghana in the era of free trade, using an annual secondary data from 1989 to 2011. Using Johansen cointegration and ordinary least squares regression (OLS) approaches for the estimation, he finds that cocoa output, aggregate world cocoa export and trade openness have a robust positive effect on cocoa export from Ghana. The findings indicated a weak relationship between the world price and export. Conversely, the results showed an inverse relationship between domestic cocoa consumption and cocoa export in the country.

Abdulai and Rieder (1995) investigated the determinants of the cocoa supply in Ghana using error correction model. They found out that cocoa supply was significantly related with the real producer price of cocoa, the supply of finished goods and the real exchange rate in the country. More so, their results showed that the supply of cocoa was inelastic both in the short and long runs.

Abolagba et al. (2010); Ndubuto et al (2010) attempted to explore factors affecting the export of cocoa from Nigeria. They found out that Nigeria has high comparative advantage in the exportation of cocoa and as such was highly competitive. More so, Nigerian cocoa production (output) was positively associated with exports.

From the above studies on the determinants of cocoa export, there could be the problem of simultaneity and multicollinearity. This is as a result of the inclusion of both real exchange rate and producer price as separate explanatory variable. It is to be noted that, in Ghana, the exchange rate of the domestic currency does not affect Ghana's cocoa beans export directly; it affects the export through its effect

on the producer price as confirmed by Fosu (1992) in his study of "Real exchange Rate and Ghana's Agricultural Export. Therefore, including both real producer price and exchange rate as separate explanatory variables in the export equation could lead to the problem of simultaneity and multicollinearity.

Conclusion

This chapter reviewed relevant literature on the History of the Ghanaian Cocoa Sector, Ghana Cocoa Marketing and some Structural Reforms and Exchange Rate Development in Ghana, and further reviewed literature on both theoretical and empirical works on the relationship between exchange rate, price incentive to smuggle and cocoa export.

From the studies on Price-Incentive to Smuggle and Cocoa Export, there could be a measurement problem which this study seeks to develop and get a more appropriate measurement for the price-incentive to smuggle.

Also, studies on the determinants of cocoa export brought to bare a lot of variables which this study will adopt, however, the inclusion of both real producer price of cocoa and exchange rate as two separate variables in the export equation could result in a problem of simultaneity and multicollinearity. This study therefore develops on that by using only the real producer price in the export equation and estimating the real exchange rate on the producer price ratios (price-incentive to smuggle).

Furthermore, studies on the transmission of world price to domestic prices of goods have brought to bare the inconsistency in their findings. As some studies

found a complete transmission of world prices to domestic prices, others found a less responsive transmission while others observed a no transmission. This clearly shows inconsistency and believe this could be as a result of interventions of government to protect the income of farmers against world price variations. The study therefore finds out how the world price movement creates the price-incentive to smuggle.

CHAPTER THREE

RESEARCH METHODS

Introduction

This chapter presents the econometric framework employed to test the effects of exchange rate on the price-incentive to smuggle and price-incentive to smuggle on cocoa beans export in Ghana. It discusses the methods and tools of analysis employed in this study. Specifically, the first section captures the theoretical/Conceptual Frame work and empirical specification of the models that were used in the study. The second section captures the description and measurement of the variables. The third section provides the sources and description of data. Finally, section four provides a detailed description of the estimation techniques used for the analysis.

Theoretical Model Specification of Price-Incentive to Smuggle

To derive the theoretical framework for the price-incentive to smuggle, the study follows Bulir (2002) to define price-incentive to smuggle as the ratio of Cote d'Ivoire cocoa producer price to Ghana producer price.

The basic theoretical foundation and structure of econometric model for the price-incentive to smuggle used in this study was adopted from Fosu (1992) in his study of real exchange rate and Ghana's agricultural export. This framework models the relationship between exchange rate and the producer price of cocoa to domestic aggregate non-tradable goods price (P_{cc}/P_N) as follows:

According to Fosu (1992), exportable goods have their prices directly linked to corresponding foreign prices. In addition, the study considers a good j as a non-tradable or home good, exportable good, or importable good depending on whether Gj = 0, Gj < 0, or 0 < Gj ≤ 1, respectively, given that Gj is defined as Gj = (Cj - Qj)/Cj where Cj = Qj + Mj - Xj with C, Q, M, and X respectively denoting consumption, production, imports and exports.

The relationship between domestic prices and foreign prices of exportable (P_{iXf}) and importables (P_{iMf}) can be represented as

$$P_{iX} = E.P_{iX,f}(1 - T_{iX}), \text{ i = A, N} \quad (1)$$

$$P_{iM} = E.P_{iM,f}(1 - T_{iM}), \text{ i = A, N} \quad (2)$$

where E is the nominal exchange rate, T_{iX} denotes implicit export tax, and T_{iM} denotes implicit import tariff.

We then represent the aggregate agricultural price as a Cobb-Douglas aggregation of the agricultural export price (P_{AX}), the agricultural imports price (P_{AM}), and the agricultural non-tradable or home goods price (P_{AH}):

$$P_A = P_{AX}^{\emptyset AH} . P_{AM}^{\emptyset AM} . P_{AH}^{1-\emptyset AX-\emptyset AM} \quad (3)$$

where $\emptyset_{AX}$ denotes the geometric weight of P_{AX} in P_A ($0 \leq \emptyset_{AX} \leq 1$), and so on.

The analogue of equation (3) for non-agricultural price (P_N) can be written as (4);

$$P_N = P_{NX}^{\emptyset NM} . P_{NM}^{\emptyset NM} . P_{NH}^{1-\emptyset AX-\emptyset AM} \quad (4)$$

Similarly, the aggregate home-goods price (P_H) can be written as

$$P_H = P_{AH}^{\emptyset AH} . P_{NH}^{1-\emptyset AH} \quad (5)$$

Substitute (1) and (2) given that i=A into (3) gives

$$P_A = [E.P_{AX,f}(1 - T_{AX})]^{\emptyset AX}\ [E.P_{AM,f}(1 + T_{AM})]^{\emptyset AM}\ .P_{AH}^{1-\emptyset AX-\emptyset AM} \quad (6)$$

But, by definition, the real exchange rate R as indicated is given by

$$R = E.P_f\ .P_H^{-1} \quad (7)$$

Where, P_f denotes the aggregate foreign price of Ghana's trading partners. Upon the appropriate rearrangement of the real exchange equation, we can write (8)

$$E = R.P_H\ .P_f^{-1} \quad (8)$$

Substitute (5) into (8) gives

$$E = R.P_{AH}^{1-\emptyset AH}\ .P_f^{-1} \quad (9)$$

Substituting (9) into (6) gives

$$P_A = [R.P_{AH}^{\emptyset AH}\ .P_{NH}^{1-\emptyset AH}.(P_{AX,f}).(1 - T_{AX})]^{\emptyset AX} \times$$

$$[R.P_{AH}^{\emptyset AH}\ .P_{NH}^{1-\emptyset AH}\ .\left(\frac{P_{AM,f}}{P_f}\right).(1 + T_{AM})]^{\emptyset AM}\ .P_{AH}^{1-\emptyset AX-\emptyset AM} \quad (10)$$

Similarly, substituting (1) and (2) given that i = N into (4) and further substituting (9) into the result gives

$$P_N = [R.P_{AH}^{\emptyset AH}\ .P_{NH}^{1-\emptyset-AH}\ .\left(\frac{P_{NX,f}}{P_f}\right).(1 - T_{NX})]^{\emptyset NX} \times$$

$$[R.P_{AH}^{\emptyset AH}\ .P_{NH}^{1-\emptyset-AH}\ .\left(\frac{P_{NM,f}}{P_f}\right).(1 + T_{NM})]^{\emptyset NM}\ .P_{NH}^{1-\emptyset NX-\emptyset NM} \quad (11)$$

In order to derive the relationship between the cocoa producer price-to-non-agricultural price ratio (P_{CC}/P_N) and the real exchange rate, we disaggregate the agricultural export price into cocoa (P_{CC}) and non-cocoa (P_{ncc}) components with

shares b_{cc} and $(1 - b_{cc})$ respectively $(0 < b_{cc} \leq 1)$. Suppose price aggregation is of the Cobb-Douglas form, then we can write

$$P_{cc} = P_{AX}^{b_{cc}^{-1}} . P_{ncc}^{-(1-b_{cc})b_{cc}^{-1}} \tag{12}$$

Substituting for $P_{AX}\ and\ P_{ncc}$ gives

$$P_{cc} = [R.P_{AH}^{\emptyset AH} . P_{NH}^{1-\emptyset AH} . (\frac{P_{AX,f}}{P_f})(1 - T_{AX})]^{b_{cc}^{-1}}$$

$$\times [R . P_{AH}^{\emptyset AH} . P_{NH}^{1-\emptyset AH} . (\frac{P_{ncc,f}}{P_F})(1 - T_{cc})]^{-(-b_{cc})b_{cc}^{-1}} \tag{13}$$

Dividing (13) by (11) and taking the natural logarithms of the result gives (14)

$$\ln\left(\frac{P_{cc}}{P_N}\right) = (1 - \emptyset_{NX} - \emptyset_{NM})\ lnR + b_{cc}^{-1} ln(1 - T_{AX})$$

$$+ (b_{cc} - 1)\ b_{cc}^{-1} \ln(1 - T_{ncc}) + b_{cc}^{-1} \ln\left(\frac{P_{AX,f}}{P_f}\right)$$

$$+ (b_{cc} - 1) b_{cc}^{-1} \ln\left(P_{ncc,f} . P_f\right) - \emptyset_{NX} \ln\left(\frac{P_{NX,f}}{P_f}\right)$$

$$- \emptyset_{NM} \ln(1 + T_{NM}) + \emptyset_{AH}\ (1 - \emptyset_{NX} - \emptyset_{NM}) lnP_{AH}$$

$$- \emptyset_{AH}\ (1 - \emptyset_{NX} - \emptyset_{NM}) lnP_{NH} \tag{14}$$

Equation (14) explains the natural logarithm of (P_{cc}/P_N) in terms of the real exchange rate, implicit agricultural export tax, implicit agricultural imports tarrifs, inter alia. The maginal elasticity of (P_{cc}/P_N) with respect to the real exchange rate is equal to $(1 - \emptyset_{NX} - \emptyset_{NM})$.

Empirical Model Specification for Price-Incentive to Smuggle

To achieve the first objective of investigating the effect of exchange rate on the price-incentive to smuggle (which is a ratio of the Cote d'Ivoire producer price of cocoa to Ghana producer price of cocoa), and for reasons of data availability, the econometric function which is analogous to equation (14) is estimated as follows

$$SMUG_t = \alpha_0 + \alpha_1 lnREER_t + \alpha_2(TAX_t) + \alpha_3 lnWPCOC_t + \alpha_4 lnWCOCX_t + \mu_t \quad (15)$$

Where

$SMUG_t$ represents the price-incentive to smuggle in time t

$lnREER_t$ represents real effective exchange rate in time t

TAX_t represents the implicit cocoa beans export tax in time t

$lnWPCOC_t$ represents world price of cocoa in time t

$lnWCOCX_t$ represents world cocoa export in time t

The coefficients parameters are a_1, a_2, a_3, a_4 and a_1, a_3, a_4 represent the elasticities of the respective variables and a_0 represents the drift components. t also denotes time. The following are the a-priori expectation of the variables in the model.

$\alpha_1 < 0, \alpha_2 > 0, \alpha_3 >< 0, \alpha_4 >< 0$

Conceptual Framework for Cocoa Beans Export

The study is founded on simple micro-economic theory of demand and supply where the researcher assumed a perfect competitive international market,

hence every primary commodity producer country like Ghana is a price-taker and unable to influence world price of cocoa. In other words, product differentiation is insignificant. The Small Country assumption by which export supply is assumed to equal actual volume of export is therefore implied. The study further considers that exporters are not usually the same as the producers. The farmers who produce the bulk of the export commodities do not participate in the international trade because of its complexity. It is assumed that these farmers are rational economic agents, hence, they usually refer to the producer prices to determine their supply. Their rational behavior also compels them to compare the price in neighboring countries relative to their domestic prices. They have the decision to sell in either domestically to LBCs or smuggling to neighboring countries. Thus, the incentive to sell is not just determined by the absolute producer prices but also by the relative prices in neighboring countries.

Empirical Model Specification for Cocoa Beans Export

Based on the conceptual framework, the study then follows Fosu (1992) to specifies the cocoa beans export function which depends, among other variables, on the price-incentive to smuggle as follows:

$$lnCOCBX_t = \beta_0 + \beta_1 lnCOCY_t + \beta_2 lnDC_t + \beta_3 SMUG_t + \beta_4 \ln RPP_t + \mathcal{E}_t \quad (16)$$

Where

$lnCOCBX_t$ represents volume of cocoa beans export in time t

$lnCOCY_t$ represents quantity of cocoa beans output in time t

$lnDC_t$ represents domestic consumption in time t

$SMUG_t$ represents the price-incentive to smuggle in time t

$lnRPP_t$ represent real producer price in time t

$\mathcal{E}_t$ and $\mathcal{U}_t$ represents the error terms. This is assumed to be normally distributed with zero mean and constant variance and also captures all other explanatory variables which influence cocoa beans exports but not captured in the model.

