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FOOD IMPORTS UNDER FOREIGN EXCHANGE CONSTRAINTS IN THE CFA'S FRANC ZONE OF SUB-SAHARAN AFRICA (SSA)

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THESIS

A thesis submitted in partial fulfillment of the requirement for the degree
Of Master of Science in Agricultural Economics in the College of Agriculture
at the University of Kentucky

By

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Lexington, Kentucky

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ABSTRACT OF THESIS

FOOD IMPORTS UNDER FOREIGN EXCHANGE CONSTRAINTS IN THE CFA'S FRANC ZONE OF SUB-SAHARAN AFRICA

To respond to the high imported food prices in their domestic markets, net food importing countries in the Communauté Financière Africaine (CFA) zone[1] are adjusting their import tariffs and homologate domestic prices of imported commodities such as rice, wheat, maize, and sugar. This research uses a multivariate specification of error correction model (VECM) of estimation to investigate the link between food imports, world price index of rice, wheat, maize and sugar, real effective exchange rates, domestic food production, GDP, and trade openness in the short and long run. The data are on each homogenous commodity from 1969 to 2012. This research finds a long-run relationship between world price index, domestic production, GDP, real effective exchange rates and trade openness. Under fixed exchange rates regime, GDP, domestic food production, world price index of food, and trade openness are the determinants of food imported in the CFA zones. Policy options focusing on long-term investment in domestic food production of rice, wheat, maize and sugar, and trade openness are the fundamental factors to curtail the increasing food import volume/bill under fixed exchange rate regime in the CFA zones.

KEYWORDS: CFA Zone, Food imports, Food Security, International Trade, and Sub Saharan Africa.

Seydina Ousmane Sene

DATE: 08/02/2014

[1] The CFA zone in Sub-Saharan Africa is the WAEMU and CEMAC Countries, which are listed and represented in figure 1.

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Dedication

I hold a firm believes that no one can make this journey alone unless surrounding by the right people in the right environment. In a performance oriented environment at the University of Kentucky, couple with an increasingly consistent mounting pressure and stress, I realized once again how important is the family support. This thesis is exclusively dedicated to my wife Dr. Fanta Diamanka, my lovely and caring daughter and princess Marieme Sene and My mom who is currently facing difficult health issues. Despite her illness she is consistently praying for my family and she will always remain a source of motivation for me to pursue my dream and ambitions. I feel very lucky and blessed to have the support of my best friend and sweet wife who not only understand academic challenges but also embrace fully the role of being a mom, a wife and a professor at the same time. Like every academic piece I have ever done Dr. Diamanka contributions is remarkable. She is quick to point out mistake, check format and consistency, and eager to apply his long experience of academic and intellectual subsoil

that allowed me to process the information and directions I received from my committee throughout the process. I also dedicate this thesis to my Muslim brother at the Islamic Center of Lexington and New Orleans Cheikh Mahmoud and Ousmane Biteye respectively. This thesis is also dedicated to my best friend Cheikh Ibrahima Kebe who is one of my best companion and ever-lasting brother. Without you all I would not be able to maintain and persevere despite all the challenges I faced throughout.

Acknowledgment

First overall, I would like to express my sincere gratitude to my advisor Dr. Sayed Saghaian for his continuous effort and consistent support throughout the process of this research. Many Thanks to Dr. Reed, Dr. Maynard and Dr. Dillon for their support and contribution during my stay at the University of Kentucky for their patience, motivation, enthusiasm, and financial support. Many thanks to the Faculty of the department of Agriculture Economics at the University of Kentucky and The Graduate Student Congress for the Travel Grant Award at the 17th Annual Conference on Global Economics Analysis "New Challenges in Food Policy, Trade and Economic Vulnerability" held in Dakar Senegal. Thank you very much to everybody who attended my presentation at the SAEA Annual Meeting February 1-4 at Sheraton Dallas Hotel and Convention Center – Dallas, TX at an early stage of this research for their useful critiques, comments and suggestions. My sincere gratitude and encouragement the ANSD (Agence National De la Statistics et de la Demographie Senegal for making some of the Data used in this research available.

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CHAPTER 1: INTRODUCTION

This thesis looks at imported food, such as rice, wheat, maize, and sugar, under fixed exchange rate constraints, and customs unions in the Communauté Financière Africaine (CFA) zone of Sub-Saharan Africa. By definition, the countries in the WAEMU and CEMAC are small, open economies under fixed exchange rate, which is pegged to the euro and guaranteed by the French treasury. The countries within the institutional setting of the CFA zone are not indifferent to global economic challenges and food crises due to their dependence on developed countries for trade, foreign direct investment, and financial development. An understanding of resource commodity markets in Sub-Saharan Africa's growing dependence plays a central role in economic development, international trade, and macroeconomic stability in the CFA region. The long-term policy responses to minimize the corroding effects of higher food prices on child education and health, trade deficit, and growth under exchange rate constraints are more important than ever in the CFA zone of Sub-Saharan Africa.

Rising global food prices coupled with poor agricultural productivity under exchange rate constraints and customs unions lead CFA's African governments to homologate domestic prices of food imported into the CFA zone. FAO (93-94) shows that policymakers of the CFA franc-zone countries initiated a battery of measures such as, price controls, tariff adjustments, and subsidies to mitigate cereal prices especially rice, wheat, maize, and sugar and to provide consumer relief subsequent to the devaluation of the CFA franc in 1994 (p.14).

The food trade deficit began in the 1960s following independence (i.e., 1960s) in most African countries. Food imports continue to increase at a faster rate, exceeding $1 trillion USD in the last 20 years (FAO's recent report, 2012). In Africa, where momentum grows gradually, the increase in food imports, especially cereals such as rice, wheat, and maize is puzzling, and motivates the quest for answers. Whether Sub-Saharan Africa sustains the rising food import bills of primary commodities in ensuring food security in the long run is not clear, especially in the CFA zone. This question remains and depends exclusively on each individual country's farm population, irrigation system, trade policies, food productivity and efficiency of food supply chain, agribusiness enterprises, value chain financing, exchange rate adjustment, and regional harmonization. Lopez and Thomas's findings suggest, "More comprehensive assessment of import demand will be needed if the size and even direction of changes in import demand in response to policy reform is to be understood and anticipated" (1990. p. 195).

Many studies in the literature pertaining to food imports, and also IMF's 2008 countries' report show that exchange rate adjustment in the CFA zone had a limited scope in boosting regional trade and export revenue while paying the high food import bills. According to Mansour and Graziosi "Over 80% of member countries of CFA zone's tax (including tariff) revenues are derived from taxes that are subject to regional directives or regulations" (2013, p. 3). However, FAO's investigations in 2007 were striking, showing that "Only about one-third (19 out of 53) of African countries had enough agricultural export revenue to pay for their food import bills" (p.1). This study found that in African countries, such as Benin, Burkina Faso, Chad,

Congo, Center African Republic, Mali, Niger, Senegal, and Togo, the total export revenues of agricultural commodities from 1969 to 2012 was documented to be far short of covering the food import bills (See figure 3-6). Figure 3-6 shows the total value of import and export for each commodity, while figure 7 shows the total volume of import for each commodities. Figure 8 shows the world price index of each rice, wheat, maize, and sugar in the world market for agricultural commodities. Similarly, a recent report by the United Nations (2012) found that "From the perspective of developing countries, especially those whose principal means of foreign exchange earnings come from the exports of primary commodities, unstable commodity prices create macroeconomic instabilities and complicate macroeconomic management" (p. 58). Deaton (1999) suggested that "Additional income from commodity price booms helps the economies of African producing countries, just as they are hurt by the loss of income during slumps" (p. 24). Moreover, Abbott (2009) highlighted the negative macroeconomic consequences, especially in developing countries, noting the deteriorating terms of trade and slowing of economic growth (p. 3).

Generally, in the literature on food import, many researchers have highlighted the rising food bills and dependency on food imports, which leaves African countries in the CFA zone with two options to address chronic imbalance of food trade deficit and food security. The first option requires boosting agricultural production by mechanizing (i.e., machines and fertilizers) and financing agricultural sectors while implementing extension programs, focusing on research, development, and marketing of agricultural products. The second option requires African countries to effectively

gauge their comparative advantage in the major food and mineral exports in the regional and international markets.

The discussions with respect to these two policy options raise issues of optimality and sustainability of food import dependency in the long run, and the extent to which the two options are dependent, complementary, or mutually exclusive. The literature is still far from being conclusive and exhaustive on the mechanics of these long-term fluctuations on food import dependency and its consequences on growth and macroeconomic stability in the CFA zone. However, even though the effects of spiraling food prices vary across countries, some common impact and policy options can be clearly delineated, especially in the CFA zone (WAEMU & CEMAC) of Sub-Saharan Africa (Mathur, 2010, cited in Huppe, et al., p. 17).

The objective of this research is to investigate the links between food imports, domestic food production, commodity prices, income (GDP), and trade policies in the region. The goal of this research is to assess the determinants of food imports and policy options and alternatives under foreign exchange constraints in the CFA zone (WAEMU & CEMAC). The purpose of this research is to understand how policy makers in the CFA zone coped with past decisions on food imports with respect to the past, current, and future expectations of income, food prices, and domestic food production under a fixed exchange rate and trade liberalization.

The rest of the research is organized as follows: Chapter 2 provides a background on this research by looking at the macroeconomics and institutional setting of the CFA zone of Su-Saharan Africa. Chapter 3 reviews the literature, which is structured into three sections. Section 3.1 reviews the existing literature by focusing

on food imports in relation to consumer welfare, policy responses, and impact of food imports on poverty. Section 3.2 focuses on food imports in relation to income, institution, foreign exchange, and macroeconomic stability in the CFA zone of Sub-Saharan Africa. Section 3.3 focuses on food import theories and modeling, empirics and estimation methods in the literature. Chapter 4 sets the research framework, the theoretical foundations, and the empirical model specifications of the research. Chapter 5 indicates the methods of data collection, the source of the data, and a description of the variables. Chapter 6 presents the econometric tests and analysis, which is divided into three sections. Section 6.1 summarizes the descriptive statistics. Section 6.2 presents the performance of various econometric techniques and tests to analyze the dynamic behavior and memory process of the data. Section 6.3 presents the co-integration analysis. Chapter 7 provides the results and analyzes and discusses policy implications of the parameters. Chapter 8 provides a conclusion.

Figure 1: Maize: Total volume Imported and Exported for all Countries in the CFA Zone from [1969 - 2012]

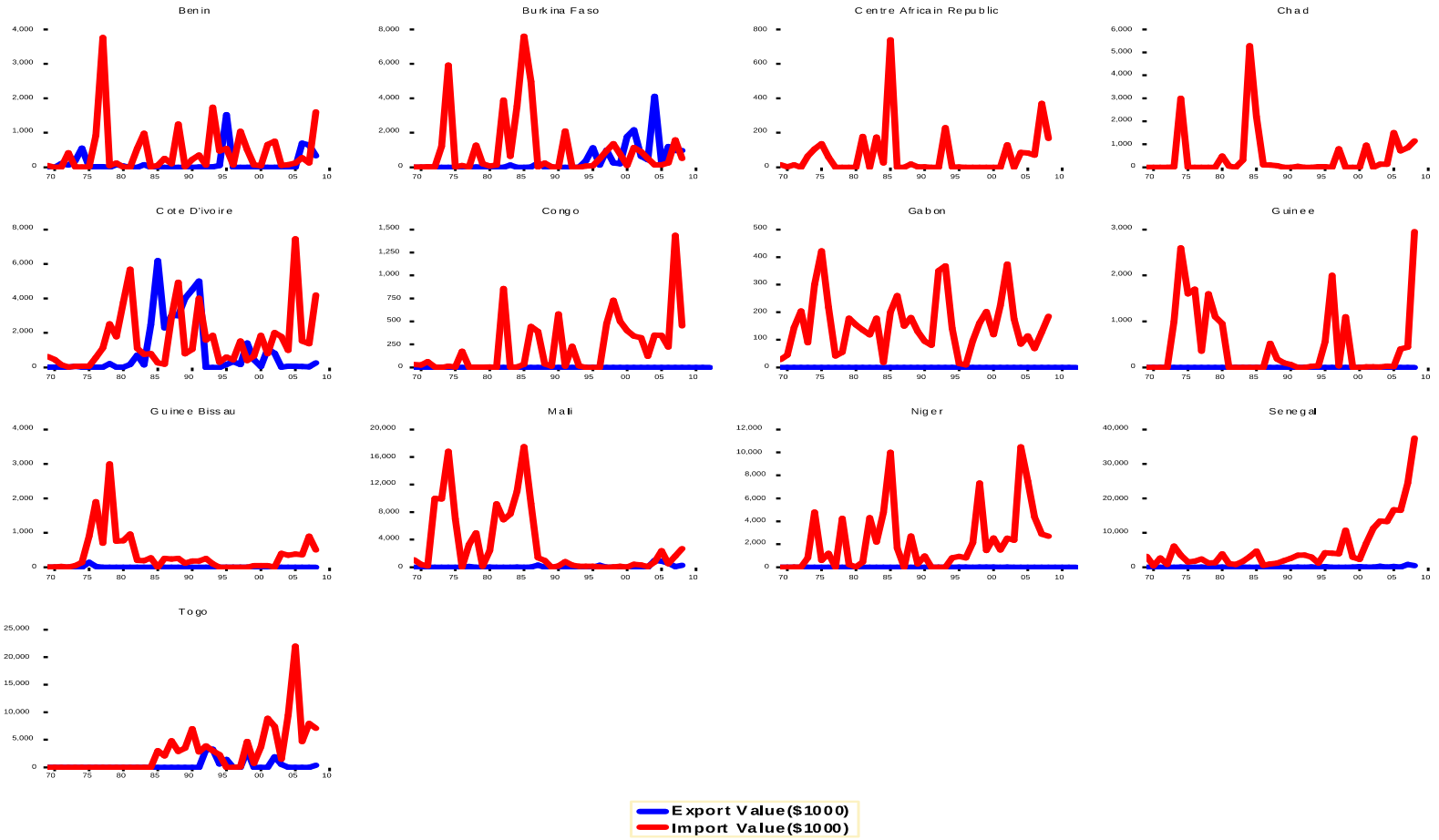


Figure 2: Wheat: Total volume Imported and Exported for all Countries in the CFA Zone from [1969 - 2012]

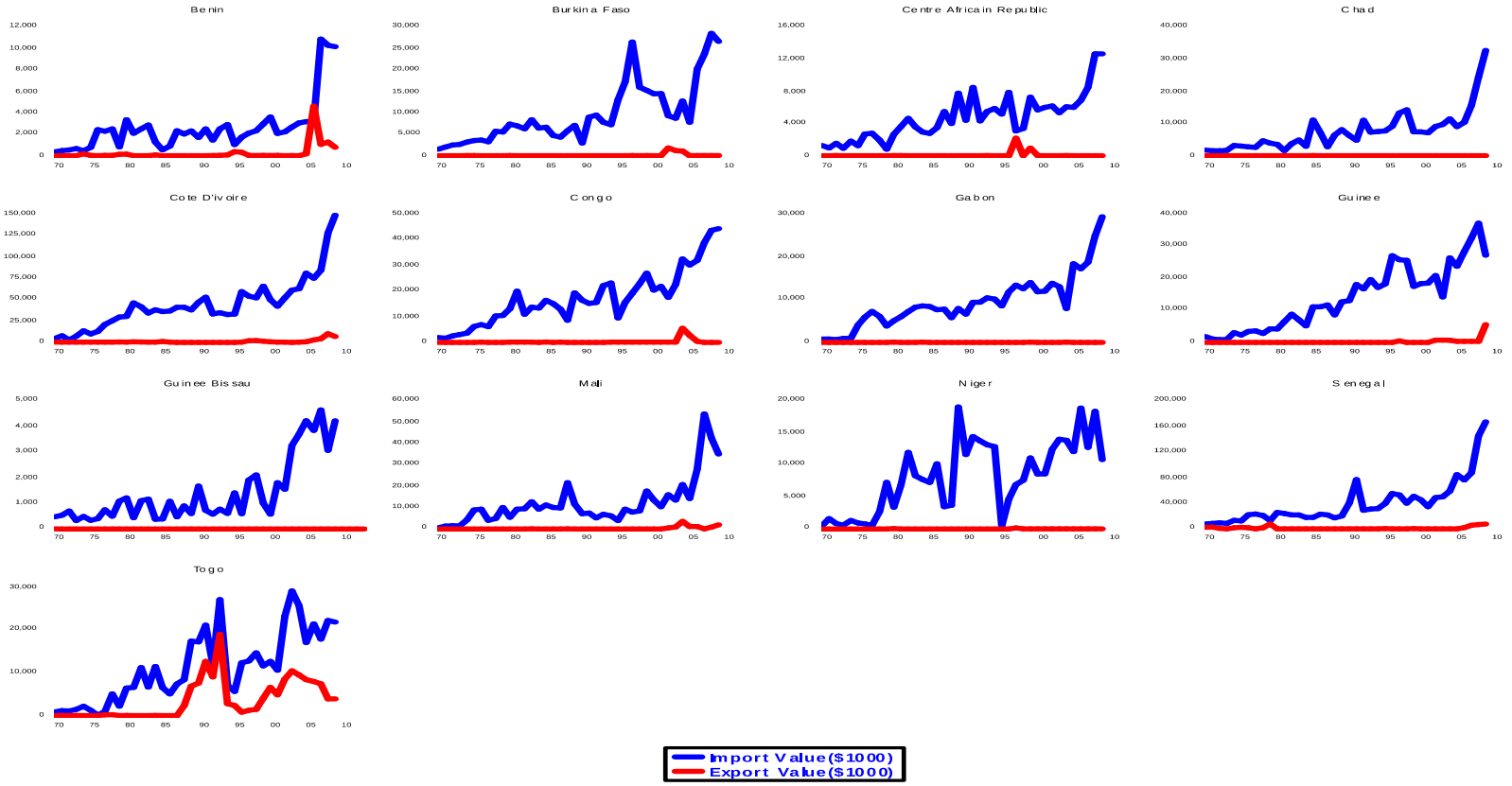


Figure 3: Sugar: Total volume Imported and Exported for all Countries in the CFA Zone from [1969 - 2012]