The coefficients parameters are $\beta_1, \beta_2, \beta_3, \beta_4$ and $\beta_1, \beta_2, \beta_4$ represent the elasticities of the respective variables and β_0 represents the drift components. t also denotes time

The following are the a-priori expectation of the variables in equation (16). $\beta_1 > 0, \beta_2 < 0, \beta_3 < 0, \beta_4 > 0$.

Justification, Measurements and A-Priori Expectations of Variables

Price-Incentive to Smuggle ($SMUG_t$)

This variable appears as a dependent variable in equation (15) and as an explanatory variable in equation (16). It represents the ratio of the cedi value of Ivorian cocoa producer price to the cedi value of the Ghanaian cocoa producer price. The Cote d'Ivoire producer price in dollars is converted to cedis using the cedi to dollar exchange rate. When the ratio is equal to or less than 1, there is no incentive to smuggle, implying that, either the cedi value of producer price in Cote d'Ivoire is equal to that of Ghana or even smaller than that of Ghana respectively. Therefore, the actual incentive to smuggle is obtained by subtracting one from the

ratio and equating all negative values to zero (disincentive to smuggle). The price-incentive to smuggle measures the rate of return of cocoa smuggled to Cote d'Ivoire compared with that of cocoa sold domestically Bulir (2002). Closing the wedge between the producer prices should increase domestic cocoa export supply which will lead to an increase in export. In equation 16, it must be recognized that, when the cedi value of the Ivorian cocoa producer price is higher than that of Ghana, an incentive is created for smuggling and this reduces the volume of Ghana cocoa beans export. Therefore, in equation 16, the price incentive to smuggle is expected to have a negative effect on cocoa beans export. Hence $\beta_3 < 0$. The inclusion of this variable in the export equation is in consonance with Akiyama and Duncan (1982), Bulir (1998) and Fosu (1992). Data on both Ghanaian and Ivorian producer prices were obtained from agricultural production database of the Food and Agricultural Organisation (FAOSTAT), and the price-incentive to smuggle was generated by author.

Real Effective Exchange Rate ($REER_t$)

The real effective exchange rate enters the model as a determinant of the price-incentive to smuggle. It is worthy to note that the exchange rate directly influences the price-incentive to smuggle, and therefore, its inclusion in the equation is in consonance with Fosu (1992) in his study of the real exchange rate and Ghana's agricultural export. Real exchange rate (RER) corresponds to the multilateral real effective exchange rate or trade weighted real exchange rate. Real effective exchange rate is the nominal effective exchange rate which is a measure

of the value of a currency against the weighted average of several foreign currencies divided by a price deflator or index of cost. With respect to Ghana, it was weighted against the currencies of the major trading partners which include United Kingdom, United State, Germany and Netherlands.

The real effective exchange rate (REER) using geometric mean (GM) method of averaging can be the product of the nominal effective exchange rate and the effective relative price indices, following (Hinkle & Nsengiyumva, 1999).

$$REER = \frac{NEER_{jit} * P_{gft}}{P_{gdt}} \qquad (17)$$

Where $NEER_{jit}$ $\prod_{i=1}^{k} E_{dt}$, defined as the index of nominal exchange rate (period average rates) in units of domestic currency per unit of foreign currency for home country J. P_{gft} and P_{gdt} are the foreign price index (using WPI as a proxy) and the domestic price index (using CPI as a proxy) respectively, with W_{it} as the appropriate weights for each country and denotes the product of the variables. Also P_{gft} =$\prod_{i=1}^{k} P_{gft}$, where EP_{gft} is the GM weighted average (or effective) foreign price index at time t, and P_{gft} is the WPI of trading partner at the time t, with all other notation as defined. The trading partner's weights are defined to allow for time variation in the weights and so that weight sum to unity.

It is worthy to note that the REER enters the model as a policy variable. A decrease in the index of the real effective exchange rate implies an appreciation (depreciation of local currency) whiles a rise implies a depreciation (appreciation of local currency). An increase of the real effective exchange rate, which implies an appreciation of the local currency, is expected to result in a decrease in the cedi value of the Ivorian cocoa producer price of cocoa over the Ghanaian producer price

of cocoa. Hence a decrease in the price-incentive to smuggle. The REER is therefore expected to be negatively related to price incentive to smuggle $\alpha_1 < 0$. Data on REER was gathered from the world development indicators.

Implicit Export Tax (TAX_t)

According to Fosu (1992), cocoa has traditionally been taxed by the government, collecting the difference between the expected international price and the cost of marketing the crop, which consist primarily of payments to farmers and the COCOBOD's operating expenses. He further indicates that, agricultural export producers smuggle their output to neighboring border countries or under-report the volume of their exports in order to avoid taxation, price controls, and the effects of domestic currency overvaluation. Also, Bulir (2002) explains that, the distortionary effect of domestic taxes in Ghana widened the gap between the Cote d'Ivoire and Ghanaian domestic prices, and ultimately creates incentives to smuggle Ghana cocoa to the Cote d'Ivoire. Therefore, a positive relationship is expected between implicit tax and price-incentive to smuggle. That is, an increase in implicit tax leads to an increase in the price-incentive to smuggle. Hence $\alpha_2 > 0$. Data on implicit tax was obtained from equation 1 through calculations by the author.

World Price of Cocoa (WPCOC)

The world price of cocoa enters the model as one of the determinants of the price-incentive to smuggle. The world price is the expectation of the local cocoa producer prices. It is worth noting that, Ghanaian and Cote d'Ivoire cocoa farmers

are shielded against world price volatility by the government through the use of a price stabilization system and CCC (Conseil du CaféCacao) in the two countries respectively. Marketing of the cocoa beans in Cote d'Ivoire prior to their structural reform in 2012, was done on spot basis throughout the harvest period, with prices determined nearly exclusively by variations in international cocoa prices (World Bank, 2011). Therefore, whenever international cocoa price increased or decreased throughout the harvesting season, a gap in price was created between the producer prices in these two countries. That is, when the world price increased, the producer price in Cote d'Ivoire exceeded COCOBOD's fixed price and vice versa which increased the incentive to smuggle.

However, as a result of the structural reform in 2012, producer prices in Cote d'Ivoire are fixed by CCC (Conseil du Café Cacao), as it is also fixed by PPRC in Ghana. Even though a positive relationship has been found between world price and producer price of cocoa by Mundlak and Larson (1992) and Coleman, Akiyama and Varangis (1993) in Ghana and Nigeria. The relationship between world price and price-incentive to smuggle depends on the percentage of the world price that goes to producers as producer prices in Cote d'Ivoire and Ghana. Therefore, the relationship between world price and price-incentive to smuggle is indeterminate, since it can go either way. Hence $\alpha_3 >< 0$ is expected. The variable is converted to Ghana cedi per metric tonne. Data on world price of cocoa was obtained from Federal Reserve Economic Data (FRED).

World Cocoa Export (WCOCX)

According to the annual report from the International Cocoa Organisation (2012), there was a 25% decrease in the world price of cocoa as a result of an increase in production mainly from Ghana and Cote d'Ivoire with 48% growth in the sector over the years. In economic theory, an increase in supply leads to a fall in price. Therefore, the degree of transmission of the world price to the producer price in Cote d'Ivoire and Ghana will determine the expected sign of this variable. When a high percentage of the world price is transmitted to the producer price in Cote d'Ivoire than the producer price in Ghana, then the world export will be expected to be positively related to price-incentive to smuggle and when the transmission is higher in Ghana than Cote d'Ivoire, then world export is expected to be negatively related to price-incentive to smuggle. Hence the relationship between world cocoa export and price-incentive to smuggle is indeterminate, since it can go either way. Hence $\alpha_4 <> 0$.

Cocoa Beans Exports (COCBX)

Cocoa beans export is a dependent variable in this study and constitutes the total quantity of cocoa beans exported from Ghana to Ghana's cocoa trading countries. Ghana is a major cocoa exporting country with about 80% of all cocoa exports of the country being in the raw form. This variable is measured in tonnes. Data on cocoa beans export was gathered from the agricultural production database of the Food and Agricultural Organisation (FAOSTAT). The variable is logged to reduce skewness and to make the coefficient elasticities.

Cocoa Output (COCY)

Cocoa output influences the amount of cocoa beans exported. It represents the total tonnes of cocoa beans harvested and sold to the Licensed Marketing Companies by the farmers, who also sell to the Cocoa Marketing Company of COCOBOD for export. The inclusion of this variable in the equation is in consonance with the finding of Abolagba et al. (2010) and Boansi (2013), who found a positive relationship between cocoa export and cocoa bean production in Nigeria and Ghana**.** This variable is measured in tonnes and expected to have a positive relationship with cocoa export, i.e., $\beta_1 > 0$

Domestic Consumption (DC)

This refers to the quantity of the cocoa beans consumed domestically, mostly by quantity sold to domestic processors. A huge domestic demand for cocoa products will lead to a high demand for cocoa beans by these processing companies which decreases cocoa beans export. In the works of Ball (1996) on "The relationship between UK export performance in manufacturers and the internal pressure of demand", he found that with a relatively high level of domestic demand, the quantity of resources devoted to export is lower, adding that, at lower domestic demand, the surplus production leads to increased export volume. Therefore, as long as domestic demand of the cocoa beans increases, by virtues of "pulling effect", cocoa exports will reduce. Also, the study by Boansi (2013) on Competitiveness and determinants of cocoa exports from Ghana, found a statistically negative relationship between domestic demand and cocoa beans

export. Further, in a study by Verter (2014) on the drivers of cocoa export from Ghana, domestic consumption was found to have a statistically negative relationship with cocoa export. Hence $\beta_2 < 0$ is expected for cocoa beans exports. This variable is measured in tonnes of cocoa beans.

Real Producer Price of Cocoa (RPP)

The producer price of cocoa refers to the fixed amount set by PPRC, at which the Licensed Buying Companies (LBC) buy cocoa beans from the farmers. It is added to the model as one of the determinants of cocoa exports, and this is in consonance with the study by Abdulai and Rieder (1995) on the determinants of the cocoa supply in Ghana, using error correction model. They found that cocoa supply was significantly related with the real producer price of cocoa. That is, increases in the real farm gate price of cocoa served as an incentive for farmers to sell their produce to domestic licensed buyers rather than smuggle them into neighbouring countries with higher prices on the black market. Also, increases in real producer price of cocoa enables farmers to invest appropriately in their fields in anticipation for better and sustainable outputs in the coming years. This make real producer price of cocoa a crucial determinant of cocoa export. In addition, the study by Verter (2014) on the drivers of cocoa export from Ghana found a statistically significant positive relationship between cocoa export and real producer price of cocoa. Hence $b_4 > 0$. Data on nominal producer price of cocoa was gathered from FAOSTAT and deflated with consumer price index (CPI) sourced from the world development indicators with 2010=100 as the base year. It

is measured in GHC per tonne. The variable is as well logged to reduce skewness and to further enhance interpretation.

Sources and Description of Data

The study employed annual secondary data for the period 1986 to 2016. The data used for the study were cocoa beans export and price-incentive to smuggle as the dependent variables while the explanatory variables were real effective exchage rate, implicit export tax, world cocoa export, world price of cocoa, cocoa output,domestic consumption and real producer price of cocoa. Data on cocoa were obtained from Food and Agriculture Organization (FAO) of the United Nations and the State of the Ghanaian Economy published by the Institute of Statistical, Social and Economic Research (ISSER). Real effective exchange was obtained from World Bank,2016.

Estimation Techniques

In order to achieve the objectives of estimating the effects of exchange rate on price-incentive to smuggle and price-incentive to smuggle on cocoa beans export in Ghana, the study employed the Linear Autoregressive Distributed Lag (ARDL) estimation method, developed by Pesaran et al. (2001). The estimation procedure therefore involved the following steps: First, the study assessed the stationarity of the variable for the study using the Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests. Secondly, the study tested for cointegration using the

bounds test of Pesaran et al (2001) and then estimated the long run and short run equations using ARDL.

Stationarity Test (Unit Root Test)

Before starting the estimation, the stationarity of the variables was investigated using the Augmented Dickey-Fuller test (ADF) (1979; 1981) and Phillips-Perron (PP) test (1988). According to Naceur and Ghazouni (2007), many macroeconomic time series contain unit roots, which tend to be dominated by stochastic trends. Therefore, estimating variables with non-stationary properties often lead to spurious regression (Tang, 2006). When this occurs, regression results may show a high and significant relationship among variables when actually they do not exist. Also, according to Stock and Watson (1988), when a non-stationary time series is used in estimating an econometric model, the Ordinary Least Square (OLS) traditional diagnostic statistics for evaluating the validity of the model estimates become highly misleading and unreliable in terms of forecast and policy, that is, coefficient of determination (R-squared,), Fisher's Ratio(F-Statistic), Durbin-Watson (DW-Stat), t-statistic etc. Therefore, to enhance confidence in the results of the estimation, the stationarity property of the variables was needed to be investigated first. A series is therefore said to be non-stationary if the mean, variance, covariance and autocorrelation functions are time dependent, that is, change overtime and this affects the long run development of the series. This therefore leads to the violation of assumptions of constant means and variances of OLS.

It is worthy to also note that, besides ensuring that the variables were stationary, the unit root test was also conducted to ensure that the variables were stationary at most at first difference, that is, they are I (0) and I (1) to justify the use of the ARDL technique. A variable is said to be integrated of order one, or I (1), if it is stationary after differencing once, or of order two, I (2) if stationarity is attained after differencing twice. A variable is however described as being stationary at level or integrated of order zero, that is, I (0) if stationarity was attained without differencing. The ARDL cointegration technique was used in determining the long run relationship between series with different order of integration, that is, I (0) and I (1) only (Pesaran et al. 2001). The model is not applicable in instance when a variable is integrated of order I (2). Therefore, it was imperative for the unit root test to be carried out to avoid ARDL model crash in the presence of integrated stochastic trend of I (2).

There are various methods of testing the stationarity and unit roots of variables. They include; Durbin-Watson (DW) test, Dickey-Fuller test (1979) (DF), Augmented Dickey Fuller (1981) (ADF) test, Philip- Perron (1988) (PP) test, among others. This study adopted the Augmented Dickey-Fuller (ADF) test and Philip- Perron (PP) because they are considered reliable and therefore accepted by many in econometric analysis.

The two selected tests have several similarities but differ in how autocorrelation in the residuals is corrected. The PP non-parametric test simplifies the ADF procedure and allow for less restrictive assumptions for time series in question. The Akaike Information Criterion (AIC) and Schwarz Information

Criterion (SIC) are used for selecting the lag lengths in both the ADF and PP test. The null hypothesis to be tested is that the variable of interest has a unit root against the alternative of stationarity. The ADF is specified as follows

$$\Delta X_t = a + \delta t + \rho X_{t-1} + \sum_{i=1}^{p} \beta_i \Delta X_{t-i} + v_t \qquad (18)$$

Where X_t denotes the time series at time t, Δ is the difference operator, $a, \delta, \rho,$ β, are parameters to be estimated and v is the stochastic random disturbance term with properties of white noise.

Both ADF and PP methodology test hypothesis as follows:

H_0 : series contains unit root (series not stationary)

H_1: series has no unit root (series are stationary).

The series achieves stationarity if null hypothesis is rejected, and this occurs if the ADF and PP statistic are higher (in absolute terms) than the critical values. If stationarity is not achieved at level, the series is then differenced. But if stationarity is not achieved after first difference, differencing continues until stationarity is achieved. But to justify the use of ARDL, variables need to be stationary at levels, that is, I (0) or at most at first difference, that is, I (1).

The PP test is considered as being superior to ADF for the following reasons: First, ADF test do not consider cases of heteroskedasticity and non-normality that are regularly present in the raw data of economic time series variables; Also, ADF is unable to discriminate between stationary and non-stationary series that have a high degree of autocorrelation.

The ARDL Bounds Test Approach to Cointegration

After establishing the time series properties of the variables in the models 15 and 16 above, and having satisfied the criteria that the variables are a mixture of I (0) or I (1), the study further tested for cointegration among the variables of interest. To achieve the objective of estimating the effects of exchange rate on the price- incentive to smuggle and the effect of price-incentive to smuggle on cocoa beans export, the study adopted the ARDL bounds test for cointegration (Pesaran et al., 2001). The general form of the ARDL model used to achieve both the first and second objectives were as follows in equation (19) and (20) respectively:

$$\Delta SMUG_t = c_0 + c_1 SMUG_{t-1} + c_2 lnREER_{t-1} + c_3 (TAX)_{t-1} + c_4 lnWPCOC_{t-1} + c_5 lnWCOCX_{t-1} + \sum_{i=0}^{P} \theta_{1i} \Delta SMUG_{t-i} + \sum_{i=0}^{P} \theta_{2i} \Delta lnREER_{t-i} + \sum_{i=0}^{P} \theta_{3i} \Delta (TAX)_{t-i} + \sum_{i=0}^{P} \theta_{4i} \Delta lnWPCOC_{t-i} + \sum_{i=0}^{P} \theta_{5i} \Delta lnWCOCX_{t-i} + \mathcal{E}_t \quad (19)$$

$$\Delta lnCOCBX_t = \beta_0 + \beta_1 lnCOCBX_{t-1} + \beta_2 lnCOCY_{t-1} + \beta_3 lnDC_{t-1} + \beta_4 SMUG_{t-1} + \beta_5 lnRPP_{t-1} + \sum_{i=0}^{P} \emptyset_{1i} \Delta lnCOCBX_{t-i} + \sum_{i=0}^{P} \emptyset_{2i} \Delta lnCOCY_{t-i} + \sum_{i=0}^{P} \emptyset_{3i} \Delta lnDC_{t-i} + \sum_{i=0}^{P} \emptyset_{4i} \Delta SMUG_{t-i} + \sum_{i=0}^{P} \emptyset_{5i} \Delta lnRPP_{t-i} + \mu_t \quad (20)$$

Where P denotes optimal lags, selection based on the AIC and SIC criteria

Δ denotes the difference operator

i = 0,1, 2, ...

c_0 and β_0 are constants

$c_1 - c_5$ and $\beta_0 - \beta_5$ are the long run parameters

$\theta_1 - \theta_5$ and $\emptyset_1 - \emptyset_5$ are the parameters representing short run dynamic coefficients of the underlying ARDL model

ε_t and $\mathcal{U}_t$ are the white noise error term for the respective models

All other variables remain as defined earlier

The ARDL bound testing approach to cointegration followed a series of three steps to investigate the relationship between an independent variable and its dependent variables.

First, equation (19) and (20) were estimated by the ARDL bound test to test for the existence of long run relationship among the variables by conducting an F-

test for the joint significance of the coefficients of the lagged level variables. The null and alternative hypotheses for this test were as follows:

$H_0 : c_1 = c_2 = c_3 = c_4 = c_5 = 0$ (no long run relationship)

$H_1 : c_1 \neq c_2 \neq c_3 \neq c_4 \neq c_5 \neq 0$ (long run relationship)

The calculated F-statistic was compared with the two sets of critical value bounds for the F-statistic generated by Pesaran, et al. (2001). In this test, if the computed F-statistic fell below the lower bound critical value, we failed to reject the null hypothesis of no long run relationship between variables. Contrary, if the computed F-statistic lied above the upper bound critical value; the null hypothesis was rejected, implying that there was a long-run cointegration relationship amongst the variables in the model. The result however became inconclusive if the calculated F-statistic falls within the bounds.

Secondly, after establishing a long run relationship between the variables, the conditional ARDL long-run model for price-incentive to smuggle (SMUG) and Cocoa Beans Export ($lnCOCBX_t$) was estimated as illustrated in equations 21 and 22 respectively :

$$SMUG_t = c_0 + c_1 SMUGX_{t-1} + c_2 lnREER_{t-1} + c_3 (TAX)_{t-1} + c_4 lnWPCOC_{t-1} + c_5 lnWCOCX_{t-1} + \varepsilon_t \quad (21)$$

$$lnCOCBX_t = \beta_0 + \beta_1 lnCOCBX_{t-1} + \beta_2 lnCOCY_{t-1} + \beta_3 lnDC_{t-1} + \beta_4 SMUG_{t-1} + \beta_5 lnRPP_{t-1} + \mathcal{U}_t \quad (22)$$

Where all variables were as previously defined.

The order of ARDL (p, q) model was attained using the Akaike's Information Criterion (AIC) and Schwarz Information Criterion (SIC).

Finally, after estimating the Long run relationship between the variables, we obtained the short-run dynamic parameters by estimating an error correction model using the ARDL model as specified in equations 23 and 24 for Price-Incentive to Smuggle and Cocoa Beans Export respectively:

$$\Delta SMUG_t = \theta_0 + \sum_{i=0}^{P} \theta_{1i} \Delta SMUG_{t-i} + \sum_{i=0}^{P} \theta_{2i} \Delta lnREER_{t-i} + \sum_{i=0}^{P} \theta_{3i} \Delta(TAX)_{t-i} + \sum_{i=0}^{P} \theta_{4i} \Delta lnWPCOC_{t-i} + \sum_{i=0}^{P} \theta_{5i} \Delta lnWCOCX_{t-i} + \gamma ECT_{t-1} + \mathcal{E}_t \quad (23)$$

$$\Delta lnCOCBX_t = \beta_0 + \sum_{i=0}^{P} \emptyset_{1i} \Delta lnCOCBX_{t-i} + \sum_{i=0}^{P} \emptyset_{2i} \Delta lnCOCY_{t-i} + \sum_{i=0}^{P} \emptyset_{3i} \Delta lnDC_{t-i} + \sum_{i=0}^{P} \emptyset_{4i} \Delta SMUG_{t-i} + \sum_{i=0}^{P} \emptyset_{5i} \Delta lnRPP_{t-i} + \varphi ECT_{t-1} + \mu_t \quad (24)$$

where, γ and φ are the speeds of adjustment parameter and ECT is the error correction term, derived from the estimated equilibrium relationship of Equation (23) and (24) above respectively.

All other variables were as previously defined.

The study adopted the ARDL Bounds Test Approach. The reasons for the selection of this technique were as follows:

First, the ARDL technique avoids the order of integration problems normally associated with other methodologies such as the Johanson Likelihood Methodology. The ARDL is useful irrespective of the stationary properties of the

variables whether the variables are I (0) or I (1) or both. (Pesaran and Pesaran, 1997). Secondly, this technique is strong enough to cater for the sample bias created by other conventional cointegration techniques which becomes only useful in large sample size. The sample bias is catered for since this model is useful in small sample (Pesaran et al., 2001). In this study, the data points are 31 which makes it efficient to use ARDL. Also, in the ARDL model, short-run estimates and long-run estimates are given in a single estimation and this helps in achieving the objective of investigating the effects of exchange rate on price-incentive to smuggle and the effects of the price-incentive to smuggle on cocoa export in Ghana.

Stability Test

The study followed Brown, Durbin and Evans (1975) to employ cumulative sum of recursive residuals (CUSUM) and cumulative sum of squared recursive residuals (CUSUMSQ) tests to assess the stability of the regression equation. This test was important because, a movement of the CUSUM and CUSUMSQ residuals outside the critical lines was an indication that the estimated co-efficient were unstable over the sample period. The null hypothesis tested was that there was no structural break against the alternative hypothesis of the existence of structural break.

Summary and Conclusion

This chapter developed and presented the methodology framework suitable for conducting the study. The model was developed from the theoretical

formulations of micro-economic theory of demand and supply. Annual time series data of cocoa beans export, price-incentive to smuggle, real effective exchange rate, implicit export tax, world cocoa export, world price of cocoa, cocoa output, domestic consumption and real producer price of cocoa., from 1986-2016 using ARDL was employed for the study. Stationary test was conducted using ADF and PP tests to ensure that the variables were not integrated in higher order than one to avoid spurious regression. Cointegration test was done to established long run relationship among variables. ARDL model was employed as estimation technique to analyse how the exchange rate affects the price-incentive to smuggle and how the price-incentive to smuggle affects the cocoa beans export in Ghana.

The study then employed cumulative sum (CUSUM) and cumulative sum of squared (CUSUMSQ) tests to assess the stability of the regression equation.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This chapter presents the empirical findings and discussions of the results of the study. The aim is to examine the effects of exchange rate on price-incentive to smuggle and the effect of the price-incentive to smuggle on cocoa beans exports in Ghana. The first section presents the results of the descriptive statistics of the variables for the study. Secondly, the results of the time series properties of the variables, using the Augmented Dickey Fuller and Phillips-Perron (PP) tests are presented. This is to help examine the stationarity status of the variables for the study. Further, the results of the long run relationship between the variables using the ARDL bound test of cointegration is presented in the third section. Section four presents the short run and long run ARDL for both price-incentive to smuggle and cocoa beans export results.

Descriptive Statistics

The study presents descriptive statistics of all the variables employed. The descriptive statistics include the mean, median, maximum, minimum, standard deviation, skewness, kurtosis, sum, sum squared deviation and number of observations. These statistics are illustrated extensively in Table 3. From Table 3, it can be observed that all the variables have positive average values (mean and median). In addition, the deviation of the variables from their means indicated by the standard deviation shows a relatively high fluctuation among these variables

over the period under consideration. In terms of skewness, it can be observed that all variables are positively skewed with the exception of Tax which is negatively skewed.

The Jarque-Bera statistic which shows the null hypothesis that all the series are drawn from a normally distributed random process cannot be rejected for all variables except Price-Incentive to Smuggle (SMUG), Real Effective Exchange Rate (REER), World Price of Cocoa (WPCOC) and Domestic Consumption (DC). This implies that not all the variables are normally distributed.