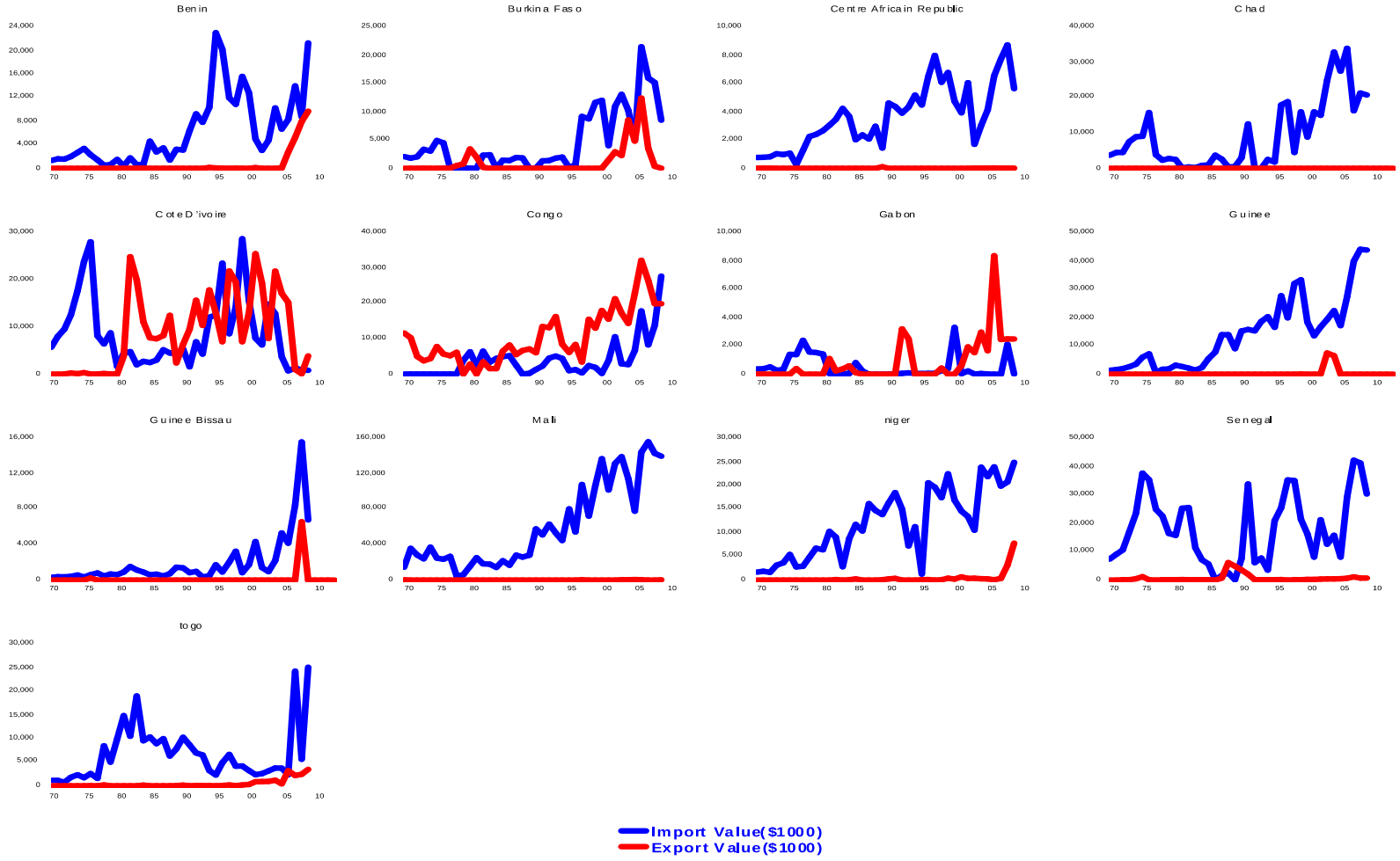


Figure 4: Rice: Total volume Imported and Exported for all Countries in the CFA Zone from [1969 - 2012]

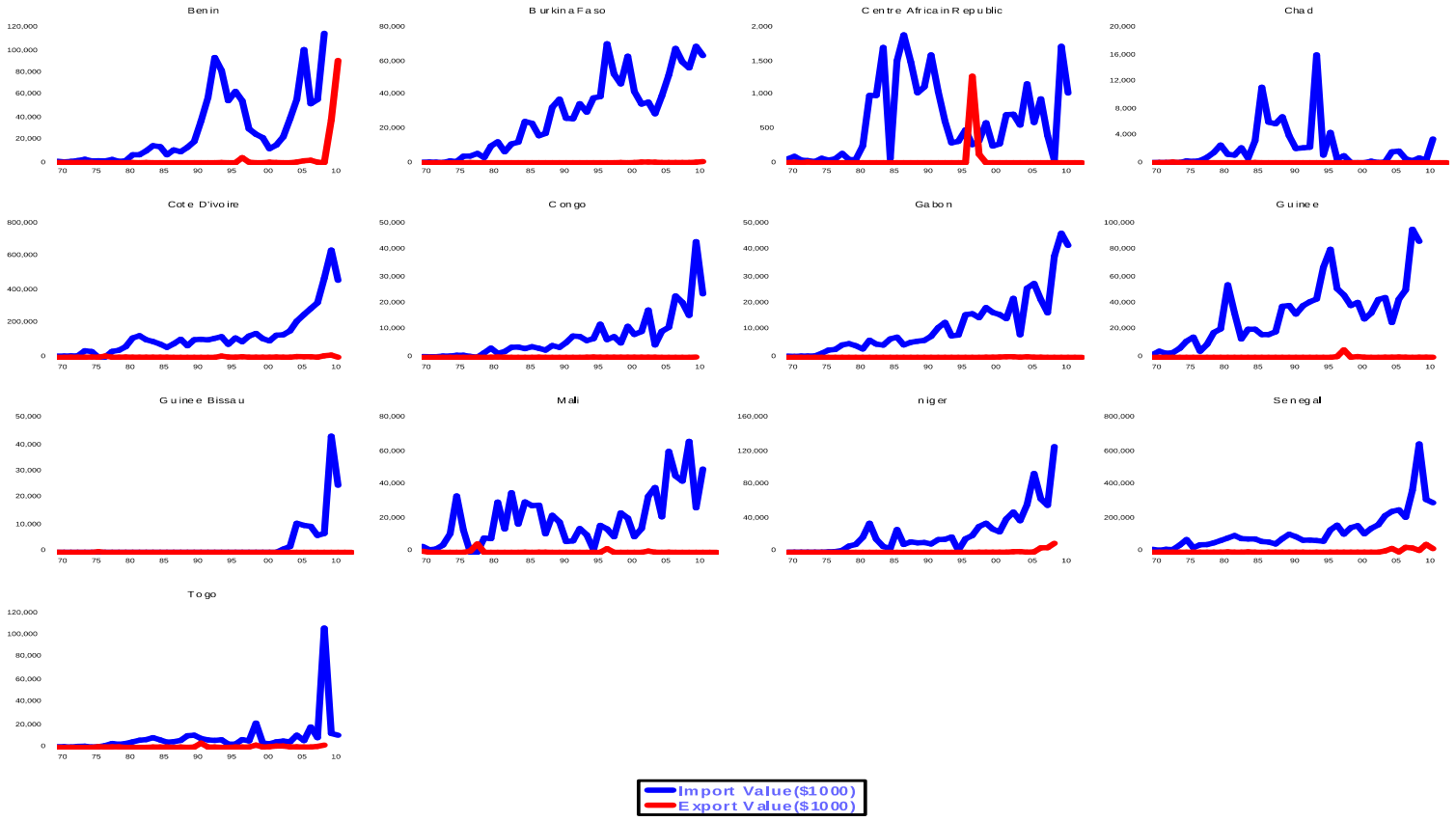


Figure 5: Total volume Imported by Countries in the CFA Zone for: Rice - Wheat - Maize - Sugar from [1969 - 2012]

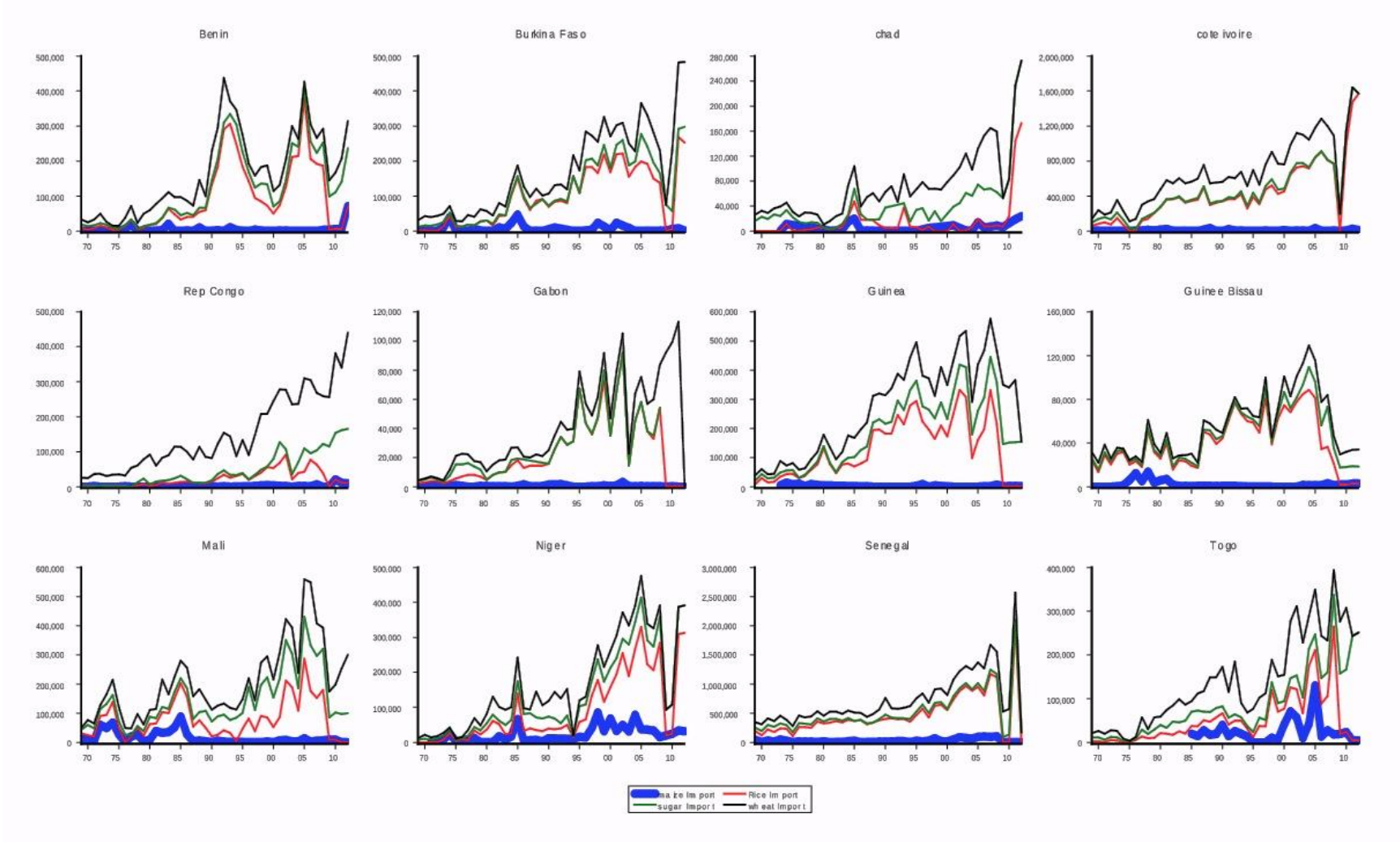
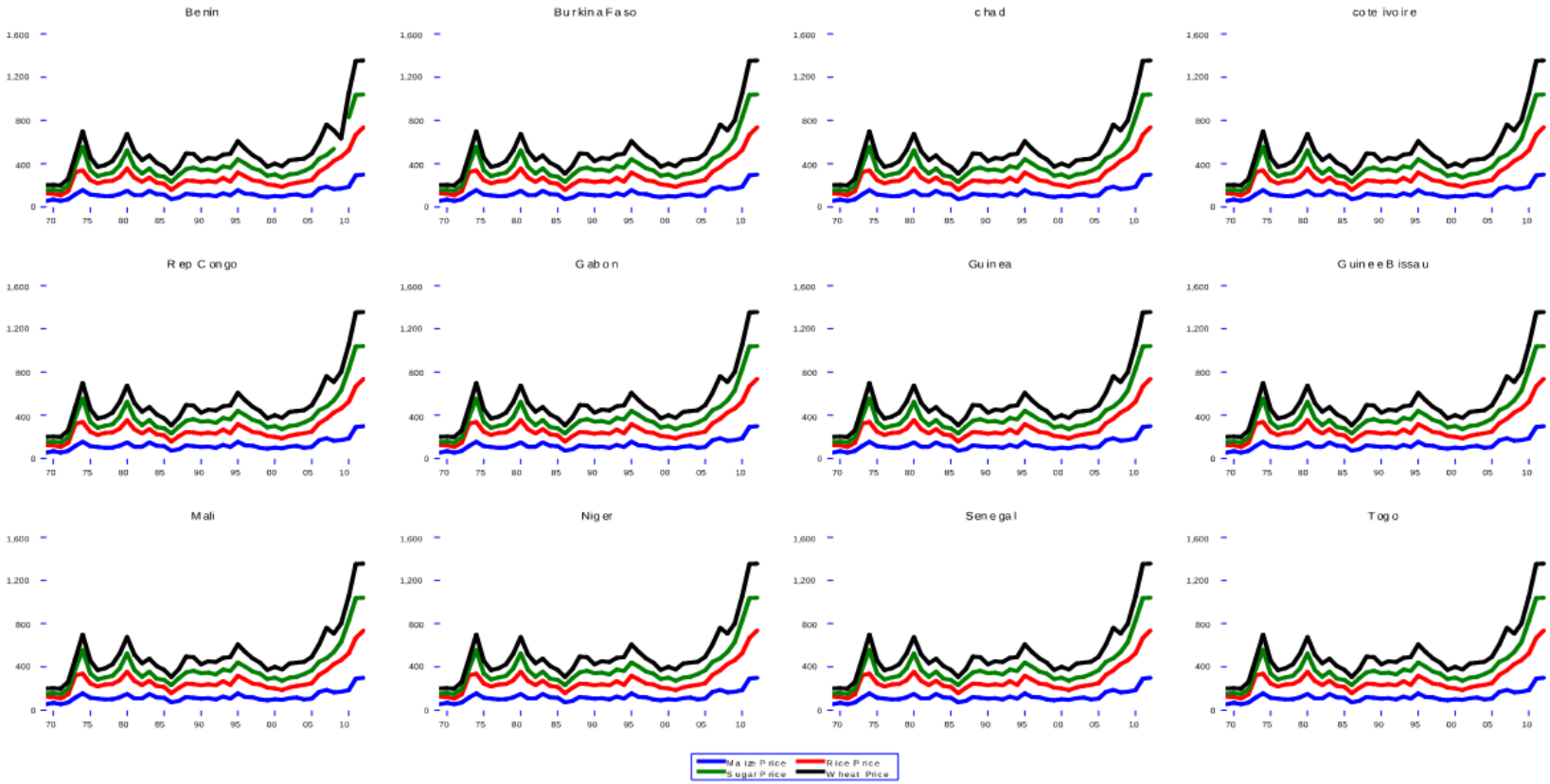


Figure 6: World Price Index of Commodities (Import**) by Countries:** Rice -Wheat - Maize - Sugar **from [1969 2012]**



CHAPTER 2: BACKGROUND

2.1. Macroeconomic Setting of the CFA Zone

This section of the research dwells on the unique macroeconomic features of the CFA zone, which have contributed significantly to the stable economic experiences of Sub-Saharan Africa. Fielding (2002) argues that even though the CFA zone has shown resiliency and consistent gains from the macroeconomic performance, there are significant institutional obstacles embedded within the two monetary unions. Moreover, in the context of the global economy, countries within the institutional framework of the CFA zone (created in 1948) are not immune to exogenous shocks of rising global food prices. Therefore, an understanding of the macroeconomic space and institutional arrangements of the country members of the region is important to this research.