Table 3-*Descriptive Statistics*

	SMUG	REER	TAX	WPCOC	WCOCX	COCBX	COCY	DC	RPP
Mean	0.135850	120.7087	0.505392	2215.368	2351579.	412241.2	510418.5	100258.0	1584.930
Median	0.007131	102.8391	0.531679	779.6092	2404384.	348031.0	434200.0	48381.00	1333.800
Maximum	0.775912	257.8657	0.769086	11499.86	3314332.	718600.0	879348.0	349192.0	3571.873
Minimum	0.000000	69.45169	0.231631	18.44023	1557097.	195224.0	188170.0	76.00000	703.1206
Std. Dev.	0.202679	40.69241	0.139613	3199.804	488331.3	178966.6	230044.9	116016.2	788.8219
Skewness	1.977300	1.424339	-0.287964	1.826045	0.128648	0.319718	0.282441	1.089196	0.874438
Kurtosis	6.711778	5.294827	2.338198	5.469655	1.932740	1.494421	1.580763	2.658113	2.756664
Jarque-Bera	37.99587	17.28405	0.994165	25.10607	1.556773	3.456043	3.013881	6.280446	4.027130
Probability	0.000000	0.000177	0.608303	0.000004	0.459146	0.177636	0.221587	0.043273	0.133512
Sum	4.211357	3741.970	15.66717	68676.42	72898952	12779478	15822975	3107999.	49132.84
Sum Sq. Dev.	1.232369	49676.18	0.584757	3.07E+08	7.15E+12	9.61E+11	1.59E+12	4.04E+11	18667201
Observations	31	31	31	31	31	31	31	31	31

Source: Computed by author using EViews 10.0 package

Unit Root Test Results

Before applying the ARDL model to examine the effects of exchange rate on price-incentive to smuggle and the price-incentive to smuggle on cocoa beans export in Ghana, unit root test was conducted on all variables used in the study, using the Augmented Dickey-Fuller (ADF) and the Philips Perron (PP) Test. This was to investigate the stationarity status of the variables and to further make sure none of the variables are stationary at second difference, that is I (2) which is a requirement for the application of the ARDL estimation approach. The Schwartz-Bayesian (SBC) and Akaike Information Criteria (AIC) were used to determine the optimal number of lags included in the test and used the P-values for making the unit root decision. Table 4 presents the results of the unit roots test for all variables for both at levels and at first difference, showing also their corresponding order of integration.

Table 4 - *Unit Root and Stationarity Test (ADF)*

Variable	Augmented Dickey-Fuller Test				
	At Level		At First Difference		
	Constant	Constant & Trend	Constant	Constant & Trend	Order of Cointegration
SMUG	-2.940340*	-3.185493	-6.015047***	-3.960706**	I (0)
LNREER	-2.695437*	-3.307282*	-5.070463***	-5.024083***	I (0)
TAX	-3.080492**	-4.101160**	-5.151567***	-5.084965***	I (0)
LNWPCOC	-2.275813	-2.948808	-4.341551***	-4.665085***	I (1)
LNWCOCX	-2.099788	-1.355582	-6.716634***	-7.367649***	I (1)
LNCOCBX	-1.258102	-3.709839**	-7.747587***	-7.630292***	I (0)
LNCOCY	-0.844292	-4.424255***	-5.838527***	-5.733612***	I (0)
LNDC	-3.304235**	-4.997520**	-1.765911	-1.546126	I (0)
LNRPP	-0.514784	-3.199064	-5.482500***	-5.634883***	I (1)

Source: Computed by author using EViews 10.0 package

Note: ***, **, *, represents significance at 1%, 5% and 10% levels respectively.

From the results of the unit root test in Table 4, it can be observed that the null hypothesis of the presence of unit root can be rejected for $SMUG$, $LNREER$, TAX, $LNCOCX$, $LNCOCY$, $LNDC$, showing these variables are stationary at level while the others are not. However, all the other variables are stationary at first difference. Therefore, the unit root test using the ADF test clearly shows the variables are a mixture of I (0) and I (1), thus providing enough justification for the use of the ARDL estimation technique.

Table 5 which presents unit root test using the Philip Perron Test also presents similar results as presented by the ADF. Variables for the study are all stationary at either level or at first difference. Therefore, results from both tests justify the use of the ARDL estimation technique.

Table 5 - *Unit Root and Stationarity Test (Philip Perron)*

Variable	Philip Perron Test				
	At Level		At First Difference		
	Constant	Constant & Trend	Constant	Constant & Trend	Order of Cointegration
SMUG	-3.012404**	-3.044755	-7.188193***	-7.385206***	I (0)
LNREER	-3.147592**	-3.192008	-6.582626***	-6.998054***	I (0)
TAX	-2.952258*	-4.746234***	-9.344352***	-9.051164***	I (0)
LNWPCOC	-1.922087	-1.920196	-5.649769***	-5.596314***	I (1)
LNWCOCX	-2.026978	-1.073286	-6.810921***	-7.367649***	I (1)
LNCOCBX	-1.033544	-3.713499**	-10.11618***	-10.28761***	I (0)
LNCOCY	-0.791311	-3.521747*	-10.70260***	-13.90790***	I (0)
LNDC	-2.988387**	-5.139118***	-7.241950***	-10.95260***	I (0)
LNRPP	-0.019692	-2.079046	-5.706883***	-7.145704***	I (1)

Source: Computed by author using EViews 10.0 package

Note: ***, **, *, represents significance at 1%, 5% and 10% levels respectively.

ARDL Bound Test for Price-Incentive to Smuggle

To achieve the objectives of investigating the effects of exchange rate on price-incentive to smuggle, it is imperative to examine the long run relationship

between the variables for the study. The Bounds test is carried out to ensure that there exists a long-run relationship among the variables. The null hypothesis of the bounds test is that there is no cointegration among the variables, with the alternative hypothesis indicating a long run relationship among the variables. The Bound test results is presented in Table 6.

Table 6 - *Bound Test Results for Price-Incentive to smuggle*

Significance	Lower Bounds	Upper Bounds
10%	2.2	3.09
5%	2.56	3.49
2.5%	2.88	3.87
1%	3.29	4.37
Test Statistic	Value	K
F-Statistic	4.925894	4

Source: Computed by author using EViews 10.0 package

From Table 6, it can be seen that the F-statistic of 4.925894 is higher than the upper bound at all levels and therefore the null hypothesis of no cointegration between the variables is rejected. That is, there is a long-run relationship or cointegration among the variables for the study.

Long Run Estimation Results

After establishing the existence of a long run relationship among the variable. We then go ahead to estimate the ARDL model to investigate the long run

effect of all the explanatory on the price-incentive to smuggle. Table 7 therefore presents the long run estimation results.

Table 7 - *Long run Results for Price-Incentive to Smuggle*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNREER	-0.908321**	0.382903	-2.372198	0.0260
TAX	0.678747***	0.152691	4.445242	0.0002
LNWPCOC	0.146780**	0.066623	2.203141	0.0374
LNWCOCX	0.239418	0.208456	1.148533	0.2621
C	1.524147	2.532554	0.601822	0.5

Source: Computed by author using EViews 10.0 package

Note: ***, **, *, represents significance at 1%, 5% and 10% levels respectively.

It is worthy to note that, analyses in this study are done under the assumption that: the exchange rate of CFA Franc to Dollar remains constant, there is no cost involved in smuggling, and that farmers have perfect information on cocoa producer prices in Cote d'Ivoire. The long run results show that price-incentive to smuggle (SMUG) is significantly influenced by Real Effective Exchange Rate (LNREER), World Price of Cocoa (WPCOC) and Implicit Tax (Tax).

Real Effective Exchange Rate (LNREER), is a major determinant of price incentive to smuggle with coefficient of -0.908321, significant at 5%. This implies that, a 10-percentage increase in the real effective exchange rate leads to, approximately, 0.1 decrease in price incentive to smuggle. In other words, a 10-

percentage appreciation of the cedi leads to, approximately, 0.1-cedi decrease in Cote d'Ivoire producer price of cocoa relative to the producer price in Ghana, and this reduces the price-incentive to smuggle. This implies that, an appreciation of the domestic currency leads to a decrease in the price-incentive to smuggle and vice versa. The negative relationship was expected, meaning that, whenever the currency appreciates, Cote d'Ivoire producer price of cocoa, in cedi terms, becomes lesser or equal to that of Ghana, since an appreciation in the exchange rate reduces, in nominal terms, the cedi value of the Cote d'Ivoire. Hence reducing the incentive to smuggle out. The opposite however occurs for the depreciation of the exchange rate.

Also, the implicit cocoa export tax is another determinant of the price incentive to smuggle, significant at 1% with coefficient of 0.678747. This implies that, a percentage increase in the magnitude of implicit cocoa export tax leads to 0.679 increase in the price incentive to smuggle. This implies that, a percentage increase in the implicit cocoa export tax precipitates a, approximately, 0.7 cedis increase in Cote d'Ivoire cocoa producer price relative to that of Ghana, hence increasing the price-incentive to smuggle. The increase in the export tax reduces the domestic producer price of cocoa and that widens the gap between the Ghana producer price and the Cote d'Ivoire producer price, increasing the price-incentive to smuggle. This finding confirms the statement by Bulir (2002), that distortionary effect of domestic taxes in Ghana widened the gap between the Cote d'Ivoire and Ghanaian domestic prices, and ultimately creates incentives to smuggle Ghana cocoa to the Cote d'Ivoire.

The results further show that world price of cocoa (WPCOC) also explains some of the variations in the price-incentive to smuggle cocoa out of Ghana. This variable is significant at 5%, with coefficient of 0.146780, signifying that a 10% increase in the world price of cocoa will result in, approximately, 0.015 increase in price incentive to smuggle. Implying that, Cote d'Ivoire producer price increases by 0.015 cedis relative to Ghana producer price, with a 10-percent increase in world price. This finding is in consonance to Coleman, Akiyama and Varangis (1993) in their estimation of the domestic price of cocoa for Ghana and Nigeria, where they found that domestic producer price changes were influenced by changes in international cocoa prices. Also, it is worthy to note that, the world price of cocoa has a minimum effect on price-incentive to smuggle because cocoa farmers are shielded from world price volatilities through the fixed prices by COCOBOD and CCC in Ghana and Cote d'Ivoire respectively. Therefore, the world price does not have enough power in creating a disparity in the producer prices in the two countries. However, the power of the world price to create an incentive to smuggle depends on the degree to which world prices are transmitted to domestic prices in these two countries.

Short run results for Price-Incentive to Smuggle

Once the long run cointegration has been estimated, we then model the short run dynamic parameter within the ARDL model. Table 8 therefore presents the short run estimation results based on the SIC and AIC lag selection criteria.

Table 8 - *Parsimonious Error Correction Model*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.199015	3.456134	0.346924	0.7317
D (SMUG (-1))	-0.786679***	0.160050	-4.915203	0.0001
D(LNREER)	-0.714557**	0.273143	-2.616055	0.0151
D(TAX)	0.533956**	0.249371	2.141214	0.0426
D(LNWPCOC)	0.115468**	0.042014	2.748358	0.0112
D (LNWCOCX)	0.188345	0.209183	0.900384	0.3769
ECM (-1)	-0.786679***	0.131639	-5.976013	0.0000

R-squared	0.577096	Mean dependent var	0.140379
Adjusted R-squared	0.488991	S.D. dependent var	0.204543
S.E. of regression	0.146217	Akaike info criterion	-0.830588
Sum squared resid.	0.513108	Schwarz criterion	-0.550349
Log likelihood	18.45882	Hannan-Quinn criter.	-0.740937
F-statistic	6.550099	Durbin-Watson stat	1.892198
Prob. (F-statistic)	0.000565		

Source: Computed by author using EViews 10.0

Note: ***, **, *, represents significance at 1%, 5% and 10% levels respectively.

The short-run relationship between the explanatory variables and the price incentive to smuggle is captured by their lagged differences. The results in table 8 shows that the lagged values of price incentive to smuggle D (LNSMUG (-1)), Real Effective Exchange Rate (D(LNREER)), Implicit Tax (D(TAX)) and world price of cocoa (D(LNWPCOC)) are the determinants of price-incentive to smuggle. The speed of adjustment is measured by the magnitude of the coefficient of ECM (-1). The coefficient is statistically significant at 1% and correctly signed. A speed of

adjustment of -0.786679 means that the model adjusts to long run equilibrium from previous period's disequilibrium at the rate of 78.6%.

ARDL Bound Test for Cocoa Beans Export

To achieve the objectives of investigating the effects of price-incentive to smuggle on cocoa beans export, the study examines the long run relationship between the variables for the study. The Bounds test is carried out to ensure that there exists a long-run relationship among the variables. The null hypothesis of the bounds test is that there is no cointegration among the variables, with the alternative hypothesis indicating a long run relationship among the variables. The Bound test results is presented in table 9.

Table 9 - *Bound Test Results for Cocoa Beans Export*

Significance	Lower Bounds	Upper Bounds
10%	2.2	3.09
5%	2.56	3.49
2.5%	2.88	3.87
1%	3.29	4.37

Test Statistic	Value	K
F-Statistic	5.649284	4

Source: Generated by Author

From Table 9, it can be seen that the F-statistic of 5.649284 is higher than the upper bound at all levels and therefore the null hypothesis of no cointegration

between the variables is rejected. That is, there is a long-run relationship or cointegration among the variables for the study.

Long Run Estimation Results for Cocoa Beans Export

After establishing the existence of a long run relationship among the variable. We then go ahead to estimate the ARDL model to investigate the long run effect of all the explanatory variables on cocoa beans export. Table 10 therefore presents the long run estimation results.

Table 10 - *Long run Results for Cocoa Beans Export*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNCOCY	0.169513***	0.035828	4.731323	0.0001
$LNDC$	-0.236948	0.204078	-1.161068	0.2600
$SMUG$	-0.358225*	0.175495	-2.041218	0.0554
$LNRPP$	0.506269**	0.155288	3.260186	0.0041
C	8.220463***	0.825941	9.952846	0.0000

Source: Computed by author using EViews 10.0 package

Note: ***, **, *, represents significance at 1%, 5% and 10% levels respectively**.**

Results from Table 10 indicates that the price-incentive to smuggle has a 10% statistically significant negative relationship with cocoa beans export. The coefficient of -0.358225 implies that, an increase in the price-incentive to smuggle leads to a 35.8% decrease in cocoa beans export. Implying that, a cedi increase in

the Cote d'Ivoire producer price relative to the producer price in Ghana leads to, approximately, 36% percent decrease in the volumes of cocoa bean export in Ghana. Logically, as more cocoa beans are smuggled to neighborhood countries, the quantity available to be sold to COCOBOD declines, hence affecting cocoa export. This finding is in consonance with the findings of Fosu (1992), who found that cocoa smuggling to Cote d'Ivoire tend to exert a negative effect on the volume of Ghana's cocoa export, statistically significant at 5%. Also, Bulir (1998) found a statistically significant negative relationship between price-incentive to smuggle and cocoa export supply in Ghana.