There are four monetary unions in the world and two of them (i.e., WAEMU and CEMAC), which are the focus of this research, are located in Sub-Saharan Africa. The WAEMU and CEMAC were formed in the 1948 regroup with eight countries: Benin, Burkina Faso, Côte d'Ivoire, Guinea Bissau (which sign its entry , 1997) Mali, Niger, Senegal and Togo in West Africa, and the CEMAC regroup with seven countries: Cameroon, Central African Republic, Chad, Congo, Equatorial Guinea (which sign its entry, 1985), Gabon in Central Africa, and the Comoros.

At the macro-level, IMF (2006), and Gulde and Tsangarides (2008, p.3) argue that the arrangement has benefited the CFA zone since, but a variety of monetary, macroeconomics, and institutional reforms are needed to readjust and acquaint with the

new framework of the euro and the debt woes and fiscal challenges in the Euro Zone. According to Saxegaard (2006), "Countries in the union on average have reserves amounting of 13.2% of total deposit with median value estimated at 8.3%"(p. 9). Gulde and Tsangarides (2008) state that "High structural excess liquidity has prevailed in the whole CFA franc zones since the 1994 franc devaluation: capital that had flown the region before the devaluation was repatriated but structural obstacles have been hindering private sector credit growth"(IMF, 2008). Furthermore, many other researcher direct the discussions toward heterogeneity in the preferences for long-run inflation, labor market flexibility, prevalent rate of high level of unemployment in the CFA's region, and a lack of credible fiscal sanctions via three main transmission mechanisms: financial contagion or spill over effects, EMU's fiscal consolidation, and exchange rate swings. Another important feature is also the establishment of an open capital account with no financial sanction/incentive between members of the union.

Against this background, despite the increasing and consistent progress of regional integration, macroeconomic performance and institutional and political stability in the WAEMU region, the central bank is constrained to shift its focus from national to regional macroeconomic policies. Foreign aid seems not to be doing any good, agricultural productions are lagging, international and bilateral trade are insignificant, and growth is only slowly and gradually gaining momentum. Gulde and Tsangarides (2008) state "One of the most peculiar characteristics of the WAEMU is the longevity of the fixed exchange rate regime, which has been among the most stable of such arrangements worldwide" (p. 2). Therefore, inefficient mechanisms to manage cash in the banking

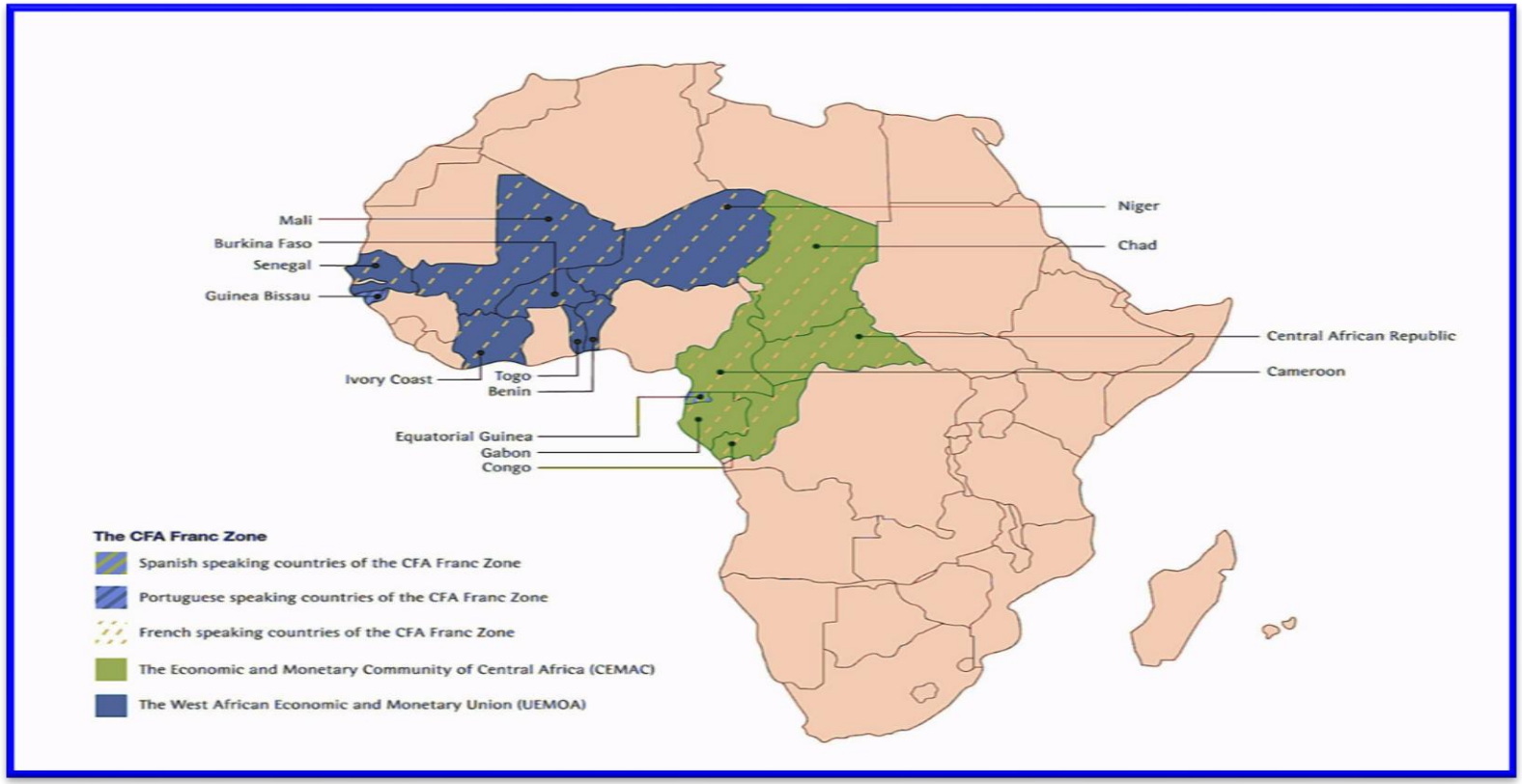
sector, trade deficit, and the countries' government policies make macroeconomic policy more complex and dynamic in the WAEMU and CEMAC of sub-Saharan Africa.

2.2. Institutional Setting of the CFA Zone

According to Gulde and Tsangarides (2008), at the institutional level, the configuration is characterized by three features: First a fixed exchange rate pegged to the Euro, Second a convertibility mechanism guaranteed by the French Treasury who participates in the executive boards of the two regional central banks of the CFA zone. Finally a set of legal and bounded institutional treaties, macroeconomic policies instrumented to ensure regional integration and the sustainability of the monetary union (p. 81). Moreover, the institutional arrangements with France are such that in order to alleviate excessive resource to central banks for financing budget deficits, both central banks are constraint to limit their outstanding credit to each government in the region to about 20% of the fiscal revenues of the past year. Another legal binding arrangement is that the central banks in the CFA zone have their foreign assets uphold at more than 20% of prospect liabilities. In addition, the WAEMU and CEMAC have regional institutions, which supervise and control their banking systems and monetary policy. However, the currency pegged to the euro imposes some constraints on monetary policy, which limits perfect capital mobility: the central banks have to follow the interest rates set by the European Central Bank (ECB). Now within the CFA zone, governments are committed to joint their projects and harmonize their telecommunication and transportation systems, business law, and agricultural and industrial policies to ease cross-border linkages and regional integration, and reduce transaction costs.

Deburn, et al. (2010), Gulde and Tsangarides (2008), and Yinusa (2009) differentiate the huge macroeconomic disparity among countries of SSA and their main institutional arrangements in the monetary system. For example, Gulde and Tsangarides argue that: " One of the CEMAC's members (Gabon) is an oil exporter and that both the WAEMU and the CEMAC face the costs and disruptions of regional conflict and the related political, institutional, and socioeconomic instability in some countries" (p. 15). Political instability and ongoing conflicts in countries such as Cote d'Ivoire, Guinee Bissau (recurrent coup d'état), Mali (recent "terrorists" attacks) and Central African Republic (civil war, 2014) challenge other members of WAEMU and CEMAC not to neglect substantial gains/profits of trade partnerships outside the union, or the question of optimality of the CFA currency in the union. This environment raises concern regarding the capacity of the union to successfully pass three stages: Stage I: Build a macroeconomic framework to suppress internal trade barriers and free movements of persons, goods and services. Stage II: The creation and transition to a single currency. Stage III: Device an irrevocable fixe exchange system of the currencies within the monetary union. (Giovannini 1990, Masson, Debrun, and Pattillo IMF 2010, Barry 1993, Cameroon 1997, and Dyson and Featherston 1999).

Figure 7: Countries of the WAEMU and CEMAC in the CFA Zone of Sub-Saharan Africa



Source: This map representing the WAEMU and CEMAC countries in the CFA zone is adapted from bgafricagroup.com/News-Blog/Blog/Integration-in-Francophone-and-Lusophone-Africa

CHAPTER 3: LITERATURE REVIEW

The literature on food import demand and its policy implications in Sub-Saharan Africa is very scarce, especially for the CFA Zone. However, there are a few studies that look at the issues of food import demand and dependency in developing countries using various methods with different foci (for example, Moran 1988; Faini, et al., 1988; Lopez and Thomas 1990; Egwaikhide 1999; Kargbo 2002, 2005, 2007; Wodon and Zaman 2008; Bayo and Bernard 2012; Huppe, et al., 2013; and Manitra, et al., 2011). To capture the state of the existing literature on food import dependency especially in Sub-Saharan Africa, the literature reviewed is organized into three sections.

3.1. Food Imports: Consumer Welfare and Poverty Impact

This section of the literature review includes FAO's and World Bank reports and addresses food import dependency in Sub-Saharan Africa. The focus of the investigation and analysis is on consumer's welfare, poverty impact, and policy responses in the context of rising international food prices (i.e., the global financial crisis of 2008), and also on trade adjustment policies such as tariffs and quotas (Wodon and Zaman, 2008). For instance, Huppe, et al., (2013) argue that since food prices have increasingly risen in recent years, and it is projected to follow the same trend, exposing food imports to high tariffs barriers will reduce household purchasing power for these commodities (p. 4). Wodon and Zaman (2008) in analyzing rising food prices in Sub-Saharan Africa show that the high poverty rate in Sub Saharan

> Africa is directly associated with the negative impact of food price shocks on poor households' consumers' surplus, which largely outweigh the benefits to poor local producers in the CFA zone (p. 1).

Moreover, the literature shows that for internal policy options, the most well know policy device used in Sub Saharan Africa especially in the CFA zone, is reducing taxes, tariffs or quotas (Mario and Graziosi, 2013, p.6). For external policy options, governments or regional organizations in the CFA Zone target price control and consumer subsidies (Mario and Graziosi, 2013, p. 27). . Furthermore, many studies in West African Economic and Monetary Union (CEMAC&WAEMU) report that inflation has traditionally been relatively low before the food crisis in 2008. A World Bank study by Wodon and Zaman demonstrates that several countries in the CFA Zone have "experienced double-digit inflation in 2008, with tremendous increases in commodities prices" especially on rice, sugar, wheat and maize. In conclusion, these above authors find that in West and Central Africa, "an increase in the price of cereals of 50% could increase the share of the population in poverty by 4.4 percentage points if only the impact on consumers is taken into account" (Wodon and Zaman, 2008, P.11).

Gauthier, et al. 2000 argues that the most common policy device is reducing taxes and tariffs in the CFA Zone (p. 27). In this context one can argues that tax break, tariff reductions on imported staples food in the CFA zone are incline to affect moderately and incongruently rural households consumers, as transaction costs are not flexible and very high in the CFA region. However, other researchers like Wodon and Zaman argue that indirect tax cuts are more likely to have significant impact on urban rather than rural households.

Lopez and Thomas (1990) study the magnitude and scope of food imports and its long term implications on poor households and others macroeconomic variables in the CFA Zone. They show that after the structural adjustment programs, most country in the CFA zone have imposed quotas on import of food in response to the increasing scarcity of foreign exchange coupled with fixed exchange rate, to mitigate the negative impact on households (p. 203). In addition, Lopez and Thomas state that if countries in the region succeed in making the import quotas on food necessary, policymakers in the region can prevent domestic prices of imports from being mainly affected by variations of the international food price (p.196). Consequently, in the CFA region, Lopez and Thomas note that the volumes of import are being reduced significantly, which is putting a downward pressure on macroeconomic variables such as growth rate of gross domestically product (p.197).

The countries in the CFA region have, to varying scale, cut consumption, devalued their real exchange rates, and reduced trade restrictions, which shifted the focus to export growth strategy. As a result, Angelos and Peart (1998), indicate that the expected export revenue does affect the volume of import especially for country in the CFA zone with limited access to foreign assets. Restrictions on import quotas of food within the CFA zone also affect the speed of import adjustment over time (p. 13).

In the same framework, Kargbo (2005), show that countries in the CFA zone continue to witness their per capita domestic food production on commodities such as rice, wheat, maize and sugar declining, coupled with rising volume of food imports and subsequent increase of food prices (p.1). Kargbo demonstrates that “food price shocks have significant impacts on domestic food production and consumption patterns, and

have serious implications for poverty reduction" (pp.205-206). Kargbo (2000) shows that since the volume of food import persists in the CFA region, "price reforms that target food producers at the farm level and stabilization of food prices for consumers are key components of the macroeconomic adjustment packages" (p.207). Lançon and Benz (2007), Keyser (2012), and Dorward, et al. (2003) argue that price reforms, which incorporate flexible price control and subsidies on imported food price in the CFA region, as well as farm inputs like fertilizers and pesticides, have serious implications for poverty reduction especially in the CFA region. (Cited in Kargbo, 2005, p. 207).

3.2. Food Imports: The Impact of Weak Institutions and Conflict on Food Production

This section of the literature review explains food import dependency in the CFA region of Sub-Saharan Africa in relation to food production when institutions are weak and civil wars and ethnic conflict prevalent. For instance, studies like (Kargho (2007), Bazzi and Blattman (2011), and FAO (2005) focus their analysis on the symbioses of factors pertaining to ethnic conflict, urban migration, distortions in the agricultural sector, weak institutions, lack of infrastructure, and macroeconomic adjustment policy on food import. The FAO's (2005) policy brief No.1 finds that, "In as many as 17 countries of the region, conflicts have constrained the flow of food, and, in some cases, it is claimed that food has even been used as a tool to ensure the submission of populations" (p. 2). According to FAO (1997-2005), in Africa and mostly in the CFA Zone, the most cited constraint on agricultural development and food production is weak institution, lack of infrastructure, political instability and armed conflicts (p. 3).

However, Bazzi and Blattman (2011) and many others researchers interested in commodity export/import price shock, investigated how the effect of world price of commodity exports have important impacts on GDP, government spending and investment (p. 2). They argue, "Export price shocks arguably affect conflict only through economic channels such as household incomes or state revenue and food production" (p. 2). Bazzi and Blattman (2011) used price shocks from 65 globally traded commodities, looking at all developing countries from 1957 to 2007 including countries in the CFA Zone. They found a relationship "between oil and mineral price shocks and conflict outbreak, but (like agricultural prices) rising oil and mineral prices

are associated with shorter and less intense conflicts mostly in developing countries in Sub-Saharan Africa" (p. 4). In summary, Bazzi and Blattman found that "Price shocks have no impact on new conflicts, and rising food prices is directly linked to less intense armed conflict" (p. 1).

Looking at agricultural productivity in the CFA zone, if the relationship found in Bazzi and Blattman is strong there are two observations. Whenever conflict strikes in the region, (recent crisis in Mali, (2013) and Cote d'Ivoire (2010-2011)) farmers are displaced, infrastructures are dismantled, and access to market remained hindered, food production declined, which exacerbated the dependency on food import. However, in the literature, the direction of causality between armed conflict, international price shock, food import, and food security is not clear. As Flores (2004) argues "Whilst conflict exacerbates food security, food insecurity can itself also fuel conflict" (p. 2).

Teodosijevicuhi (2003), used "a sample of 38 countries plagued by conflict and civil unrest between the years 1961 and the years 2000, and posits that food production volume on a per-capita basis is on average relatively 10% lower during conflict and" post-conflict compared to five years before conflict especially in West Africa (p. 11). This study also showed that in the CFA zone, the impact of political instabilities, regional conflict and civil unrest on domestic food production greatly affect the dietary needs and food intake of poor rural household in West Africa (cited in Flores (2004, p. 6). Furthermore, Flores showed that for West Africa, especially in the CFA region, these results are true and confirmed (see table 1 in Flores (2004)).

Sierra Leone and Liberia are leading, followed by Benin, Burkina Faso and Guinea, which have demonstrated considerable progress by significantly increasing

daily calorie supply and food intake and dietary needs of poor household. Flores (2004) contends that, "The import capacity in countries in the CFA zone is systematically linked to the level and diversification of exports" (p. 7). In addition, Flores found that "for countries where one commodity provides more than 20% of total export revenue, food import is very much dependent on international market prices" fluctuations (p.7). For instance, according to Flores, "this is the case of Guinea-Bissau (cashew nuts, 97% of total exports); Benin (cotton, 36%); Burkina Faso (cotton, 35%); Côte d'Ivoire and Ghana (cocoa beans, 23% and 21%)" (Flores, 2004, p .7).

In 2008, Burkina Faso and Senegal in 2008 experienced violent food riots, protesting for shortage of food. Scholars such as Mirza (2011) found that "The dependency of food from abroad in the CFA zone is intrinsically tied to world food prices and shortages of food around the globe (p.1)." Therefore, even though weak institution and ethnic division play a central role in food production, international price shock seems to be a determinant at least for the CFA region.

Teodosijevicuhi (2003) in response to Flores (2004) and Mirza (2011) argues "in at least 32 countries people suffered from malnutrition, poverty-related limitations in access to food, and acute food shortages as a result of armed conflict."(p. 9). Moreover, Teodosijevicuhi (2003) used a sample of 38 countries which include those in the CFA region from 1961 to 2000 and finds that "per-capita food production volume are about 10% lower during conflict, and in the five years after the conflict, than in the five years before conflict" (p.11). Teodosijevicuhi (2003) concludes that even though food imports keeps increasing during conflict, food aid also increases rapidly to substitute food production in the CFA region (p. 12)

Fennell (2009) joined this discussion by highlighting the difficulty that pertains when measuring food production in relation to weak institutions. Fennell argues, "Despite the challenge in measurement, Sachs and Warner (1997) show that countries in the CFA region can attain an annual per capita growth of 4.3% in food production instead of 0.8 % if growth-promoting polices and weak institution are strengthened (p. 5). Fennell (2009) argues that Fulginiti et al. (2003) and many econometric studies invoke that institutional factors have a substantial impact on food production (p.6). Fennell asserts that based on a set of 41 sub-Saharan countries from 1960 to1999, Fulginiti et al. (2003) show that 19 ex-British colonies in Sub-Saharan Africa had a better total factor productivity, 14 ex-French colonies in the CFA zone had an intermediate results on total factor productivity and the differences are due to the estimated effects of conflicts and weak institutional settings (p. 6).

3.3. Food Import Modeling: Determinants and Empirical Estimation Methods

This section of the literature review in this research, investigates the progress of the theories, empirics, and estimation methods of food imports in the short and long run in developing countries especially in the CFA zone. Generally, in the literature reviewed, all the studies that investigate the determinant of import demand, find its foundations in the traditional approach developed by Hemphill (1974). Moran (1986, 1988) revised Hemphill (1974) and extended the model, which was later empirically tested by Sun-Dararajan (1986), Winters (1987), and Faini, et al (1988). Following these authors, almost all of the research carried out on food import modeling in Sub-Saharan Africa adopted and expanded the traditional import demand models of Hemphill (1974).

Hemphill (1974) demonstrates that import demand is determined by foreign

exchange obtainability, and relationships of short-term reaction to disequilibrium are based on the specification of the import-exchange equation**.** Moreover, Hemphill argues that most "empirical and theoretical studies of aggregate import behavior show the flow of imports to be determined chiefly by aggregate economic activity and by import prices relative to prices of domestically produced" (p. 637). However, for developing countries, Hemphill indicates that this relationship is uncertain and leaves a lot of critiques because of the impact of trade and exchange restrictions. But the understanding is that, these anomalies and critiques on the import demand functions are only valid for developed nations where import demand is characterized by producer goods, capital apparatus, grain conservation, and imported semi-final goods, which have no domestic substitutes whatsoever.

A pioneering study by Moran shows that "The traditional model of import behavior which looks only at GDP and real import prices as explanatory variables, failed to predict or explain the developing countries' import slumps in the early 1980s" (Moran, 1998, p. 2). A recent study by Kargbo (2005) suggests that to unpack the effects of both real and nominal price fluctuations of commodities prices in the region (SSA), and the dynamic process of long-term memory of food price behavior, a vector error correction model (VECM) is required (p. 207). Moreover, Kargbo (2005) argues that the methodology "is very useful from a policy perspective and has gained wide applications in the economics literature (for example see Sims, (1980); Oden (1986); Davidson and MacKinnon (1993); Johansen (2000), cited in Kargbo 2005, p .3)". Additionally, like Johnson (1994) and Jaeger and Humphreys (1988), the authors pursued the argument by stating that prior studies on policy impact in Sub-Saharan

Africa and especially in the CFA zone have not yet embraced this optic of inquiry practically (2005, p. 3).

The extensions and applications of the recent studies on the food import demand model and food security in SSA are far from being exhaustive. That situation is typical of CFA zone countries where export earning is very volatile (see figure 1-5), access to foreign reserve is limited, and foreign exchange constraints and customs union are not harmonized. This is due to the fact that countries in the CFA zone have borrowing constraints; limited access to foreign exchange and poor macroeconomics management in addition to chronic structural imbalances. Therefore, countries in the CFA zone need to curtail import demand under rising world commodity prices, even for basic cereals.

However in Sub-Saharan Africa, commodity price shocks (positive/negative) are still poorly managed, and a typology of African countries pinched on the data used in this research from 1969 and 2008 shows that the state of Africa food import dependency is not homogeneous across countries in Africa, even though they present the same trend. Policymakers in the CFA zone are struggling to devise policies that promote growth in productivity, regional and international trade, and macroeconomic stability. Wodon and Zaman (2008) show that "An increase in food prices will have uneven impacts across countries and population groups" (p. 7). Consequently, CFA's countries producing oil and refined oil products for instance Gabon are more likely to have better terms of trade than those that are net food importers to satisfy domestic demand. The implication of coordination/harmonization framework of the WAEMU under foreign exchange constraint and food import should therefore be of paramount interest to policymakers in Sub-Saharan Africa (SSA).

While many studies have looked at commodities dependence from the export revenue side in Africa, there are very few studies addressing the issues pertaining to food import dependency and food trade deficit and its policy implications in the context of customs union, tax coordination, and fixed exchange rate constraints in West Africa (WAEMU & CEMAC). The contribution of this study lies on evaluating policy options and the sensitivity of the variables in the context of subsequent rising food prices (exogenous) and increasing dependency of food import in countries in the CFA zone. The impact of rising food prices under foreign exchange constraints in the CFA zone entails macroeconomic imbalances. The impact on the population is irrevocable, as households will be forced to switch to fewer foodstuffs to substitute for the basic food intake.

This research adopts the parsimonious VECM model of import demand function derived by Moran (1988) and Faini, et al. (1988), and applied empirically by Kargbo (2007) for Sub-Saharan Africa, which departs from Hemphill's (1974) theoretical foundation, and goes beyond the traditional approach of import demand function. Investigating the link between food import, food production, relative commodity prices, GDP, trade policies and macroeconomics stability in the CFA zone for major commodity imports under customs union and regional tax harmonization is needed more than ever for policy option recommendations. According to Egwaikhide (1999), evidence from numerous regression models using VECM indicates that terms of trade, real income (GDP) and the index of trade restriction have very good parameters estimates (p. 9). Bayo (2012) shows that the VECM provides a useful policy barometer through the error correction term, which is in fact the most consistent determinant of imports (p. 63). In

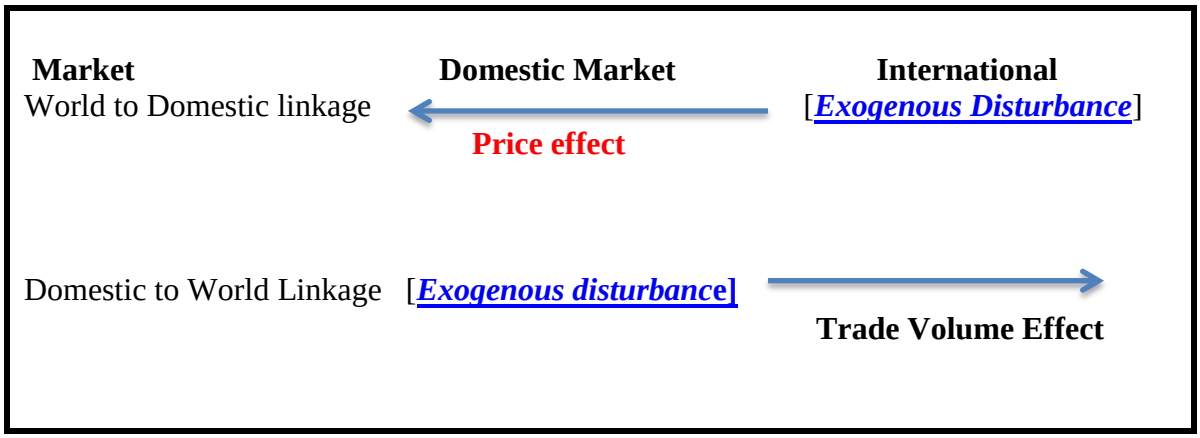
addition, Bayo demonstrates that the speed of adjustment reflects the relative importance that policy makers in a particular regime place on the various import policies options.

CHAPTER 4: THEORETICAL FOUNDATIONS OF THE MODEL AND THE CONCEPTUAL FRAMEWORK

This chapter deals with the theoretical foundation and conceptual framework, and lays the foundation of the research that leads to the determination and specification of the functional form of the model. Across spatially separated markets, if imports react more sensitively than exports to trade liberalization, it is very important for policy makers, as in the CFA zones, to accurately model past present and future import demand for food such as rice, wheat, maize, and sugar.

Figure 2 depicts how the world market of agricultural commodities is linked to domestic market and affects a country's volume of trade via the effect or channel of an exogenous shock and vice-versa. However, in the literature, there are few countries with which domestic markets directly affect world market via an exogenous disturbance. Blandford argues the domestic-world linkage conditions which show how changes in the domestic market affect the international market through the impact of an exogenous domestic disturbance on a country's volume of trade has not received much attention (p. 2). For countries in the CFA zone, there are significant implications for which changes in domestic market have substantial effects on international markets as CFA zone rising consumption of rice, wheat, maize and sugar have the potential to significantly impact world demand of these commodities. However, it is without doubts that figure 2 does not fully captured the complexity and subtlety of the complexity of world relationship among countries under trade liberalization.

Figure 8: The Two Components of Domestic International Market Linkage in spatially separated markets



Source: David Blandford (1986). Modeling the Linkage between Domestic and International Markets, No: 86-24

According to economic theory, there are different perspectives and methods of modeling exports and imports demand. According to economic theory, the appropriate model depends on whether or not the objective or purpose of the model is to test a hypothesis or to forecast. Also the modeling depends on data availability/shortage, the level of aggregation/disaggregation, and finally the type of goods traded. Moreover, according to Hemphill (1974), Khan (1974; 1975), Arize and Afifi (1987), and Moran (1988) the major components of the import demand framework can be classified into three categories. The traditional aggregate trade volume import model, the aggregate import exchange model, and the monetarist approach of modeling aggregate import. For the purpose and context of this research, it is important to note that when we talk about aggregate import of food, we refer to total quantity or total trade volume of imported homogeneous goods such as rice, wheat maize and sugar in the CFA zones.

The traditional aggregate (trade volume of commodities in this research) import model is conceptually similar to other demand models based on consumer demand

theory. According to Murray and Ginman (1976), "price and quantity are assumed to be inversely linked (ceteris-paribus), to the equilibrium price and quantity determined by the interaction between supply and demand" in the market (p. 75). Even though many researchers theoretically criticize the traditional model because of identification issues, the problem has been solved in international trade by assuming that supply elasticity is infinite, and homogeneity of degree zero in price and income.

Murray and Ginman (1976) state that the assumption is when firms are not using their full capacity; change in output takes place without changes in price (p.75). Consequently, if there is a slack in demand, then firms will suppress production but not price. The rigidity in price is explained by the fact that in noncompetitive sector of the economy, firms are very sensitive to any price change by their market competitors. In this framework, firms will change price only when they reach their full capacity. Thus, the supply curve in the sector of the economy is horizontal or flat until the full capacity of output is reached, leading to an infinite elasticity of supply when the level of employment is not full in that sector of the economy. This assumption resumes and calibrates the traditional model to a single functional equation and the coefficients could be estimated using:

$$lnQ_t = (\delta^1; Y^{\delta^2}; P^{\delta^3}; e^{\varepsilon}) \qquad (1)$$

where, Q_t is the quantity of total import, and Y is real gross domestically product (GDP), P represents the import price index, and e is the base of the logarithm. δ^1 represents the constant term intercept, δ^2 and δ^3 are the income and price elasticity and finally ε is the stochastic disturbance assumed to be IID (identically and independently distributed). Following the authors, by linearizing equation (1) the traditional aggregate import

demand is specified as:

$$lnQ_t = \delta^1 + \delta^2 \ln(Y_t) + \delta^3 \ln(P) + \varepsilon \qquad (2)$$

The aggregate import exchange framework assumes that foreign exchange availability is positively related to all type of imports. The theory assumes that import demand is only possible when foreign exchange is available. Hemphill (1974) in his paper "The effects of foreign exchange receipts on imports of less developed countries" developed a framework where he argues against the limitations of the traditional model to track and explain the declining rate of imports for countries that are constraint by foreign exchange limitations (also see Mirakhor & Montiel, 1987 and Simon Harvey 2011). Hemphill (1974) argues that since indices of import prices are usually derived from foreign supplier prices, then the price impacts of trade and exchange restrictions imposed by the importing country are missing (p. 637). According to Hemphill, the argument justifying the relationship is that usually demand for foreign exchange surpasses supply of foreign exchange for a given preexisting exchange rate level. Subsequently, the stock of reserve assets is quasi insignificant. In this framework, if export revenues decreases and/or capital inflow declines, the policy makers of developing countries have no other choice left but to restrict import in the short run and vice versa for import (p. 639).