Also, domestic production of cocoa (LNCOCY) is a major determinant of cocoa beans exports with coefficient of 0.169513, significant at 1%. This implies that, a percentage increase in volumes of cocoa beans output precipitates, approximately, 0.170% increase in volumes of cocoa beans export in Ghana. The positive relationship between cocoa output and cocoa export was expected because the quantity of cocoa beans produced determines the volume of cocoa beans available to be sold to the LBC and in turn to COCOBOD for export. This result is in line with the works by Ndubuto et al. (2010); Amoro and Shen (2012); Verter and Bečvářová (2014b); Okon and Ajene (2014) who also found a robust positive connection between cocoa production and export performance in Cote d'Ivoire and Ghana export.

Finally, the real producer price of cocoa (LNRPP) is found to be statistically significant in explaining variations in cocoa beans export in Ghana. This variable is significant at 5% with a coefficient of 0.506269. this implies that a

percentage increase in real producer price of cocoa leads to a 0.506% increase in cocoa beans export. This relationship was expected as increases in the real farm gate price of cocoa incites farmers to sell most of their produce to domestic licensed buyers as against smuggling them into neighboring countries with higher prices on the black market. Further, according to Bulir (1998), farmers invest appropriately in their fields in hope for better and sustainable outputs in the coming years whenever the real farm gate price increases. An increase in the real producer price of cocoa therefore affects cropping decisions, as well as farmers' decision to sell domestically or to smuggle. This result is in consonance to the findings of Bulir (1998), in his report on the "price incentive to smuggle and the cocoa supply in Ghana, he found a statistically positive relationship between cocoa producer price and cocoa supply in Ghana. He added that, some farmers even decide not to collect their current crop if the offered producer prices are too low. In addition, a study by Abdulai and Rieder (1995) on the determinants of cocoa supply in Ghana, found that cocoa export supply was significantly related to the real producer price. This shows that real producer price is a crucial factor in the supply decision of farmers, and setting it too low may have depressing effect on export.

Table 11 - *Parsimonious Error Correction for Cocoa Beans Export*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNCOCBX(-1))	-0.274704**	0.117954	-2.328906	0.0311
D(LNCOCY)	0.066118**	0.017197	3.844794	0.0011
D(LNCOCY(-1))	-0.045289**	0.017407	-2.601845	0.0175
D(LNRPP)	-0.300785**	0.107032	-2.810243	0.0112
ECM (-1)	-0.645566***	0.098660	-6.543365	0.0000

R-squared	0.679948	Mean dependent var	0.039447
Adjusted R-squared	0.626605	S.D. dependent var	0.172703
S.E. of regression	0.105532	Akaike info criterion	-1.504022
Sum squared resid	0.267287	Schwarz criterion	-1.268282
Log likelihood	26.80832	Hannan-Quinn criter.	-1.430191
Durbin-Watson stat	2.281205		

Source: Computed by author using EViews 10.0

Note: ***, **, *, represents significance at 1%, 5% and 10% levels respectively.

The short-run relationship between the explanatory variables and cocoa beans export is captured by their lagged differences. The results in table 11 shows that the lagged values of cocoa beans export D (LNCOCBX (-1)), cocoa output (D(LNCOCY(-1))), and real producer price of cocoa D(LNRPP) are the determinants of cocoa beans export in Ghana. The speed of adjustment is measured by the magnitude of the coefficient of ECM (-1). The coefficient is statistically significant at 1% and correctly signed. A speed of adjustment of -0.645566 means that the model adjusts to long run equilibrium from previous period disequilibrium at the rate of 64.6%.

Diagnostic Test

To ensure that the model and estimates are devoid of any econometric problems, various diagnostic tests are conducted and the results for both price-incentive to smuggle and cocoa beans export are presented in table 12.

Table 12 - *Diagnostic Test Result – Price Incentive to Smuggle and Cocoa Beans Export*

Test	**SMUG**		**LNCOCBX**	
	Statistic	**P-value**	**Statistic**	**P-value**
R-squared	0.577096		0.679948	
Serial Correlation	0.185434	0.8320	1.675848	0.2166
Heteroscedasticity	1.899420	0.1319	0.933712	0.5193
Normality	1.539552	0.463117	9.736155	0.107688
Functional form	4.592463	0.0629	3.779046	0.0677

Source: Computed by author using EViews 10.0 package

The models recorded a high R-squared of 0.577096 and 0.679948 for the price-incentive to smuggle and cocoa beans export respectively, implying a high predictive power of the determinants. The high R- squared shows a tight fit for the model, showing that, about, 58% and 68% of the variations in price- incentive to smuggle and cocoa beans export is explained by the independent variables in the two models respectively.

From the result, the Breusch-Godfrey Serial Correlation LM test reveals the absence of serial correlation among the variables for both the price-incentive to

smuggle and cocoa beans export. This is because the F-statistic of 0.185434 and 1.675848 were not statistically significant per the p-values of 0.8320 and 0.2166 for the two models respectively.

Also, the Breusch-Pagan-Godfrey Test for Heteroscedasticity also shows the absence of heteroscedasticity among the error terms. The F-statistics for price-incentive to smuggle and cocoa beans export of 1.899420 and 0.933712 were insignificant at p-values of 0.1319 and 0.5193 respectively.

Additionally, there is an indication from results in table 10 that, based on the Jacque-Bera normality test, the series in the model are normally distributed for both price-incentive to smuggle and cocoa beans export. This is because the F-statistics of 1.539552 and 9.736155 are statistically insignificant with p-values of 0.463117 and 0.107688 for the two models respectively.

Finally, the Ramsey-RESET stability test for the correct functional form of the models shows that the model is correctly specified for both price-incentive to smuggle and cocoa beans export. This is as a result of the F-statistic of 4.592463 and 3.779046 being statistically insignificant with the P-value of 0.0629 and 0.0677 for the two models respectively.

Stability

Cumulative sum of square and cumulative sum test: According to Brown et al. (1975), the stability test is based on the cumulative sum of the recursive residuals. Pesaran and Pesaran (1997) suggest that once the models have been estimated, it is necessary to apply the cumulative sum of recursive residuals

(CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) tests to assess the parameter constancy. This aims to check the stability of the parameters in the model for the sample period. This option plots the cumulative sum and the cumulative sum of squares together with the 5 percent critical lines. The test finds parameter instability if the cumulative sum and cumulative sum of squares goes outside the area between the two critical lines. The stability test for both price-incentive to smuggle and cocoa beans export are shown in the figures below.

Price-Incentive to Smuggle

The CUSUM and CUSUMSQ of the price-incentive to smuggle linear model is shown in figures 1 and 2 respectively

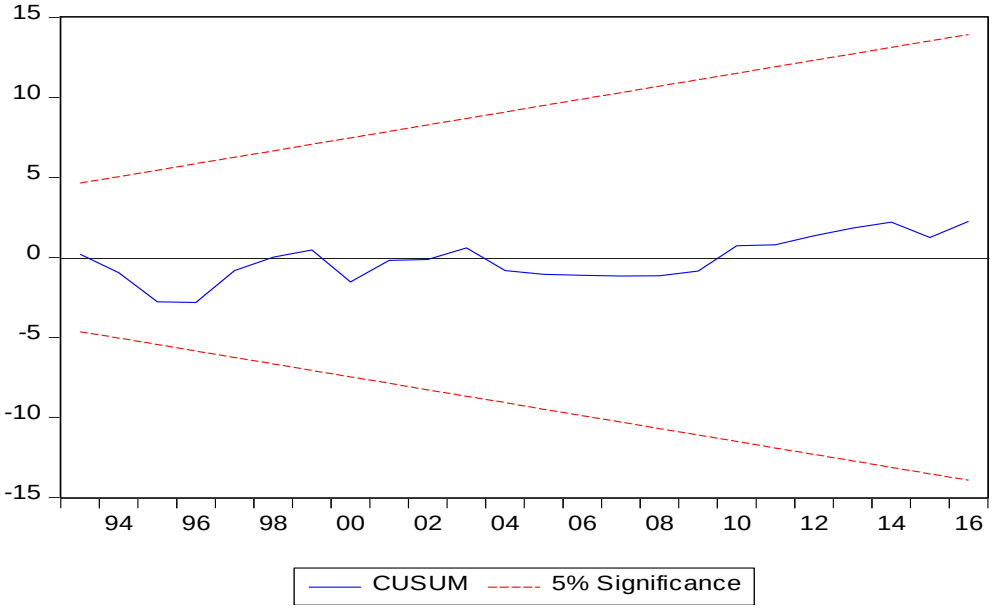


Figure 3: CUSUM for Price-Incentive to Smuggle

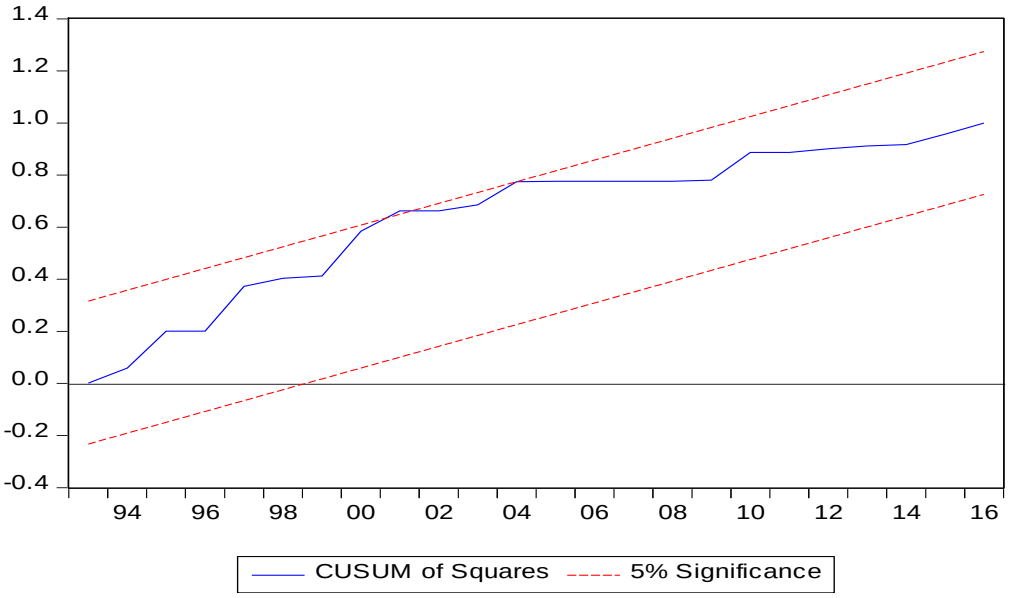


Figure 4: CUSUM of Squares for Price-Incentive to Smuggle

Cocoa Beans Export

The CUSUM and CUSUMSQ of cocoa beans export linear model is shown in figures 5 and 6 respectively