One might argue that this assertion ignores the validity of excess demand for foreign exchange, because according to Hemphill restrictions could be used when the level of exchange rate is at its long-run equilibrium value. In the same token, Hemphill posits that this line of argument neglects the opportunity to finance imports from foreign exchange reserves receipt in the short-run as well. Therefore, the theoretical relation between aggregate imports and foreign exchange receipts is introduced in the reduced

form, where the lagged level of international and foreign exchange receipts are the principal components of imports demand function specified as:

$$m_t = \theta_0 + \theta_1 IR_t + \theta_2 R_{t-1} + \theta_3 m_{t-1} + \varepsilon_t \qquad (3)$$

where m_t, y_t, IR_{t-1}, m_{t-1}, and ε_t are the actual volume of total imports, the lagged level of international reserves, the lagged level of total imports, and the error term, respectively. The error term is assumed to be i.i.d (i.e. independently and identically distributed).

However, the particularity of this model is that Hemphill did not take into consideration the relative prices of commodities and national income, which are important for developing countries like those in the CFA zone. Given this limitation, Moran (1986, 1988) expands the model by introducing variables from the traditional aggregate import model such as GDP and relative prices, to correct for omissions biases. Moran expanded Hemphill model and re-specified it as:

$$lnm_t = \theta_0 + \theta_1 lnIR_t + \theta_2 R_{t-1} + \theta_3 lnm_{t-1} + \theta_4 \ln\left(\frac{p^{imp}}{p^d}\right) + \theta_5 lnY_t + \varepsilon\_t \qquad (4)$$

where here Y_t, and $\ln\left(\frac{p^{imp}}{p^d}\right)$ are the GDP and relative price of imported goods over the domestic price of their substitute. Equation (4) represents Moran's extension of the basic import model with exogenous prices. In relation to the traditional aggregate import model specified before in this section, we can set $\theta_1 = \theta_2 = 0$ in equation (4) and obtain the traditional model of aggregate import demand.

The particularity of this model is that both Moran and Hemphill did not take into consideration the role of money in relation to market prices of imports. As a result, the monetarist approach of modeling aggregate imports took another approach by introducing the state of equilibrium in the money market as a major determinant of aggregate import

demand (see, Ozo-Eson 1984 cited in Harvey (2011, p. 20). According to Harvey (2011), Ozo-Eson derived a reduced form of the aggregate import demand model with a distributed lag of money supply, assuming a partial adjustment mechanism of the demand for real money balance (p.13). In this monetary framework, pure income elasticity of import demand is equal to the sum of the income elasticities found by the traditional framework (presented earlier in this section) and the income elasticity of money demand. Many researchers argue theoretically that the traditional aggregate import demand model underscores the pure-income elasticity of import demand (Harvey, p. 232). Consequently, according to this view, a reduction in money supply is more likely to decrease aggregate import.

Within, these frameworks, the traditional aggregate import model, constitutes the main or benchmark theoretical framework for this research. According to Khan (1974; 1975), the traditional aggregate import model suggests that the aggregate imports demand be entrench into the consumer demand theory. As a result the conceptualization of the aggregate import demand links the real quantity of commodities/goods imports demanded in country ***j*** to the ratio of import prices over the domestic prices and real income for all ***t*** (time). But, the most important underlying feature here is that this theory assumes a certain degree of substitutability between imports and domestic commodities/goods, and homogeneity of degree zero in prices and income, which underlies the non-existence of money illusions (Arize and Afifi 1987, cited in Sedegah and Harvey 2011, p.17).

Moreover, Labys (1973), Varian (1992), and Henderson and Quandt (1980), assuming that aggregate import demand behavior to be time invariant, argue that consumer demand theory is well suited to determine and specify a static relationship and

explain aggregate commodities import demand based on maximizing consumer utility, given a set of budget constraints. By solving the utility maximization problem, we generate a set of solution leading to a set of demand equation such that:

$$Qimp_{it} = q_t\left(Pcom_{jt}\,;\, p_1\,;\, p_2\,;\, p_3 \ldots p_n\,;\, y_{jt}\right) \qquad (5)$$

$Qimp_{it}$ is quantity demanded, and $Pcom_{jt}$ represents the price of the commodities, $p_1\,;\, p_2\,;\, p_3 \ldots p_n$ the price of others conmmodities, and y_{jt} represents income.

Also, there are other forms of consumer demand theory derived from a utility function, which is assumed to be separable (Chambers 1988), but for the scope of this research, we did not dwell into those as well as other restrictions imposed on demand equations, derived from the utility maximization approach such as "cournot" aggregation and "cournot" quantity setting equilibrium, "slutsky" symmetric conditions, Engel aggregation, and so forth (Chambers 1988 and Andino 1993). In this framework, the international trade theory of aggregate (trade volume) import demand distinguished two major theoretical framework to model aggregate food import: the new trade theory known as the imperfect (Marshallian, Chamberlinian, Cournot approaches) and perfect competition theory of trade (Hong 1999, Xu 2002, and Goldstein and Khan 1985)

Furthermore, international trade theory offers two general models of trade: perfect and imperfect substitutes, which are often seen as contenders or complements in modeling aggregate trade volume import, or exports demand under trade liberalization. On one hand, according to Goldstein and Khan (1985), the model of imperfect substitutes is mostly used for aggregate import dealing with manufactured goods and assumes that "neither imports nor exports are perfect substitutes". On the other hand, Goldstein and Khan (1985) posit that in the perfect substitute model, each country **j (**j = 1, 2, 3 . . .) is

either an importer or an exporter of the traded commodities but not both at the same time. Moreover, the perfect substitute model assumes perfect substitutability between domestic country **j** and foreign commodities and this model is of paramount interest for this research dealing with CFA zones.

The argument is that the in an imperfect model, imports and exports to/from the rest of the world cannot be defined as perfect substitutes for domestic production of the commodities such as rice, wheat, maize, and sugar for instance. The following example sketches an import-export demand equation model of imperfect substitutes to illustrate Goldstein and khan (1985) system of equation characterizing the imperfect substitute model.

$$\{Q_j = \mathcal{F}(Y_{J;}\, P^W; P^J)\} \qquad (6)$$

$$\{X_j = \mathcal{G}(Y_{W;}\, P^I; P^W)\}$$

where $Y_J \ and \ Y_W$ represent the GDP of country **j** and GDP of the world. $P^W \ and \ P^I$ is the price of domestic commodity produce in country j and the price of imported commodities from the world. According to Goldstein and Khan (1985), consumer in country **j** maximizes utility with respect to budget constraints and the solution yields equations of import and export as a function of income in country **j**, the imported commodities own prices, and the price of domestic substitute in country **j**.

However, Goldstein and Khan (1985) demonstrate that different to the system of equation characterizing the imperfect substitutes model, the perfect substitute model does not need a separate or individual import/export demand or supply function. In this framework, the focus is to determine the link between international market and domestic market via the elasticity of import demand relative to world price index of commodity

imported, for instance in the CFA zones. Therefore, assuming that import and domestically produced rice, wheat, maize or sugar are perfect substitutes, we can derive excess demand elasticity for each market such as rice, wheat, maize, or sugar in country **j** of the CFA zone.

Following Blandford (1986), total excess import from a country under the perfect substitute model is defined as:

$$Q_{imp} = Q_{dJ} - S_J \qquad (7)$$

where: Q_{imp_t} is the total quantity import and Q_{dJ} is quantity demand in country j and S_J is the total supply of commodity domestically produced in country **j.** Therefore, given the price P we have: $\frac{\partial Q_{imp}}{\partial P} = \frac{\partial Q_{dJ}}{\partial P} - \frac{\partial Q_{dJ}}{\partial P}$ equivalent to

$$\frac{\partial Q_{imp}}{\partial P}.\frac{P}{Q_{imp}} = \frac{\partial Q_{dJ}}{\partial P}.\frac{P}{Q_{imp}} - \frac{\partial S_J}{\partial P}.\frac{P}{Q_{imp}}$$

$$= \frac{\partial Q_{dJ}}{\partial P}.\frac{P}{Q_{dj}}.\frac{Q_{dj}}{Q_{imp}} - \frac{\partial S_J}{\partial P}.\frac{P}{S_j}.\frac{S_j}{Q_{imp}}$$

$$\text{Hence,} \qquad \eta_{Q_{imp}.p} = \eta_{Q_{dJ}.p}.\frac{Q_{dj}}{Q_{imp}} - \eta_{S_J.p}.\frac{S_j}{Q_{imp}} \qquad (8)$$

Then the elasticity of excess aggregate total import demand, given exogenous world prices of rice, wheat, sugar and maize, is equal to the difference between the elasticity of domestic demand of the commodity, weighted by the ratio of demand imports of the commodity, over the elasticity of domestic supply of the commodity, weighted by the ratio of supply to imports of the commodity. According to Blandford (1986), equation (8) holds under the assumption that no differentiation is necessary between domestic and world prices. Consequently, the elasticity of price transmission from the world market to domestic market is unity ($\eta_{pp^w} = 1$), which clearly reveals the dual impact of price

adjustment in domestic supply and demand on total or aggregated quantity imports for the CFA zone on homogeneous commodities such as rice, wheat, maize, and sugar.

Since in this research the CFA zone presents a unique case in the world in term of its dependency of food imports for the selected commodities, import/export or demand/supply does not depend on price differentials between domestic markets in the CFA zone and the foreign commodities in the global markets for rice, wheat, sugar, and maize (Goldstein and khan, 1985). Consequently, the demand for imports in this research represents the excess demand for the domestic commodities in the CFA zone for each commodity.

For the purpose of this research, to estimate the aggregate import demand for perfectly substitutable and homogenous commodities, imports are perceived as residuals (Goldstein and Khan, 1985). Most importantly in this research, given that all prices are expressed in the same currency, i.e., US dollars, and that transaction costs, storage costs, processing costs, and others trade barrier costs are controlled, we only care about one traded commodity price, which is the world price (WPRICE**)** index in the conceptual framework of perfect substitute model (Goldstein and Khan, 1985). Therefore countries in the CFA zone could affect the world prices of the traded commodities such as rice, wheat, maize and sugar, depending on the extent to which they affect the world demand/supply. Moreover, Blandford (1986) indicated that Jabara (1982) in modeling wheat import demand among middle-income developing countries showed that excess demand equations have typically been based upon time series data.

Jabara (1982) highlighted that in time series applications, the perfect substitute model is expressed as:

$$M_t = f(P^w;\ Y;\ Z) \qquad (9)$$

where Y is GDP (income), P^w represents world prices index, and Z denotes others exogenous factors. As in the imperfect substitution model, the question of price transmission process is very complex because without an explicit specification of the underlying structural assumptions it is not clear what the coefficient might encompass (Blandford, 1986; Senhadji and Montenegro, 1999; Goldstein and Khan, 1985).

The advantage of using the perfect substitute of direct estimation approach for the CFA zone lends this research the possibility to incorporate the dynamic properties of the data, in particular the lagged responses which greatly affect the relationship between trade volumes and domestic or international variables (Blandford 1986, p. 8). However, even though the lagged response is specified in ad hoc manner, without mentioning the structural and policy parameters which could create rigidities, Blandford argues "it is frequently been found that a better explanation of response (in a statistical goodness of fit sense) can be achieved by incorporating lags."(p. 9).

In this research, the directly estimated excess demand functions are embodied in the functional form, both the types of market linkage and world linkage through world price, and domestic factors such as domestic production in the CFA zone for each commodity such as rice, wheat, maize, and sugar. In the very insulated market like CFA zone where government pricing and price support policies have significant effects like homologate, this functional forms reflects the statistic that domestic production is essentially predetermined at time **t.** Also, domestic production affects inventory response, which in turn affects imports (Blandford, p. 9).

The aggregate trade volume excess function is this framework can be used by

policy makers in the CFA zone to reflect government intervention at the margin via state trading, import licensing, or foreign exchange control, as argued by Blandford. For instance, Africa Rice Center's report (ex-WARDA) (2007) states "the global rice export market is thin, with only 7% of global production traded on the international market". Moreover, many researchers found attest that the world market of rice is highly concentrated with five leading rice exporters (Thailand, Vietnam, India, USA, and Pakistan) with more than 66% of global rice exported in the world market. The report posits "since African rice imports represent a third of the total quantity traded on the global markets, all major rice exporters value" highly and responds quickly to the African domestic markets. FAO (2006) reports that 1/5 of the top 10-world rice importers in 2006 are in the CFA zone (p. 9).

To conclude this section, many theoretical researchers such as Blandford (1986), demonstrated that "In the past, it has often been argued that direct estimation of an aggregate (trade volume) import equation was a somewhat suspect short-cut alternative to the estimated of a complete set of structural equations like the imperfect substitutes model." However, they have demonstrated that this is not the case for developing countries like the CFA zone facing foreign exchange constraints or running with state trading regimes.

4.1. Model Specification

Small open economies of the CFA zone of Sub-Saharan Africa with a lot of constraint to trade with the rest of the world are concomitant with less economic incentives. Empirical models that do not take into consideration the impact of import constraints and harmonization or homologation of prices and customs union in the CFA

zone are not effective. Countries in the CFA zone are subject to a foreign exchange constraint since December 26, 1945, and have experienced a devaluation of their currency (CFA) two times in 1948 and 1994. For instance, Faini, et al. (1988), show that "econometric evidence that does not allow for the impact controls cannot be used reliably to assess the effect of devaluation on trade balance (World Bank, 1988, p. 2)." According to the literature (e.g., Hemphill 1974, Goldstein and Khan 1985, Faini, et al. 1988, Moran 1988, Antzoulatos and Peart 1998, Modisaatsone and Motlaleng 2013), there are mainly three approaches or options in modeling and estimating import demand: First, an import demand model under import controls that is relatively stable over time; second, an import demand model under foreign exchange availability; and third, an import demand which incorporates the quantitative restrictions of recovering structural demand parameters (see Faini, et al., p.2). However, this research departure from Moran's Benchmark and parsimonious model of aggregate import demand which is specified as (Moran, 1988):

$$\ln\mathrm{FODIM_{it}} = \mathrm{H_t}(\mathrm{P_{it}}, \mathrm{P_{it}^s}, \mathrm{PFOOD_{it}}, \mathrm{GDP_{it}}, \mathrm{REER_{it}}, \mathrm{OPEN_{it,}}\mathrm{DOM_{it}}) \qquad (10)$$

where $FODIM_{it}$ is import demand in country j, t = 1, 2 . . . T, $PFOOD_{it}$ is real price index of cereals in year t = 1, 2 . . . T, GDP_{it} is gross domestically product in country j, t = 1, 2 . . . T, P_{it}^{s} is price of domestic substitute, t = 1, 2 . . . T, P_{it} is aggregate price index, t = 1, 2 . . . T, $MREER_{jt}$ is real effective exchange rate in country j, t = 1, 2 . . . T, $DOMPF_{jt}$ is domestic food production in country j , t = 1, 2 . . . T, and $OPEN_{jt}$ is openness to trade in country j, t = 1,2 . . .T. Equation (1) has its validity and framework in the following set of assumptions (Moran, 1988):

Proposition 1: The function H_t is assumed to be independent of time and H_t is a log-linear homogeneous of degree zero, i.e., the no money illusion case. After taking the log on the left and right hand side, we can write:

$$lnFODIM_{it} = \beta_0 + \beta_1 \ln\left(\frac{P_t}{P_t^s}\right) + \beta_2 \ln(GDP_{jt}) \qquad (11)$$

where the expected signs are $\beta_1 \leq 0;\ \beta_2 \geq 0$ and real GDP

Proposition 2: The variable total import instead of per capita import is assumed to be the correct index to adopt in the import function.

Proposition 3: The aggregate domestic price is proxies by the GDP deflator (P_t), which is assumed to be appropriate for domestic substitutes. Moreover, this is relevant for this research because for the CFA countries, household have absolute preference for imported goods/food to domestic good/food in the urban, regional, and rural location.

Proposition 4: The model assumes that food import demand in the CFA zone adjusts with a lag to the anticipated quantities based on a simple "partial adjustment" mechanisms and is specified as follows:

$$\Delta \ln FODIM_{it} = \varphi(\ln FODIM_{it} - lnFODIM_{jt-1}) \qquad (12)$$

$$\text{Where } 0 \leq \varphi \leq 1$$

Proposition 5: Up to this stage, the foreign exchange constraint can be ignored safely given that the real price of imports is exogenous, such that each individual country in the CFA zone can face an infinitely elastic import supply function (Moran, p.5). According to Moran and Pritchett, based on proposition 1 to 5, the import function can be specified as follows:

$$lnFODIM_{it} = \theta_0 + \theta_1 \ln\left(\frac{P_t}{P_t^s}\right) + \theta_2 \ln(GDP_{jt}) + \theta_3 \ln(FODIM_{jt-1}) + \theta_t \qquad (13)$$

Where, $\theta_1(\beta_1\varphi)$, $\theta_2 = (\beta_2\varphi)$ are now the short-term price and income elasticity, respectively given that $\theta_i = 1 - \theta_3$ and the long-term elasticities are:

$$\alpha_{1it} = \frac{\theta_1}{1-\theta_3}\,;\ \alpha_{2it} = \frac{\theta_2}{1-\theta_3}$$

Against this theoretical framework, equation (4) represents the benchmark model after Moran (1986-1988). However, given the scope of this study, this research follows the Hemphill (1974) and Winter's (1985) extensions in introducing the foreign exchange constraints into the model. Hemphill derives an import model based on an optimization framework assuming that policymakers in the CFA zone dismiss the cost of adjustment to the long-run foreign exchange receipts to pay for the high food import bills in the region, and generally in the Sub-Saharan Africa. Moreover, to close the model Hemphill introduced the balance of payment instrument under the assumption that the foreign exchange reserve is conceived under its transitory and persistency mechanisms (see: Moran 1988, p.7). Therefore an import demand function is derived based on a minimization approach to generate the Hemphill model, which is expressed as follows:

$$FODIM_{it} = \alpha_1 + \alpha_2 FEX_t + REER_{t-1} + \alpha_3 FODIM_{jt-1} \qquad (14)$$

Finally, Moran (1988) and Pritchett (1988), in order to recover the structural demand parameters, propose a specification of an import function, incorporating foreign exchange obtainability and exogenous prices expressed in log-form as:

$$lnFODIM_{jt} = \beta_0 + \beta_1 lnFEX_t + lnREER_{t-1} + \beta_3\left(lnP_{ip}^{d} - lnP_{ip}^{w}FODIM_{jt}\right) + \varepsilon_t \quad (15)$$

where $FODIM_{jt}$ is import demand, $FEX_t \; and \; REER_{t-1}$ represent foreign exchange receipts and foreign exchange reserve, respectively. P_{ip}^{d} represents the domestic price of substitutes for imported cereals, and P_{ip}^{w} is the world price of imported food or border price of food import in the CFA zone.

However, instead of considering equation (6), in this research we consider its VECM functional form and introduce new parameters to capture trade policy under customs unions and foreign exchange constraints. Factually, net income from foreign exchange have been falling and the CFA zone have been experiencing a loss or deficit in their accounts in terms of foreign exchange reserve amounted to -25,535$ in 2010 and -36,615$ in 2011, respectively and a negative balance of payment variation of -15% in 2010 (BCEAO annual report, 2010).

In addition, intra-regional trade represents 5.7% of the WAEMU total trade and international trade 0.1% of world export. Most importantly, a large portion of foreign exchange reserves was used to cover the large food import bill. However, most of the countries in the CFA zone do not have enough reserves and they rely heavily on debt or food aid. Therefore, not only foreign exchange reserves represents an important or major determinant of import demand for food in the CFA zones, but also foreign exchange reserves is the medium of exchange in the world market, and therefore acts as a constraint for CFA countries. As a result, if foreign exchange reserve increases, one might expect to see countries increasing their import of food. Against this unique framework, this research does not include foreign exchange reserves to avoid the

problem of near identity, and most importantly data on the CFA zone are not available.

Emran (2010) argues "the approach which we call foreign exchange availability formulation suffers from the problem that if foreign exchange availability is used as regressors when the foreign exchange constraint is binding, it alone determines the volume of imports completely." From this perspective, to elucidate the strong evidence of the near identity problem, Emran (2010) reports that the import demand for India, which included foreign exchange reserves estimated a coefficient of 1.03 with a t-value of 26.37 and a perfect R^2 (0.94) almost equal to 1. Moreover, this study proved that "the restriction that the coefficient is equal to 1 cannot be rejected by the Wald test with a P-value of 0.46" (Emran 2010). Evidently, the cited results warrant not including foreign exchange reserves in this research, but also established the one to one relationship between aggregate imports and foreign exchange reserves in this research.

4.2. The Empirical Model

These empirical findings highlight the shortcomings of using foreign exchange reserves, especially for net importing countries like the CFA zone. Following Moran (1988) and Faini, et al. (1988) specification model, this research uses a Vector Error Correction Model to investigates the link between food import, relative commodity price, real effective exchange rate, food production, GDP, and trade openness for imported food (rice, wheat, maize, and sugar) derived from a general utility function and maximization framework specified as:

$$FODIM_{it} = H_t\left(PFOOD_{jt,}GDP_{jt}, MREER_{jt}, OPEN_{jt}, DOMPF_{jt}\right) \quad (16)$$

To estimate equation (16**),** this research follows Kargbo (2007) whose assumptions are derived from Moran and Hemphill (1988), which are: infinite supply elasticity in the long run, as well as assuming imported and produced cereals in countries within the CFA zone as perfect substitutes. All the variables included in this estimation are expressed in log-form. According to Kargbo (2007), "food aid imports are imperfect substitutes with domestically produced foods" in countries in the CFA Zone and that have a strong relationship between world markets for imported food (rice, wheat, maize, and sugar) and those produced within the local and regional markets of the CFA zone in the Sub-Saharan Africa. This will allow recovering the structural parameters when featuring the obtainability of foreign exchange rate for policy options and make judgments for major structural adjustments in quotas, tariffs, customs unions, etc., in the CFA zone.

Theoretically, we expect the coefficient of $REER_{jt} \leq 0$ and that food imports to decrease as real exchange rates depreciate, while $PFOOF_{it}$ is expected to have a negative effect on $FODIM_{jt}$ for countries in the CFA zone. GDP_{jt} is expected to be positive in the long run. As $DOMPF_{jt}$ increases, we expect $FODIM_{jt}$to decrease, and establishing a negative relationship in the long run. We also expect $OPEN_{jt}$ to be either positive or negative, and trade liberalization in the CFA zone should pronounce more effect on import/export demand for diversification and larger responsiveness to economic incentives for less/more restrictive trade in the CFA Countries.

CHAPTER 5: METHODS OF DATA COLLECTION AND DESCRIPTION OF THE VARIABLES

To investigate, understand, and analyze the determinants of food imports at stake, we construct a new dataset for chosen commodities such as rice, wheat, maize, and sugar and their respective prices in all the CFA zone member countries (WAEMU and CEMAC, 14 countries). These countries are: Benin, Burkina Faso, Cote d'Ivoire, Guinee Bissau, Guinee Conakry, Niger, Senegal, Togo (WAEMU) and Cameroon, the Central African Republic, Chad, the Republic of Congo, Gabon and Equatorial Guinea (CEMAC).

The data cover the period of 43 years (1969 - 2012) for all countries under investigation in this study. However, it is crucial to mention that in the econometric analysis, because of scant information and data availability in Sub-Saharan Africa and, especially in the CFA's zone Cap-Vert and Central African Republic are dropped from the study because of data shortage on almost every variable. The observations on import/export, domestic production and values of import/export are mainly collected from mongabay.com/commodities, which draws exclusively from FAO official data source and national statistics bureau in Africa. Moreover, this site offers valuable time series observations and statistical measures that are improved by funding from the World Bank's International Development Association. According the Mongobay website, "Mongabay.com is one of the world most popular environmental science and conservation news sites", which draw exclusively from FAO and World Bank database. In fact, "Mongobay has been featured in the San Francisco Chronicle, Time Magazine,

The Wall Street Journal, and named as one of Time Magazine's Fifteen Top Green Websites" (see website April, 2008). To ensure the quality and reliability of the data collected, we also crossed examined the data with FAO, World Bank, and International Financial Statistics (IFS).

The real historical gross domestic product (GDP), total population and real effective exchange rate (REER) index per country are measured in US dollar and are from the USDA website, which concords perfectly with observations available in the World Bank official site. The real gross domestic product (RGDPC) is calculated for Baseline Countries (in billions of 2005 US dollars) from 1969-2012. Total food import quantity (FODIM) and domestic food production (DOMPFC) index per country are measured in millions per tone, and the index for trade openness is measured as (ratio of total import plus total export divided by GDP). Domestic food production is measured in tonne and is expressed in per capita. The variables trade openness (OPEN) index is a good proxy devised to capture openness relative to trade policy barriers such as tariffs and Non tariffs barriers; customs unions in the CFA zone, quotas, and export taxes or subsidies imposed by the countries members in the CFA'S Zone (Fajgenbaum, et al., 2000 as cited in Kargbo, 2005). The variable (WPRICE) is the world import price index and expressed in US dollars.

We also cross check the data with IRRI (the International Rice Research Institute) to make sure that it matches the FAO and mongobay datasets. Using the (REER) here, we assume that the real effective exchange rate (REER) in its equilibrium level will act in the model to detect and capture macroeconomic imbalances or instability in the WAEMU and CEMAC countries under fixed exchange

rate constraints and customs unions, and short term domestic policies such as price controls or homologation. According to economic theory, the equilibrium real exchange rate is a parameter with which "an economy is both in internal balance (low unemployment and low inflation), and external balance, which are defined as sustainable long-term current account position" (IMF, 2008, p.8). For instance, if a country in the CFA zone experiences a high and persistently unemployment rate and current account deficit like in the WAEMU and CEMAC member countries, a real exchange rate adjustment through nominal exchange rate depreciation or devaluation could be one mechanism to go back to equilibrium. Tables 1-4 provide a summary of the descriptive statistics of the food commodities used in this research such as rice, wheat, maize and sugar for each country in the sample.

CHAPTER 6: ECONOMETRIC TESTS AND ANALYSIS

6.1. Descriptive Statistics

Table 1, 2, 3, 4 display the panel unit root tests in all series and variables for rice, wheat, maize, sugar in the CFA zone for each country. The "Between Variance" statistics are calculated on the basis of six parameters regardless of time period whereas the "within Variance" statistics are calculated on the basis of 44 time periods regardless of the parameters. Each Table (1-5) offers the overall, between, and within variance for each variable in the sample.

- Individual mean is calculated as: $\overline{x_\iota} = \frac{1}{T}\sum_t^n x_{it}$
- Overall mean is calculated as: $\bar{x} = \frac{1}{NT}\sum_i . \sum_t x_{it}$
- Overall Variance is calculated as: $\sigma^2 = \frac{1}{n(T-1)}\sum_i . \sum_t (x_{it} - \overline{x})^2$
- Between Variance is calculated as: $\sigma_b^2 = \frac{1}{n-1}\sum_i^n (\overline{x_\iota} - \overline{x})^2$
- Within Variance is calculated as:

$$\sigma_w^2 = \frac{1}{nt-1}\sum_i \sum_t (x_{it} - \overline{x_\iota})^2 = \frac{1}{nt-1}\sum_i \sum_t (x_{it} - \overline{x_\iota} + \bar{x})^2$$

And finally the overall variance is decomposed into between variation and within variation express as:

- $\sigma_o^2 \simeq \sigma_b^2 + \sigma_w^2$

Table 1: Panel Descriptive Statistics, Rice in the CFA Zone

Variable		Mean	Std. Dev	Min	Max	Observations
Foodimp	Overall	245.8068	142.898	1	496	N=528
	Between		24.90588	205.4318	296.4773	n=12
	Within		140.8906	-39.67045	529.375	T=44
Foodp	Overall	315.2669	182.8911	1	630	N=652
	Between		69.40909	179.6136	431.9545	n=15
	Within		170.0181	-41.30131	762.6532	Tbar=43.4667
Wprice	Overall	47.16564	22.08259	1	88	N=652
	Between		1.921561	41.04545	47.95455	n=15
	Within		22.00427	7.12019	93.12019	Tbar=43.4667
Reer	Overall	307.4086	185.9366	1	631	N=651
	Between		40.68911	263.4091	395.25	n=15
	Within		181.8274	-85.8414	666.9995	T-bar=43.4
GDP	Overall	299.2945	182.4806	1	616	N=652
	Between		86.42501	166.3864	490.2955	n=15
	Within		162.2024	-188.001	729.9081	T-bar43.4667
Topen	Overall	268.176	166.6452	1	560	N=608
	Between		41.95126	154	333.3409	n=14
	Within		161.8573	-30.1649	656.176	Tbar=43.4286

Note: countries are: Benin, Burkina Faso, Cote d'Ivoire, Guinee Bissau, Guinee Conakry, Niger, Senegal, Togo (WAEMU) and Cameroon, The Central African Republic, Chad, The Republic of Congo, Gabon and Equatorial Guinea (CEMAC

Table 2: Panel Descriptive Statistics, Maize in the CFA Zone

Variable		Mean	Std. Dev	Min	Max	Observations
Foodimp	Overall	164.7424	126.3829	1	398	N=528
	Between		45.15573	93.97727	219.4545	n=12
	Within		118.7433	-49.05303	453.7652	T=44
Foodp	Overall	280.3359	167.2103	1	569	N=649
	Between		38.98256	211.425	327.7727	n=15
	Within		162.9391	-38.43683	635.9109	Tbar=43.4667
Wprice	Overall	416089	23.43692	1	87	N=652
	Between		1.020226	41.075	45.27273	n=15
	Within		23.41594	-2.663832	87.5339	Tbar=43.4667
Reer	Overall	308.0721	185.9866	1	632	N=652
	Between		29.79449	274.7727	391.175	n=15
	Within		183.8293	-14.01882	659.0494	Tbar=43.4667
GDP	Overall	314.5	184.2484	1	634	N=652
	Between		85.0403	172.2727	508.3636	n=15
	Within		164.6452	-190.8636	761.2273	T-bar43.4667
Topen	Overall	206.9523	153.8439	1	485	N=608
	Between		52.36897	111.9773	277.4318	n=14
	Within		145.2395	-57.70679	567.975	Tbar=43.4286

Note: countries are: Benin, Burkina Faso, Cote d'Ivoire, Guinee Bissau, Guinee Conakry, Niger, Senegal, Togo (WAEMU) and Cameroon, The Central African Republic, Chad, The Republic of Congo, Gabon and Equatorial Guinea (CEMAC).

Table 3: Panel Descriptive Statistics, Maize in the CFA Zone

Variable		Mean	Std. Dev	Min	Max	Observations
Foodimp	Overall	261.2367	150.5773	1	522	N=528
	Between		39.5596	191.4318	310.5455	n=12
	Within		145.7267	-33.55871	590.8049	T=44
Foodp	Overall	60.69785	83.25424	1	268	N=652
	Between		68.27527	1	155.1591	n=15
	Within		50.73272	-93.46124	218.1229	Tbar=43.4667
Wprice	Overall	53.11503	37.80397	1	633	N=652
	Between		8.229489	278.1136	367.25	n=15
	Within		36.95461	-14.42317	660.8496	Tbar=43.4667
Reer	Overall	308.9632	186.1463	1	633	N=652
	Between		24.98727	278.1136	367.25	n=15
	Within		184.5584	-14.42317	660.8496	Tbar=43.4667
GDP	Overall	315.6227	184.4131	1	635	N=652
	Between		87.72191	174.1591	509.3409	n=15
	Within		163.5671	-189.7182	763.4636	T-bar43.4667
Topen	Overall	301.1727	173.5495	1	601	N=608
	Between		45.72416	214.6818	354.5909	n=14
	Within		167.8296	-38.85003	685.4909	Tbar=43.4286

Note: countries are: Benin, Burkina Faso, Cote d'Ivoire, Guinee Bissau, Guinee Conakry, Niger, Senegal, Togo (WAEMU) and Cameroon, The Central African Republic, Chad, The Republic of Congo, Gabon and Equatorial Guinea (CEMAC).

Table 4: **Panel Descriptive Statistics, Sugar in the CFA Zone**

Variable		Mean	Std. Dev	Min	Max	Observations
Foodimp	Overall	239.3087	146.9517	1	493	N=528
	Between		43.58784	160.4545	316.3864	n=12
	Within		140.8899	-54.07765	560.8542	T=44
Foodp	Overall	184.7354	114.1943	1	384	N=616
	Between		67.20186	44.43182	296.9091	n=14
	Within		94.02135	-111.1737	472.3036	T-bar=44
Wprice	Overall	58.11275	42.41061	1	129	N=612
	Between		10.74192	47.65909	94.825	n=14
	Within		41.22381	6.9082	131.4537	Tbar=43.4667
Reer	Overall	277.9641	173.8371	1	581	N=652
	Between		27.78435	250.6136	352.8182	n=15
	Within		171.7508	-35.85413	605.3584	Tbar=43.4667
GDP	Overall	287.5376	171.505	1	585	N=652
	Between		84.21325	250.6136	469.5	n=15
	Within		151.0725	-178.9624	700.7649	T-bar43.4667
Topen	Overall	258.8792	160.435	1	535	N=568
	Between		42.14269	191.3182	337.5682	n=13
	Within		155.2726	-56.48896	593.761	Tbar=43.6923

Note: countries are: Benin, Burkina Faso, Cote d'Ivoire, Guinee Bissau, Guinee Conakry, Niger, Senegal, Togo (WAEMU) and Cameroon, The Central African Republic, Chad, The Republic of Congo, Gabon and Equatorial Guinea (CEMAC).