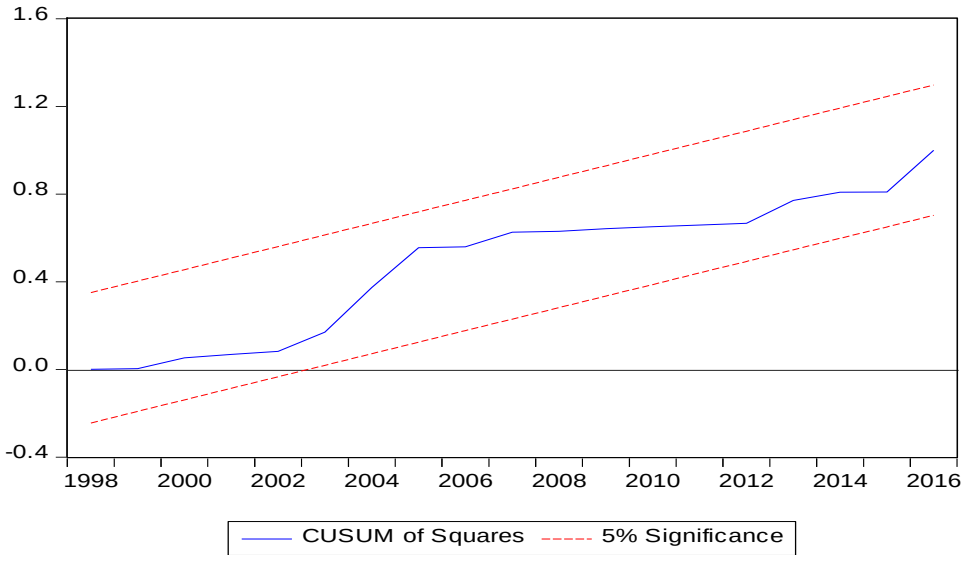


Figure 5: CUSUM for Cocoa Beans Export

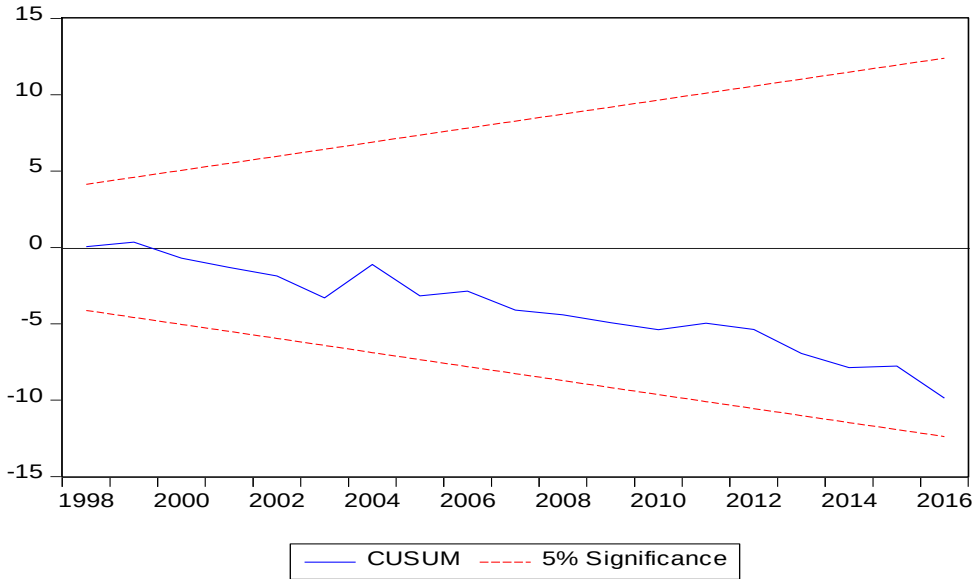


Figure 6: CUSUM of Squares for Cocoa Beans Export

Summary and Conclusion

The study aims at investigating the effects of exchange rate on price-incentive to smuggle and price-incentive to smuggle on cocoa beans export in Ghana. In order to achieve these objectives, the chapter presented the descriptive statistics on the variables. The ADF and PP unit root tests suggested the absence of unit root in some of the variables at their levels and others at first difference. Since all the variables were of order either I (0) or I (1), the study employed the ARDL model to examine the long run and short run effects.

Additionally, the study presented the diagnostics to show the robustness and behavior of the model for the period under study. The results revealed that the models passed the test of serial correlation, heteroscedasticity, normality and functional form test. The graph of CUSUM and CUSUMSQ showed the absence of any instability of the coefficient because the plots of these graphs are confined

within the 5 percent critical bounds parameter stability suggesting that all coefficients in the estimated ARDL models are stable over the study period.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter presents the summary, conclusion and policy recommendations as well as the direction for future research. The summary briefly captures the overview of the research problem, objectives, methodology as well as the findings of the study. The conclusion presents the overall findings of the study in relation to the hypothesis. In addition, the recommendations present specific remedies to be examined and implemented by specific bodies and institutions. Finally, the chapter presents the direction for future research.

Summary

This work is in five chapters namely: Background to the Study; Literature Review; Methodology; Results and Discussion; and Summary, Conclusions and Recommendations.

One of the problems the cocoa sector faced in recent years was the issue of smuggling of the cocoa beans to neighbouring countries which has led to a decrease in cocoa export in Ghana. Some reasons given was the higher export taxes and the lower producer prices paid to farmers relative to that of neighbouring countries which creates an incentive for farmers to smuggle. In response to that, and to enhance efficiency and effectiveness of the sector, several reforms or structural adjustment programs were instituted in the form of Ghana Cocoa Sector Liberalization (Laven, 2007). This was meant to enhance competition in the internal

marketing of the cocoa beans, pass on a significant share of export prices to farmers and to reduce taxes in many programs and strategies (Ministry of Manpower, Youth and Employment, 2008). This step led to the fixing of producer prices by a government organized body called PPRC which captured an increase in the percentage of FOB price given to farmers. However, in recent years, Ghana still grapples with the issue of cocoa beans smuggling. The situation is largely blamed on the depreciation of exchange rate, which makes the producer price in Ghana cedi not competitive to that of neighboring countries, thus creating the incentive to smuggle. The principal objective was, therefore, to estimate the effect of exchange rate on the price-incentive to smuggle and the effect of price-incentive to smuggle on cocoa beans export in Ghana, using an annual time series data from 1986 to 2016.

In line with the above, the study was set out to describe the structure of cocoa marketing in Ghana; the reforms that took place and the determination of cocoa producer prices in recent years and the exchange rate. The significance of the study was to bring to bear the magnitude of the effect that exchange rate has in creating the incentive for farmers to smuggle and the magnitude of the effect that price-incentive to smuggle has on cocoa beans export in Ghana, to help policy makers in the formulation of appropriate policies to improve the sector.

Relevant literature was reviewed on the History of the Ghanaian Cocoa Sector, Ghana Cocoa Marketing and some Structural Reforms and Exchange Rate Development in Ghana. The section further explored the theoretical literature and empirical literature related to the study. According to history, cocoa was first

introduced to Ghana by the Dutch missionaries at the beginning of the 19th century but couldn't sustain it until Tetteh Quarshie, a Ghanaian brought with him the Amelonado Cocoa pod in 1879 from Fernando Po where he lived and worked for several years. And this contributed to its wide spread in Ghana. The cocoa sector was managed by the Cocoa Marketing Board in 1947, but was dissolved as a result of corruption, inefficiency and politicization. In 1983, the country embarked on an Economic Recovery Programme that led to some structural reforms in the sector.

Also, trade theories based on the doctrines of absolute advantage, comparative advantage and factor endowment were also reviewed. The absolute advantage theory formalized by Adam Smith (1776), postulates that, countries should specialize in the production of items which they have absolute advantage. Also discussed was the comparative advantage theory propounded by David Ricardo (1817), who pointed out the flaws in the absolute advantage model and emphasized that comparative advantage is the way for a country to specialize in the efficient production of a good, that is, a country can produce those goods which it can produce comparatively better than the other country. Further, Eli Heckscher and Bertil Ohlin (1991) developed he Heckscher-Ohlin or Factor Endowment model which tried to expand the Ricardian model and explains why certain countries have comparative advantages for certain goods.

In addition, the Macro-Dynamic Export-Based Growth Models was also reviewed. According to the model, export trade widens the total market for a country's producers especially if they are operating at levels of increasing returns to scale. The theory of price control and general price determination mechanisms

were also reviewed to illustrate the pricing mechanism in the Ghana cocoa sector. The effect of price-incentive to smuggle on cocoa export in Ghana was also reviewed in empirical literature. Studies of Bulir (1998), Fosu (1992), May (1985) and Akiyama and Ducan (1982) all found a negative relationship between price-incentive to smuggle and cocoa export supply.

The methodology of the study was presented in chapter three. The section discussed the Theoretical/Conceptual Frame work and the Empirical specification of the models used in the study, and the description and measurement of the data was discussed. Finally, the estimation techniques used for the analysis was also discussed.

Based on the insight obtained from the review of literature and our theoretical/conceptual framework, the empirical models were specified for both price-incentive to smuggle and cocoa beans export and estimated using the ARDL estimation technique. Variable used for the study included price-incentive to smuggle, implicit cocoa export tax, world price of cocoa, world cocoa export, cocoa beans export, cocoa output, domestic consumption and real producer price of cocoa.

To estimate the models, all the variables for the study were subjected to Augmented-Dickey Fuller (ADF) and Phillip-Perron (PP) test in order to examine their stationarity properties. The unit root test results from the two models revealed that all the variables were stationary at either levels i.e. I (0) or at first difference i.e. I (1) and this gave enough justification for the use of ARDL technique. The cointegration analysis showed the presence of a long run relationship among the variables for the study.

After establishing the long run relationship among the variables, the study went ahead to estimate the long run and short run effects of the explanatory variables on price-incentive to smuggle. The long run results showed that real effective exchange rate, world price of cocoa and implicit export tax significantly influence price-incentive to smuggle. The real effective exchange rate had a statistically negative effect on price-incentive to smuggle. This implied that an appreciation of the domestic currency resulted to a decrease in the price incentive to smuggle. In other words, an appreciation of the domestic currency reduced the Cote d'Ivoire cocoa producer price relative to that of Ghana and vice versa for depreciation of the domestic currency.

The objective of estimating the effects of price-incentive to smuggle on cocoa beans export in Ghana was achieved by estimating the ADRL model. Results from the estimations showed that cocoa beans export was influenced by cocoa output (LNCOCY), price-incentive to smuggle (SMUG) and the real producer price of cocoa (LNRPP). A negative relationship was found between cocoa beans export and price-incentive to smuggle. This implied that, a cedi increase in the Cote d'Ivoire producer price relative to the producer price in Ghana, which increases the incentive to smuggle, leads to a decrease in cocoa beans export in Ghana.

The diagnostic tests results showed that both the price-incentive to smuggle and the cocoa beans models passed the Breusch-Godfrey Serial Correlation LM test, the Breusch-Pagan-Godfrey Test for Heteroskedasticity, Jacque-Bera normality test, the Ramsey-RESET stability test and the Cumulative sum of square and cumulative sum test for stability.

Conclusion

The main focus of the study was to investigate the effect of exchange rate on the price-incentive to smuggle and how the price-incentive to smuggle also affects cocoa beans export in Ghana. Findings from the study shows that, an appreciation of the domestic currency reduces the price incentive to smuggle, as that will reduce the cedi value of producer price in Cote d'Ivoire relative that of Ghana and vice versa.

Price-incentive to smuggle, on the other hand was also found to negatively affect the cocoa beans export in Ghana. Implying that, an increase in price-incentive to smuggle precipitates a decline in cocoa beans export. In other words, a cedi increase in the Cote d'Ivoire producer price relative to that of Ghana, motivate farmers to smuggle the cocoa to Cote d'Ivoire, against selling them domestically, assuming there is no cost in smuggling.

Recommendations

Having considered the findings and conclusions for the study, the following recommendations are advocated:

First, in determining the cocoa producer price in Ghana, the Producer Price Committee must consider the relative cedi value of producer price in Cote d'Ivoire. This will help reduce the gap in prices between these two countries, and that will reduce the incentive to smuggle, hence increasing Ghana cocoa beans exports.

Secondly, having observed the deleterious effect of price-incentive to smuggle on cocoa beans export, smuggling needs to be checked by COCOBOD, by

correctly forecasting the exchange rates movements to avoid wide differences between the future price and spot price of cocoa in neighboring countries, which creates the incentive to smuggle.

Finally, the government, precisely the Bank of Ghana must put in measures to enhance an appreciation of the cedi which can reduce the price-incentive to smuggle. However, this measure must be done with care since that can also make the export of cocoa uncompetitive.

Suggestions for Future Research

Whereas this study fills a number of important gaps in the literature, there remain a few that could not be explored at the moment and that require further studies.

- Future works can use a dummy to factor in the cost of smuggling in the estimation.
- Future research can focus on investigating the effect of exchange rate on cocoa beans export through the price-incentive to smuggle.
- Another interesting area that could follow up on this study would be to model the volatility of the exchange rate itself. Exchange rate movement is as important as its volatility and how it affects cocoa beans exports.

REFERENCES

Abdulai, A. (2000). Spatial price transmission and asymmetry in the Ghanaian maize market. *Journal of development economics*, *63*(2), 327-349.

Abdulai, A., & Rieder, P. (1995). The impacts of agricultural price policy on cocoa supply in Ghana: an error correction estimation. *Journal of African Economies*, *4*(3), 315-335.

Abenyega, O., & Gockowski, J. (2003). Labour practices in the cocoa sector of Ghana with a special focus on the role of children. *STCP/IITA Monograph, IITA, Ibadan, Nigeria*.

Abolagba, E. O., Onyekwere, N. C., Agbonkpolor, B. N., & Umar, H. Y. (2010). Determinants of agricultural exports. *Journal of Human Ecology*, *29*(3), 181-184.

Adu-Gyamfi P., (2017). "The Influence of Exchange Rate Changes on Agricultural Prices: The Case of Cocoa and Maize in Ghana (1966-2008)." *American Journal of Rural Development*, 5(3), 81- 89.

Aidenvironment (2018). *Pricing Mechanisms in the Cocoa Sector: Options to reduce price volatility and promote farmer value capture*. Amsterdam, Netherlands.

Akiyama, T., & Duncan, R. C. (1982). *Analysis of the world cocoa market* (No. 382.4 A313a). Washington, US: World Bank, c1982.

Amoro, G., & Shen, Y. (2012). The determinants of agricultural export: Cocoa and rubber in Cote d'Ivoire. *International Journal of Economics and Finance*, *5*(1), 228.

Anang, T. (2015). Key facts about the Ghana Cocoa industry: GDP contribution.

Arhin, K. (1985). The Ghana Cocoa Marketing Board and the Farmer', in Kwame Arhin, Paul Hesp and Laurens van der Laan (eds), Marketing Boards in Tropical Africa, London: KPI: 37–50

Aryeetey, E., & Tarp, F. (2000). Structural Adjustment and After: Which Way Forward? Economic Reforms in Ghana. *Academy of Management Review*, *12*(1), 67-75.

Asante-Poku, A., & Angelucci, F. (2013). Analysis of incentives and disincentives for cocoa in Ghana. *Technical notes series*.

Baffes, J., & Gardner, B. (2003). The transmission of world commodity prices to domestic markets under policy reforms in developing countries. *Policy Reform*, *6*(3), 159-180.