6.2 The Application of Panel Unit Root Tests

Baltagi argues "panel data are better at identifying and measuring effects that are simply not detectable in pure cross-section or pure time-series data" (2001, p.7). He indicates that researchers like Ben-Porath (1973), Freeman (1984), and Duncan & Holmlund (1983) provide pertinent examples for different study and situation (we reviewed earlier). In this study, we use panel data analysis or framework, which will permit to control for heterogeneity in the CFA region as some countries like Gabon, Cote d'Ivoire, etc., are oil producer. Baltagi argues "time-series and cross section studies not controlling for this heterogeneity run the risk of obtaining biased results" (e.g., see Moulton 1986, 1990, Baltagi and Levin 1992, and Hajivassiliou 1987).

In the literature, it's shown that pooled/panel and uni-variate time series data tend to exhibit a time trend, and therefore the variables under investigation have means, variances, and covariance that are not time invariant or not stationary. After reviewing each test, we first checked stationary issues on individual observations since it is prevalent with macroeconomic data for countries in the CFA zone; we do not have the opportunity or privilege to display multiple macro and financial series of the same process.

Given the indication that individual series are preliminary non-stationary, we follow the lead to study recent development in implementing panel unit root tests and co-integration and the econometrics issues inherent to the application of panel unit root tests. Then, after reviewing the studies of Levin-Lin & Chu (1992-2002), Im, Pesaran & Shin (1997), Breitung (2001), Hadri (2000), and Pedroni (1999), we applied each one of the tests and evaluate their performance.

We found that the Levin-Lin-Chu's (LLC) test was more restrictive in the panel series, and assumes that there is a homogeneous autoregressive parameter (AR) restriction and the error term is independently across all series in the panel in this study. The specificity of LLC test is that like Im-Peseran-Shin (IPS), Breitung, and Hadri. It allows for panel lags specification for the Augmented Dickey Fuller (ADF) regressions and also controls for the long-run variance estimation. However, the IPS test and Breitung are less restrictive compared to the LLC, as IPS tests for the null hypothesis (H_0) that all series contain a unit root against the alternative (H_A) where at least one series is stationary. In addition, given the heterogeneous aspect of countries in the CFA zone, the IPS panel root test will allow taking into consideration the heterogeneous autoregressive behavior across panels in the sample in this study. In addition, the Breitung z statistic assumes that the autoregressive constraint element is constant or invariable across all panels in the sample of this study. Table 5-8 below presents the panel unit root tests results for each commodity such as rice, wheat, maize, and sugar assessing the stationarity properties of the data in this research. And table 9 presents the results for 3x3 co-integrating vector.

Table 5: (Rice) Pool Unit Root Tests: Individual Effects Estimation: CFA Zone

		Method			
Variables	(Tests)	LLC	Breitung	IPS	Hadri
LFOODIM	(L)	0.48383	2.43518	-1.0041	13.8129
		(0.6857)***	(0.9926)***	(0.1577)***	(0.0000)**
	(D)	-15.0048	-2.96409	-18.1496	1.96474
		(0.0000)**	(0.0015)**	(0.0000)**	(0.0310)*
LDOMPFC	(L)	6.55281	5.19096	2.98522	13.2152
		(1.0000)***	(1.0000)***	(0.9986)***	(0.0000)**
	(D)	-13.9537	5.89539	-20.4013	-8.4755
		(0.0000)**	(0.0000)**	(0.0000)**	(0.8017)*
LPFOOD	(L)	12.1052	8.54317	10.0108	2.34317
		(1.0000)***	(1.0000)***	(1.0000)***	(0.0096)***
	(D)	-16.6506	-12.386	-14.3679	6.3775
		(0.0000)**	(0.0000)**	(0.0000)**	(0.0000)**
LREER	(L)	-1.83058	-0.96067	-0.33239	-1.83058
		(0.0336)***	(0.1684)***	(0.3698)***	(0.0336)***
	(D)	-23.1502	-18.8307	-20.8435	-23.1502
		(0.0000)**	(0.0000)**	(0.0000)**	(0.0000)**
LRGDPC	(L)	5.15962	3.93495	1.7824	9.65481
		(1.0000)***	(1.0000)***	(0.9627)***	(0.0000)**
	(D)	-16.5024	-2.81714	-18.1671	-0.69876
		(0.0000)**	(0.0021)**	(0.0000)**	(0.7576)***
LOPEN	(L)	1.25557	3.32711	-1.00393	13.8124
		(0.8954)***	(0.9996)***	(-0.1577)***	(0.0000)**
	(D)	-13.8465	-2.49336	-18.1492	1.96486
		(0.0000)**	(0.0043)**	(0.0000)**	(0.0310)***

Note: *** indicates the rejection of the null hypothesis of non-stationary at the 1% level of significance. And ** indicates stationary Null hypothesis (common unit root process) at the 5% level of significance and Newey-West automatic bandwidth selection & Bartlett kernel. Probabilities are computed assuming Asymptotic Normality with a left hand side rejection area, except on the Hadri test, which is right sided and are in Parentheses. Variables are in logarithm. (L) Indicates at level and (D) indicates Difference. LLC= Levin, Lin, Chu (2002), (LLC, Breitung, IPS) or stationary (Hadri). Number of observations(502)IPS=Im,Pesaran,Shin(2003).

Table 6: (Wheat) Pool Unit Root Tests: Individual Effects Estimation: CFA Zone

Variables	(Tests)	Method LLC	Breitung	IPS	Hadri
LFOODIM	(L)	-0.0409	2.57356	-2.81695	4.29777
		(0.4837)***	(0.9950)***	(0.0024)***	(0.0000)**
	(D)	-16.0154	4.92262	-18.5793	2.80739
		(0.0000)**	(0.0000)**	(0.0000)**	(0.0025)***
LDOMPFC	(L)	-5.09827	-1.36632	-5.44677	4.22175
		(0.0000)**	(0.0859)***	(0.0081)***	(0.0000)**
	(D)	-12.7617	-1.44594	-15.3962	1.8418
		(0.0000)**	(0.0741)***	(0.0000)**	(0.0328)***
LPFOOD	(L)	-4.91964	-1.68464	0.12158	11.3857
		(0.0000)**	(0.0460)***	(0.5484)***	(0.0000)**
	(D)	-20.6817	-20.2424	-20.8376	7.74597
		(0.0000)**	(0.0000)**	(0.0000)**	(0.0000)**
LREER	(L)	-1.41571	4.40961	-0.33239	-11.2665
		(0.0784)***	(1.0000)***	(0.3698)***	(0.0000)**
	(D)	-21.7501	-18.9548	-20.8435	-1.27809
		(0.0000)**	(0.0000)**	(0.0000)**	(0.8994)***
LRGDPC	(L)	5.03447	3.93495	0.18243	5.77116
		(1.0000)***	(1.0000)***	(0.5724)***	(0.0000)**
	(D)	-16.7255	2.40051	-17.5294	2.3961
		(0.0000)**	(0.9918)***	(0.0000)**	(0.0083)***
LOPEN	(L)	-0.12228	2.57361	-2.77262	7.82685
		(0.4513)***	(0.9950)***	(-0.0028)***	(0.0000)**
	(D)	-14.5429	4.92262	-17.8185	4.19335
		(0.0000)**	(1.0000)***	(0.0000)**	(0.0000)**

Note: *** indicates the rejection of the null hypothesis of non-stationary at the 1% level of significance. And ** indicates stationary Null hypothesis (common unit root process) at the 5% level of significance and Newey-West automatic bandwidth selection & Bartlett kernel. Probabilities are computed assuming Asymptotic Normality with a left hand side rejection area, except on the Hadri test, which is right, sided and are in Parentheses. Variables are in logarithm. (L) Indicates at level and (D) indicates Difference. LLC= Levin, Lin, Chu (2002), (LLC, Breitung, IPS) or stationary (Hadri). Number of observations (502) IPS= Im, Pesaran, Shin (2003).

Table 7: (Maize) Pool Unit Root Tests: Individual Effects Estimation: CFA Zone

		Method			
Variables	(Test)	LLC	Breitung	IPS	Hadri
LFOODIM	(L)	-7.06626	-5.29798	-8.57789	5.61164
		(0.0000)**	(0.0009)***	(0.0080)***	(0.0000)**
	(D)	-21.8952	-10.2839	-18.5793	-0.86382
		(0.0000)**	(0.0000)**	(0.0000)**	(0.8062)***
LDOMPFC	(L)	2.42001	2.54429	0.4392	7.91558
		(0.9922)***	(0.9945)***	(0.6697)***	(0.0000)**
	(D)	-22.5489	-0.8794	-23.3846	2.65065
		(0.0000)**	(0.1896)***	(0.0000)**	(0.0040)**
LPFOOD	(L)	-1.99078	-2.03091	-1.68358	8.9379
		(0.0233)***	(0.0211)***	(0.0461)***	(0.0000)**
	(D)	-23.8135	-17.3497	-21.5212	1.17617
		(0.0000)**	(0.0000)**	(0.0000)**	(0.1198)***
LREER	(L)	-1.4254	-1.65902	0.11295	11.2641
		(0.0770)***	(0.0486)***	(0.5450)***	(0.0000)**
	(D)	-21.7415	-18.9696	-20.8302	-1.27488
		(0.0000)**	(0.0000)**	(0.0000)**	(0.8988)*
LRGDPC	(L)	5.03447	4.40961	0.18243	5.77116
		(1.0000)***	(1.0000)***	(0.5724)***	(0.0000)**
	(D)	-16.7255	2.40051	-17.5294	2.3961
		(0.0000)**	(0.0002)**	(0.0000)**	(0.0083)***
LOPEN	(L)	-5.34655	-4.78722	-7.29764	5.30171
		(0.0086)***	(0.0000)**	(0.0098)***	(0.0070)***
	(D)	-21.5009	-8.64651	-21.4176	-1.40367
		(0.0000)**	(0.0000)**	(0.0000)**	(0.9198)***

Note: *** indicates the rejection of the null hypothesis of non-stationary at the 1% level of significance. And ** indicates stationary Null hypothesis (common unit root process) at the 5% level of significance and Newey-West automatic bandwidth selection & Bartlett kernel. Probabilities are computed assuming Asymptotic Normality with a left hand side rejection area, except on the Hadri test, which is right sided and are in Parentheses. Variables are in logarithm. (L) Indicates at level and (D) indicates Difference. LLC= Levin, Lin, Chu (2002), (LLC, Breitung, IPS) or stationary (Hadri). Number of observations (502) IPS= Im, Pesaran, Shin (2003).

Table 8: (Sugar) Pool Unit Root Tests: Individual Effects Estimation: CFA Zone

		Method			
Variables	(Tests)	LLC	Breitung	IPS	Hadri
LFOODIM	(L)	-0.66253	-4.29462	-0.03342	9.59339
		(0.7462)***	(0.0000)**	(0.4867)***	(0.0000)**
	(D)	-19.5324	-8.85402	-22.1641	0.81294
		(0.0000)**	(0.0000)**	(0.0000)**	(0.2081)***
LDOMPFC	(L)	2.42001	-0.50376	-0.31887	4.9479
		(0.9922)***	(0.3072)***	(0.37497)***	(0.0000)**
	(D)	-9.16231	7.24095	-18.1627	3.61156
		(0.0000)**	(0.0000)**	(0.0000)**	(0.0002)**
LPFOOD	(L)	-3.69619	0.15164	-4.38467	10.9275
		(0.00061)***	(0.5603)***	(0.0000)*	(0.0000)**
	(D)	-13.8913	-9.56395	-14.2352	-0.70595
		(0.0000)**	(0.0000)**	(0.0000)**	(0.7599)***
LREER	(L)	-1.4254	-1.65902	0.55927	4.41341
		(0.0770)***	(0.0486)***	(0.7120)***	(0.0000)**
	(D)	-21.7415	-18.9696	-19.2542	-1.27488
		(0.0000)**	(0.0000)**	(0.0000)**	(0.8988)***
LRGDPC	(L)	5.03447	4.40961	0.18243	5.77116
		(1.0000)***	(1.0000)***	(0.5724)***	(0.0000)**
	(D)	-16.7255	2.40051	-17.5294	2.3961
		(0.0000)**	(0.0001)**	(0.0000)**	(0.0083)***
LOPEN	(L)	-0.14147	-4.95548	-0.00865	8.55113
		(0.4438)***	(0.0009)***	-0.4966***	(0.0000)**
	(D)	-20.7319	-11.0509	-21.7846	-0.65667
		(0.0000)**	(0.0000)**	(0.0000)**	(0.7443)***

Note: *** indicates the rejection of the null hypothesis of non-stationary at the 1% level of significance. And ** indicates stationary Null hypothesis (common unit root process) at the 5%level of significance and Newey-West automatic bandwidth selection & Bartlett kernel. Probabilities are computed assuming Asymptotic Normality with a left hand side rejection area, except on the Hadri test, which is right, sided and are in Parentheses. Variables are in logarithm. (L) Indicates at level and (D) indicates Difference. LLC= Levin, Lin, Chu (2002), (LLC, Breitung, IPS) or stationary (Hadri). Number of observations(502)IPS=Im,Pesaran,Shin(2003).

6.3. Co-integration Analysis

This research implemented the Pedroni panel co-integration tests to investigate long-run relationship among the variables, which allow for considerable heterogeneity. Pedroni (1999) tests derive seven panel co-integration test statistics and among these seven statistics, four are based on pooling along the within- dimension of the panel, and three are based on pooling along the between- dimension of the panel. Thus, for the pooling along the within- dimension statistics, the null hypothesis of no co-integration for the panel co-integration is: $H_0: \gamma_i = 1 \; for \; all, i$ and $H_A: \gamma_i < \gamma \; for \; all, i$

For the pooling along the between- dimension statistics of the panel, the null hypothesis of no co-integration for the panel co-integration test is: $H_0: \gamma_i = 1 \; for \; all, i$ and $H_0: \gamma_i < 1 \; for \; all, i.$

Table 9 below presents the cointegration tests (Pedroni, 1999) results, which derived two groups of tests statistics accounting for homogeneous panels and heterogeneous panels for each individual member of the panel.

Table 9: Pedroni Panel Co-integration Tests Commodities (Rice, Wheat, Maize, And Sugar): CFA Zone:

Variables-	LFOODIM	LDOMPFC	LPFOOD	LRGDP	LREER	LOPEN		
H_A:	Common	AR	Coefs.					
	¤ (Within-dimension)					**¤ (Between-dimension)**		
Weighted								
Statistics	**Panel V**	**Panel Rho**	**Panel PP**		**Panel ADF**	**Group Rho**	**Group Rho**	**Group Rho**
RICE								
(Statistic)	7.085187**	-4.53451	-8.62802		-8.35623	-4.80132	-19.311	-11.1005
(Prob)	(0.0000)**	(0.0000)**	(0.0000)**		(0.0000)**	(0.0000)**	(0.0000)**	(0.0000)**
WHEAT								
(Statistic)	2.678702**	-1.34759	-2.48488		4.51112	-3.57204	-7.58575	-7.93978
(Prob)	(0.0037)**	(0.0889)	(0.00065)*		(0.0000)**	(0.0002)*	(0.0000)**	(0.0000)**
MAIZE								
(Statistic)	4.092524**	-7.25901	-11.1529		10.8716	-4.88122	-8.73133	-5.89706
(Prob)	(0.0000)**	(0.0000)**	(0.0000)**		(0.0000)**	(0.0161)	(0.0000)**	(0.0000)**
SUGAR								
(Statistic)	9.408095**	-5.29388	-4.16097		-1.27398	-5.4072	-13.2469	-11.9668
(Prob)	(0.0000)**	(0.0000)**	(0.0000)**		(0.1013)	(0.0000)**	(0.0000)**	(0.0000)**

Notes: ** Indicates rejection of the hull of no-co-integration at 5% level of significance. And * Indicates rejection of the hull of no-co-integration at 10% level of significance. Probabilities are computed under Asymptotic Normality. Probabilities are in Parentheses indicating rejection of the Null hypothesis of no-co-integration with 5% level of significance. Newey-West automatic bandwidth selection and Bartlett kernel. The critical values are from Levin and Lin (1992), Table 3 (with N=6 and T=528). V, non-parametric variance ratio statistic; rho, non-parametric test statistic equivalent to the Phillips and Perron (PP) rho statistic; PP, non-parametric statistic equivalent to the PP t statistic; ADF, parametric statistic analogous to the augmented Dickey-Fuller statistic.