Bah, I., & Amusa, H. A. (2003). Real exchange rate volatility and foreign trade: Evidence from South Africa's exports to the United States. *African Finance Journal*, *5*(2), 1-20.

Ball, R. J., Eaton, J. R., & Steuer, M. D. (1966). The relationship between United Kingdom export performance in manufactures and the internal pressure of demand. *The Economic Journal*, *76*(303), 501-518.

Barrientos, S.W & Asenso Akyere, K. (2012). Mapping sustainable production in Ghanaian cocoa, Report to Cadbury. Institute of Development Studies & University of Ghana.

Bates, R. (2005). *Markets and States in Tropical Africa: The Political Basis of Agricultural Policies, Berkeley*: University of California Press

Bhasin, V. K. (2004). Dynamic inter-links among the exchange rate, price level and terms of trade in a managed floating exchange rate system: The case of Ghana.

Bing, G. (1968). *Reap the whirlwind: An account of Kwame Nkrumah's Ghana from 1950 to 1966*. MacGibbon & Kee.

Boansi, D. (2013). Export performance and macro-linkages: A look at the competitiveness and determinants of cocoa exports, production and prices for Ghana.

Boateng, A. (2017). *Ghana Cocoa Sector at Crossroads: To Transform or Not to Transform. A Cluster Analysis*. Retrieved from file:///C:/Users/PC-EliteBook/Downloads/Documents/cocoa%20pricing/Ghana%20Cocoa_2017.pdf

Brown, R. L., Durbin, J., & Evans, J. M. (1975). Techniques for testing the constancy of regression relationships over time. *Journal of the Royal Statistical Society. Series B (Methodological)*, 149–192.

Bulǐř, A. (2002). Can price incentive to smuggle explain the contraction of the Cocoa supply in Ghana? *Journal of African Economies*, *11*(3), 413-439.

Bulir, M. A. (1998). *The Price Incentive to Smuggle and the Cocoa Supply in Ghana, 1950-1996*. International Monetary Fund. *capitalism*. England: Cambridge University Press, 171-173.

Cocoa smuggling rises as cedi falls. (2014, February 7). Retrieved from http:// www.myjoyonline.com.

COCOBOD (2000). Ghana Cocoa Board Handbook, 8th edn, Accra, Ghana: Jamieson's Cambridge Fax books.

Coleman, J. R., Akiyama, T., & Varangis, P. N. (1993). *How policy changes affected cocoa sectors in sub-Saharan African countries* (No. 1129). The World Bank.

Commander, S., Howell, S. & Seini, W. (1989). 'Ghana: 1983–7', in Simon Commander (ed.), Structural Adjustment and Agriculture Theory and Practice in Africa and Latin America, London: ODI: 107–26

Darkwah, S. A., & Verter, N. (2014). An empirical analysis of cocoa bean production in Ghana. *European Scientific Journal, ESJ, 10*(16).

Depetris C, N., Porto, G., & Mulangu, F. (2017). *Agricultural supply chains, growth and poverty in sub-Saharan Africa* (No. LIVRE-2017-002). Springer, 2017.

Dickey, D. & Fuller, W. (1979). Distribution of the Estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, 74:427-431.

Dzorgbo, D. B. S. (2001). Ghana in search of development: The challenge of Governance. *Economic Management and Institution Building. Ashgate Publishing Ltd, Aldershot*.

Fosu, K. Y. (1992). The real exchange rate and Ghana's agricultural exports.

Frimpong-Ansah, J. H. (1991). *The vampire state in Africa: The political economy of decline in Ghana*. Africa World Press.

Gardner, B. L. (1975). The farm-retail price spread in a competitive food industry. *American Journal of Agricultural Economics, 57*(3), 399-409.

Ghana Cocoa Board (2014). 45th Annual Report and Financial Statement. Accra, Ghana.

Ghana Statistical Service (GSS) (2015) 'Annual Gross Domestic Product'. Retrieved from http://www.statsghana.gov.gh/docfiles/GDP/GDP2015/2015_Annual_GDP_September_2015_Edition.pdf on 16 May 2017

Gyimah-Boadi, E. & Rothchild, D. (1990). 'Ghana', in V. Subramaniam (ed.), Public Administration in the Third World: An International Handbook, London: Greenwood: 229–57

Harrigan, J., & Oduro, A. (2000). Exchange rate policy and the Balance of payments. *Economic Reforms in Ghana: The Miracle and the Mirage, Oxford: James Currey*.

Hazell, P. B. R., Jaramillo, M., & Williamson, A. (1990). The relationship between world price instability and the prices farmers receive in developing countries. *Journal of Agricultural Economics*, *41*(2), 227-241.

Heckscher, E. F., & Ohlin, B. G. (1991). *Heckscher-Ohlin trade theory*. The MIT Press.

Herbst, J. I. (1993). *The politics of reform in Ghana, 1982-1991*. Univ of California Press.

Hill, P. (1963). *The migrant cocoa-farmers of southern Ghana: A study in rural*

Hinkle, L. E., & Nsengiyumva, F. (1999). External real exchange rates: Purchasing power parity, the Mundell-Fleming model, and competitiveness in traded goods. *Exchange Rate Misalignment: Concepts and Measurement. World Bank*.

ICCO (International Cocoa Organisation). 2007. Annual report 2005/2006. London: ICCO.

ICCO (International Cocoa Organization) (2012). *The World Cocoa Economy*: Past and Present. EX/146/7. 26 July 2012

Keeling, W. (1989). '*Survey of Ghana: Painful Turnaround – The Fluctuating Fortunes of the Cocoa Industry*', Financial Times, 11July: 39

Kolavalli, S., Vigneri, M., Maamah, H., & Poku, J. (2012). The partially liberalized cocoa sector in Ghana: Producer price determination, quality control, and service provision.

Kotey, R. A., & Gyekye, L. O. (1974). *Internal marketing of cocoa in Ghana* (No. 33). Institute of Statistical, Social and Economic Research, University of Ghana.

Krugman, P. & Wells R. (2008). Module 8 Supply and Demand: Price Controls (Ceilings and Floors); Macroeconomics 2 ed

Laven, A. (2007). Marketing reforms in Ghana's cocoa sector. *Partial liberalization, partial benefits*.

Laven, A. C. (2005). Relating cluster and global value chain theory to upgrading of primary commodities: The cocoa cluster in Ghana.

Lee, J. K. (1971). "Exports and the Propensity to Save in LDC's". Economic Journal Vol. 81, p. 341 - 345.

Leith, J. C., & Söderling, L. (2003). *Ghana-long term growth, atrophy and stunted recovery*. Nordiska Afrikainstitutet.

Liefert, W., & Persaud, S. (2009). The transmission of exchange rate changes to agricultural prices. Econ. *Research Rep*, (76).

Lin, J., & Chang, H. J. (2009). Should Industrial Policy in developing countries conform to comparative advantage or defy it? A debate between Justin Lin and Ha-Joon Chang. *Development policy review*, *27*(5), 483-502.

Lipsey, C. (1999). "Principles of Economics" Ninth edition Oxford University Press

Lipsey, R. G., & Harbury, C. (1992). *First principles of economics*. Oxford University Press, USA.

LMC International (1996). Final Report: The External Marketing of Ghana's Cocoa, prepared for the Ministry of Finance on behalf of the Government of Ghana

May, E. (1985). 'Exchange Control and Parallel Market Economies in Sub-Saharan Africa: Focus on Ghana',Staff Working Paper No. 711, Washington DC: World Bank.

Meier, G. M. (1984). *Leading Issues in Economic Development*. New York: Oxford University press pp. 489-509.

Ministry of Food and Agriculture (MOFA) (2002). Food and Agriculture Sector Development Policy (FASDEP), Accra, Ministry of Food and Agriculture.

Ministry of Manpower, Youth and Employment, 2008: Labour Practices in Cocoa Production in Ghana (Pilot Survey).

Minot, N. (2010). *Transmission of world food price changes to markets in Sub-Saharan Africa*. Washington: International Food Policy Research Institute.

Morisset, J. (1998). Unfair trade? The increasing gap between world and domestic prices in commodity markets during the past 25 years. *The World Bank Economic Review, 12*(3), 503-526.

Mulangu, F. M., Miranda, M. J., & Maïga, E. W. (2017). Cocoa pricing options and their implications for poverty and industrialization in Ghana. *Agricultural Economics, 48*(4), 481-490.

Mulangu, F., Miranda, M., & Maiga, E. (2015). Is More Chocolate Bad for Poverty? An Evaluation of Cocoa Pricing for Ghana's Industrialization and Poverty Reduction.

Mundlak, Y., & Larson, D. F. (1992). On the transmission of world agricultural prices. *The World bank economic review, 6*(3), 399-422.

Myint, H. (1982). The "classical theory" of international trade and the underdeveloped countries. In *International Economics Policies and their Theoretical Foundations* (pp. 365-383).

Naceur, S. B., & Ghazouani, S. (2007). Stock markets, banks, and economic growth: Empirical evidence from the MENA region. *Research in International Business and Finance*, *21*(2), 297-315

Nwachuku, I. N., Agwu, N., Nwaru, J., & Imonikhe, G. (2010). Competitiveness and determinants of cocoa export from Nigeria. *Report and Opinion*, *2*(7), 51-54.

Okon, E. B. & A. S. Ajene, (2014). Supply response of selected agricultural export commodities in Nigeria. *Journal of Economics and Sustainable Development,* 5 (5): 47–57.

Oomes, N., Tieben, B., Laven, A., Ammerlaan, T., Appelman, R., Biesenbeek, C., & Buunk, E. (2016). Market Concentration and Price Formation in the Global Cocoa Value Chain.

Osei, I. (2007). Sustainable Practices in the Global Cocoa economy–A producer's perspective. In *proceedings of the 4th Indonesia International Cocoa Conference and Dinner*.

Osei-Akom, K. (1983). Cocoa Production under Ghana's Structural Adjustment Programs: A study of Rural Farmers. *IMF and World Bank Sponsored Structural Adjustment Programs in Africa, Ghana's experience*, *1999*, 141-155.

Otieno, B., & Mudaki, K. (2011). Factors influencing real exchange rate and export sector performance in Kenya. *School of business and economics, department of economics, Moi University*.

Park, Y. C. (1981). "Export-led Development: The Korean Experience, 1960-78" in Lee, Eddy (ed.) Export-led Industrialization and Development International Labor Organization, ILO.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of applied econometrics*, *16*(3), 289-326.

Phillips, P. C., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika*, *75*(2), 335-346.

Prasad, E., Rogoff, K., Wei, S. J., & Kose, M. A. (2005). Effects of financial globalization on developing countries: some empirical evidence. In *India's and China's recent experience with reform and growth* (pp. 201-228). Palgrave Macmillan, London.

Quarmine, W., Haagsma, R., van Huis, A., Sakyi-Dawson, O., Obeng-Ofori, D., & Asante, F. A. (2014). Did the price-related reforms in Ghana's cocoa sector favour farmers? *International journal of agricultural sustainability*, *12*(3), 248-262.

Quartey, E.T. (2013). The role of parastatal Institutions in the agricultural sector: the case of the Ghana Cocoa Boad. UNCTAD Global Commodities Forum, 18/03/2013.

Retrieved June, 2016, from http://www.modernghana.com/news

Ricardo, D. (1817). The Principles of Political Economy and Taxation.

Reprint. *Londong Dent*.

Schofield, N. C. (2011). *Commodity derivatives: markets and applications* (Vol. 570). John Wiley & Sons.

Shepherd, A., & Onumah, G. (1997). *Liberalised agricultural markets in Ghana: the roles and capacity of government*. University of Birmingham.

Smith, A. (1776). An inquiry into the nature and causes of the wealth of nations: Volume One. London: printed for W. Strahan; and T. Cadell, 1776.

Steijn, C. P. A. (2016). *Towards sustainable cocoa production: a mixed method assessment of the influence of local governance modes on the farm level impact of private cocoa certification standards in Ghana* (Master's thesis).

Stock, J. H., & Watson, M. W. (1988). Testing for common trends. *Journal of the American Statistical Association*, *83*(404), 1097–1107.

Tang, T. C. (2006). New evidence on export expansion, economic growth and causality in China. *Applied Economics Letters*, *13*(12), 801–803.

Tangri, R. K. (1999). *The Politics of Patronage in Africa: parastatals, privatization, and private enterprise*. Africa World Press.

Thirlwall, A.P., (1978). Growth and Development: With Special Reference to Developing Economies. London: The Macmillan Press Ltd. pp. 331 - 363.

Tiffen, P., MacDonald, J., Maamah, H., & Osei-Opare, F. (2004). From tree-minders to global players: Cocoa farmers in Ghana. *Chains of Fortune Linking Women Producers and Workers with Global Markets. London. Commonwealth Secretariat*, 11-44.

Trivedi, P. K., & Akiyama, T. (1992). A framework for evaluating the impact of pricing policies for cocoa and coffee in Cote d'Ivoire. *The World Bank Economic Review*, *6*(2), 307-330.

UNCTAD (2013). Economic trends and foreign direct investment

Verter, N. (2016). Cocoa export performance in the world's largest producer. *Bulgarian Journal of Agricultural Science*, *22*(5), 713-721.

Verter, N., & Bečvářová, V. (2014). Drivers of cocoa export in Ghana in the era of free trade. *World Applied Sciences Journal*, *32*(8), 1710-1716.

Waldmeir, P. (1985). 'Commodities and Agriculture: Reviving the Prospects for Cocoa: Ghana's Bid to Revive its Main Export Sector', Financial Times, 4July, F1: 40

Wessel, M., & Quist-Wessel, P. F. (2015). Cocoa production in West Africa, a review and analysis of recent developments. *NJAS-Wageningen Journal of Life Sciences*, 74, 1-7

Williams, T. (2009). An African success story: Ghana's cocoa marketing system. *IDS Working Papers*, *2009*(318), 01-47.

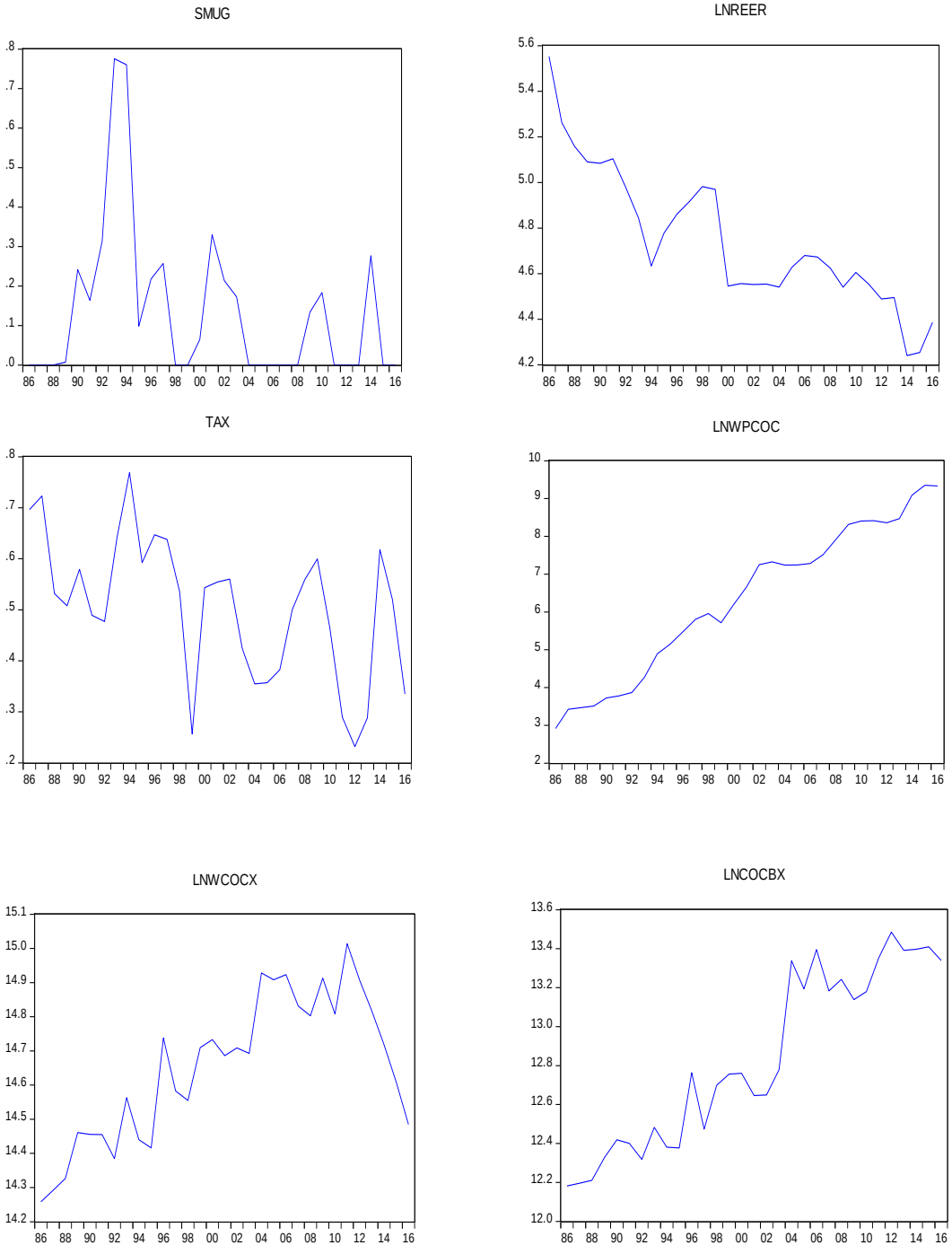
Woods, D. (2004). Predatory elites, rents and cocoa: A comparative analysis of Ghana and Ivory Coast. *Commonwealth & Comparative Politics*, *42*(2), 224-241.

World Bank (2011). Supply Chain Risk Assessment: Cocoa in Ghana. Ghana Cocoa SCRA Report

Zeitlin, A. (2006). Market structure and productivity growth in Ghanaian cocoa production. *Unpublished paper, Centre for the Study of African Economies, University of Oxford, Oxford, UK*.

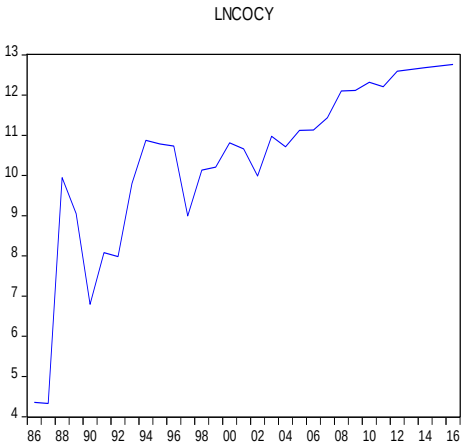
APPENDICES

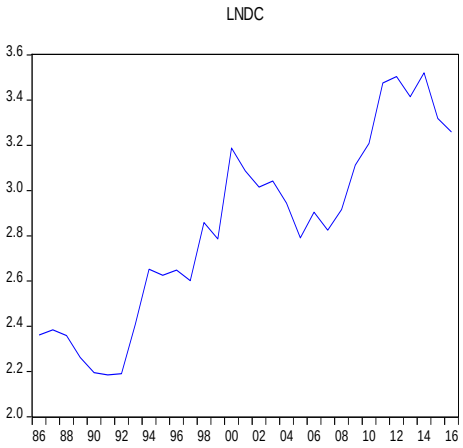
A. Plot of Variables (Series) at Levels

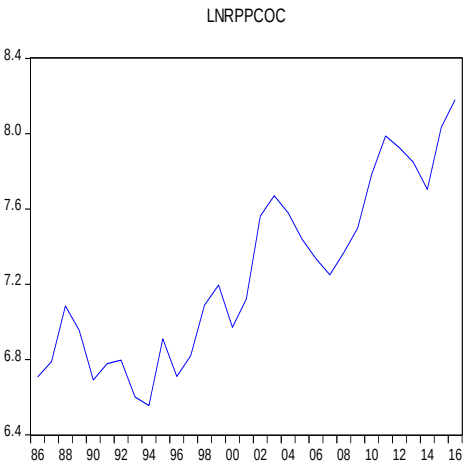


Source: Computed by Author using EViews 10.0 Package

Continued

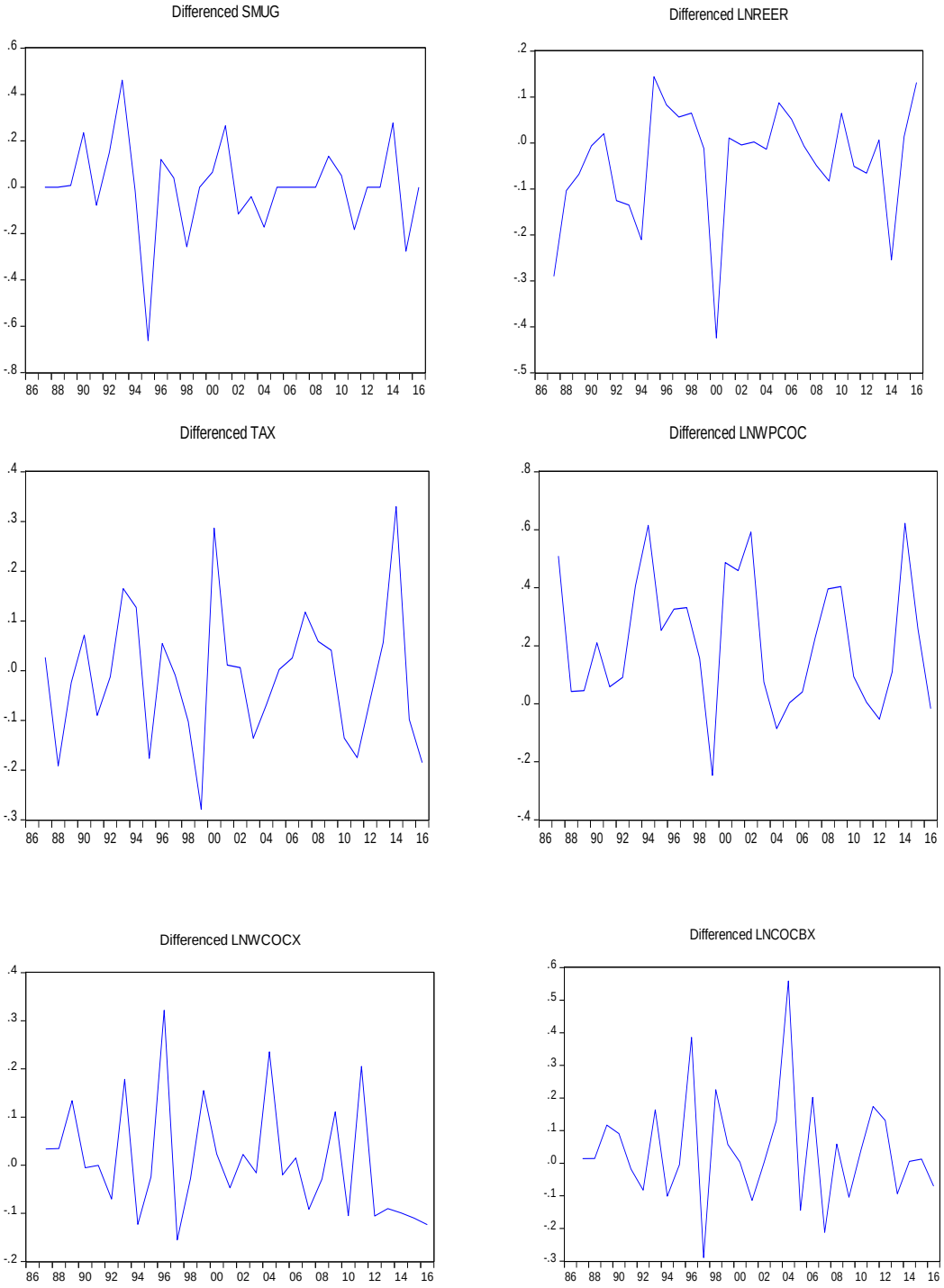






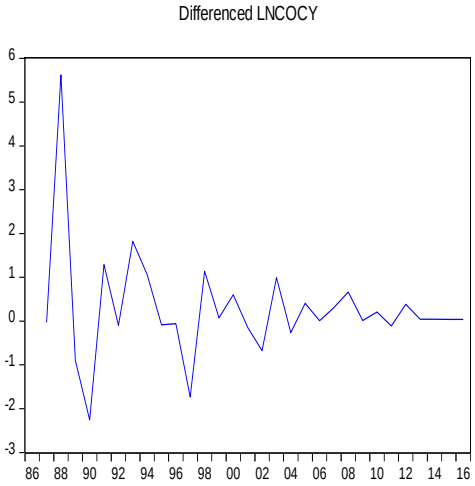
Source: Computed by Author using EViews 10.0 Package

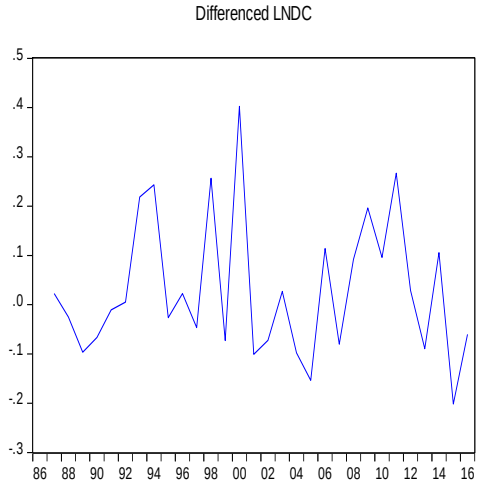
B. Plot of Variables (Series) at First Difference

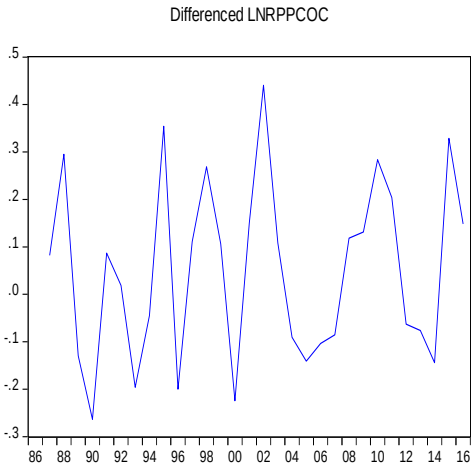


Source: Computed by Author using EViews 10.0 Package

Continued







Source: Computed by Author using EViews 10.0 Package