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CHAPTER 7: EMPIRICAL RESULTS AND INTERPRETATION

The construction of the unit root tests and cointegrated tests are from Levin-Lin-Chu's (LLC), Im-Peseran-Shin (IPS), Breitung, and Hadri and Pedroni (1997a) respectively. These tests in Tables (5-8) allow for deriving the asymptotic distributions, and investigate the sample performances and efficiency of the seven tests statistics. Each one of the variables on rice, wheat, maize and sugar was tested for stationarity on individual series. Tables (5-8) displays the tests and the intuition behind the results and correlograms of each individual series (LFOODIM, LDOMPFC, LPFOOD, LREER, LRGDPC, LOPEN) indicate special properties of unit roots at level and therefore, we take the first difference on each variables, applying the LLC, IPS, Breitung, Hadri, and Dickey-Fuller tests. After first differencing, the null hypothesis, H_0 of unit root is rejected to conclude stationary. In table 10 it is evident that the sample autocorrelation (AC) and partial autocorrelation (PC) are insignificantly far from zero (0) and the integrated of order on I(1) variables are covariance stationary and invertible since the first difference of a random walk is assumed to be a white noise.

After differencing the variables once, the tests of unit root was redone at the first-difference level and all the variables became I(1) and as a results, the co-integration tests procedure were carried out (since there is no variables integrated of order two I(2) (Table 5-8). Following these results, we implemented the Pedroni panel co-integration tests and the rejection of the null hypothesis H_0 of no cointegration,

which was one-sided, and involves variance ratio tests, shows large positive values.

Therefore, the results suggest co-integration at the 5% significance level. The other large negative six values from within and between dimensions such as Panel Rho, panel PP, Panel ADF, and Groupe Rho suggested co-integration at the 5% significance level, rejecting the null of no co-integration, at the 5% significance levels (Table 9).

We then implemented the Vector error correction model (VECM) panel estimation to account for endogeneity, correlation and Heteroskedasticity of the residuals. Table 10 displays the results of the vector error correction estimates and the signs of all the explanatory variables are consistent with the prior specifications founded in theory. The estimations are derived under the following specification, which are defined under the name: Automatic lags specification Lag Structure/Lag Length Criteria. We chose, max lags 12 endogenous determined by minimizing the AIC and SIC based on Daniel, Kernel, Integer Newey-West fixed bandwidth = 6.0000, with intercept (no trend) in the cointegrated equation (CE) and vector auto regression process (VAR) and no restrictions for all of the commodities. The model performed well as symptoms of spurious regression model were not found, given the R-squared and also compared to the Durbin-Watson statistic for each commodity with the Schwartz Information Criteria.

We also tested for normality of the residuals (H_0: no normal distribution and the H_A: normal distribution), serial correlation LM-test and autocorrelation, and potential ARCH effect (H_A: no ARCH effect and H_A: ARCH effect) under

Heteroskedasticity. The residual diagnoses for each commodity showed evidence of stationarity and confirmed the long-run co-integrating relationship among the variables.

The results indicate that although countries in the CFA zone are net exporters of non-cereal food staples, the collective behavioral analysis in the sample indicates countries in the CFA zone are food-deficit with a large agricultural share in GDP. The marginal propensity to import is positive for every country in the CFA zone, so as income level rises, import level also rises. The results in Table 6 show evidence of long-run run relationship among the variables, as their error correction terms and P-value are negative and significant with (0.950), (-0.108), (-0.473) and (-0.235) for rice, wheat, maize and sugar, respectively. A joint test, using the Wald test statistics of coefficient restrictions indicates strong causal relationship in the short run among the variables and the error correction term, indicating the speed of adjustment toward short run equilibrium for each commodity is negative and significant. Its chi-square statistics are significant as their p-value<0.05%. However, the co-integrating relationship fails to indicate the direction of causality, which can be unidirectional, or bidirectional among the variables.

The results detected the causal effects in the model in equation (16) in the short and long run. The coefficients of REERjt have the expected negative signs for all commodities (rice, wheat, maize, and sugar). The coefficients of PFOODjt have the expected negative signs as well for all commodities except for wheat. However, the long-run relationship indicates that 10% of this disequilibrium is corrected yearly to

take the system back to equilibrium, when looking at the error correction term. And its long-term effect on $FODIM_{jt}$ for countries in the CFA zone is ever lasting, and affects wheat imports for the next period.

The coefficients of GDP_{jt} in the co-integrating equation have the expected signs for wheat and sugar with (1.24) and (0.51) respectively. However, rice and sugar have a negative coefficients and the deviation from the equilibrium is corrected at 0.95%, and affects rice and sugar imports in the long run. Moreover, the possibility of having a negative elasticity of income can be explained by the ultra-pro-trade biases of promoting local consumption of rice to boost domestic production in order to decrease the volume of imports as the ultimate goal of the policy makers in the CFA zone.

The coefficients of $DOMPF_{jt}$ for each commodity have the expected sign and cereal imports will decrease in the long run as domestic production increases. The deviations from the long-run equilibrium are significant and affect cereal imports in the long run in the CFA zone. Most importantly, the coefficients of trade openness $OPEN_{jt}$ are all negative as devaluation and trade liberalization in the CFA zone suggests more impact on import/export demand. Therefore diversification and larger responsiveness to economic incentives for less/more restrictive trade in the CFA countries are recommended. Therefore, the more diverse and open these countries are the better for regional markets integration for agricultural commodities trade and food security in the CFA zone.

These policy restrictions imposed by CFA governments are tortuous and short

term reactionary, and homologated domestics food prices, tariff and quotas under foreign exchange constraints and custom unions in the CFA zone are short-run reactionary policies, which increases social discontent between consumers, wholesale traders and governments in the CFA zone. In conclusion these findings are consistent with Kargbo (2005) results who studied single countries in the CFA zone. Real effective exchange rate has significant real effects on agricultural commodities such as rice, wheat, maize and sugar in the CFA zone, and also has the ability to change structurally the relative regional and domestic price of cereals in the CFA zone. Hence, any policy device should take into consideration the variations of world prices of agricultural commodities, which are the canvas by which macroeconomics instability in the CFA zone is recurrent. Moreover, exchange rate volatility under custom unions in the CFA zone creates volatility, and has serious impact on trade and investment for growth and macroeconomic stability in the CFA zone. Table 10 below presents the Vector error correction model estimates for each commodity such as rice, wheat, maize, and sugar.

Table 10: VECM (Vector Error Correction Model Estimates: Rice-Wheat-Maize-Sugar in the CFA Zone.

Commodities	**Imports**	Rice	Wheat	Maize	Sugar
LFOODIM	(-1)	1.000000	1.000000	1.000000	1.000000
LPFOOD	(-1)	-0.001409	0.580376	-0.938069	-0.227769
		(0.02629)	(0.54747)	(0.54353)	(0.09206)
		[-11.613]**	[1.06011]**	[1.72587]**	[-2.47417]**
LDOMPFC	(-1)	-0.001409	-759901	-0.006851	-4.988546
		(0.00449)	(0.11213)	(0.09891)	(0.52157)
		[-0.31366]	[-6.7771]**	[-0.06927]	[-9.56441]**
LRGDPC	(-1)	-0.028058	1.240423	-0.068815	0.515049
		(0.00815)	(0.14253)	-0.13179	(0.20835)
		[-3.4405]**	[8.7028]**	[-0.52216]	[2.47208]**
LREER	(-1)	-0.027085	-1.333237	-0.135793	-0.5294
		(0.01765)	(0.61043)	-0.46924	(0.33927)
		[-1.53494]**	[-2.1840]**	[-0.28939]	[-1.56042]**
LOPEN	(-1)	-1.015524	-1.710075	-1.029895	-0.685515
		(0.00385)	(0.15152)	(0.06523)	(0.07496)
		[-263.73]**	[-11.285]**	[-15.787]**	[-9.1446]**
C		1.595332	14.59882	4.916065	25.16263
Error Correction Term					
D(LFOODIM)		-0.267246	-0.108343	-0.473438	-0.235223
		(0.03467)	(0.04203)	-0.03789	(0.05450)
		[-7.7092]**	[-2.57790]**	[-12.4959]**	[-4.31635]**

Note: **[t-statistics], significant at the 5 % level of significance and (-1) represent the number of lags and Standard errors are in parenthesis. The coefficients of the error correction term of import have the correct signs and are statistically significant at 5% level of significance. The speeds of convergence to equilibrium are estimated to 26%-10%-47%-23% for Rice- Wheat-Maize-Sugar in the short-run. R-square (Rice) = 0.99, R-square A.j (Rice)=0.98 and D.W- Statistic 1.711. R-square (sugar)=0.99 Adjusted R-square, (Sugar)=0.997 = 0.59; DW = 2.54; R-square (Wheat)=0.56, R-S A.J =0.55, R-square (maize)= 0.65, R-square A.J=0.64.

CHAPTER 8: CONCLUSIONS

This research finds a long-run relationship between food imports, commodities prices, exchange rates, food production, GDP, and trade openness in the CFA zone. The unit roots tests and co-integration techniques in the panel performed well and a Vector Error Correction model with exogenous prices on rice, wheat, maize, and sugar under fixed exchange rate constraint was adopted to estimate the model. The results show that GDP, domestic food production, relative price, and trade openness are major determinants of food imports in the CFA zone. Relative price of each commodities under fixe exchange rate have negative impact on aggregate imports of food. In conclusion, the increases of real income and trade liberalization through openness have large positive impacts on wheat and sugar import volumes.

Generally, SSA Countries' food supplies have been impeded by an overdependence on subsistence agriculture, unstable stream of revenue from commodity exports, a deteriorating overall tax coordination and revenue mobilization, especially in the CFA zone. According to FAO recent report (2006), to satisfy demand for food, SSA countries have had to rely increasingly on imports: 25 percent of cereal consumption is currently imported compared to 5 percent in the late 60's (p.1). Evidently this proportion is vehemently higher in almost all the CFA zone member countries, which are experiencing a negative trade balance and high GDP/Debt ratio (figure 2). Moreover, agricultural production and macroeconomic management are not up to expectation despite many development initiatives. Therefore, improving the state

of food security in the CFA zone requires steady macroeconomic performance and sustained economic growth, but most importantly an understanding of the relationship between food imports, food production, relative commodity prices, growth, and trade openness under fixed exchange rates.

The limitations of this study are several: Rice is the food staple in the CFA's zone and it is heavily imported but in this research we found that an increase in GDP has negative impact on food imports, but the magnitude is statistically insignificant. Also, we could not find domestic prices of cereals and foreign exchange reserve data to evaluate whether homologate domestic prices of food import is a short-term reactionary policy. Further avenue could also be explored to test if domestic food prices are not "self-correcting" to restore equilibrium in the balance of payments with exogenous price shocks. Moreover, CFA countries have very limited foreign exchange reserves and their access to capital markets and foreign loans cannot be used to support the rising food bills and uncertain export earnings.

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VITA

Seydina O Sene

EDUCATION

Masters of Science, Agricultural Economics, 2014

University of Kentucky College of Agriculture Food and Environment
Department of Agriculture Economics
Fields: International Trade, Production Economics, Agricultural Finance, Development Economics, Farm Management &Agribusiness
Thesis: Food Imports under Foreign Exchange Constraints in the CFA'S Franc Zone of Sub-Saharan Africa (SSA)

Masters of Arts, Business Economics & Finance, 2012

West Virginia University, Morgantown, WV
College of Business and Economics
Fields: Monetary Economics, International Finance/International Trade/ International Economics.
.

Masters of Science, Applied Economics, 2009

Ohio University, Athens, OH
College of Business and Economics
Department of Business and Economics
Field: Energy Economics, Development Economics
Thesis: Estimating the Demand for Gasoline in Developing Countries: Senegal

Master of Arts, International Affairs (African Studies), 2008

Ohio University, Athens, OH
Center for International Studies
Thesis: Alleviating Poverty through Microfinance in West Africa.

B.A Bachelor in Business Administration, 2006

I.A.M Institut Africaine de Management, Dakar, Senegal
Thesis: Approaches to Securities Trading: The Case of the West African Stock Exchange – BRVM.

Diplôme d'Etude Universitaire Générale, (DEUG I), 2001

University of Sahel (UNIS), Dakar, Senegal
Department d' Economics Applique et de Gestion

TEACHING & RESEARCH EXPERIENCES

University of Kentucky, Lexington, KY

Teaching Assistant:

- Agricultural Finance (AEC 441), Spring 2014

Research Assistant:

West Virginia University, Morgantown, WV

Teaching Assistant

- Macroeconomics (ECON 205), Spring 2011
- Statistics (ECON 225), Spring 2011
- Finances (FIN 340), Fall 2010

Ohio University, Athens, OH

Teaching Assistant:

- Principles of Microeconomics (ECON103), Spring 2009
- Principles of Macroeconomics, Fall, 2008
- Intermediate Macroeconomics, Winter, 2008

Research Assistant:

- Bio Statistics, Center for Osteopathic Research and Education, Ohio University, Summer 2008
- Grants Writing Proposal [$100000-$250000] Ohio University
- Center For International Studies, Fall 2006- Spring 2007

PUBLICATIONS

Sene, Seydina, O. (2009). Estimating the Demand for Gasoline in Developing Countries: Senegal. *Journal of Energy Economics, Elsevier*: (Accepted May 2011, Published 2012).

RESEARCH IN PROGRESS, SUBMITTED & UNDER REVIEW

Sene, Seydina, O. (2013). Long Run Money Demand and Inflation in the Monetary Union of West Africa (WAEMU): A Cointegration Vector and Dynamic Ordinary Least Square (DOLS) Panel Estimation. (Under Review *Journal of African Development.*

Sene, Seydina, O. (2013). Alleviating Poverty through Microfinance in West Africa: Case Studies Mali, Benin, Burkina Faso and Niger. Journal of International Development (First Round of Submission under Review, July 2013).

Sene, Seydina, O & Dr. Sayed Saghaian (fall, 2013*). Liberalized World Trade and Food Import under Foreign Exchange Constraints in CFA's Franc Zone of Sub-Saharan Africa* (SSA).University of Kentucky. Accepted for SAEA conference in Texas Agricultural Economics Southern Agricultural. Economics Association 45th Annual Meeting Program, February 1-4, 2014. (Accepted, 10/10/2013)

Sene, Seydina, O (spring, 2014). *Oil Demand and U.S real Exchange Rate in the CFA Zone of Sub-Saharan Africa.*

Sene, Seydina, O (spring, 2013). *Immigration and Unemployment in Industrialized Countries: Is more leaving us less jobs? New Evidence*.

Sene, Seydina O (spring, 2013). *Borders Matters: Bilateral trade Volume between North Africa and Sub- Saharan Africa.*

CONFERENCES, WORKSHOPS, TRAININGS & INVITED GUEST LECTURES

Presented:

Sene, Seydina, O. (Summer 2014). 17th Annual Conference on Global Economic Analysis "New Challenges in Food Policy, Trade and Economic Vulnerability" June 18-20, 2014 King Fahd Palace Hotel Dakar, Senegal

Sene, Seydina, O. (Spring 2014) Southern Agricultural Economics Association (SAEA) Annual Meetings in Dallas, TX: Feb 1-4, 2014.

Sene, Seydina, O (Fall, 2013). Workshop on GAMS under the Supervision of Dr. Carl Dillon. University of Kentucky, Lexington, KY.

Sene, Seydina, O. (2011). World Bank, IMF Spring Meeting 2011. Forum Civil and CSO Representatives Present at the 2011 Spring Meetings. Washington, DC.

Sene, Seydina O (Fall, 2010). Africa Fifty year Independence: Dependency, Monetary system and Globalization. Ohio University, Athens, OH.

Dr. George W. Gathigi & Sene Seydina O (Spring 2010). Qualitative Inquiry: An Ethnographic Research in East African popular culture, youth, new media and transnational cultures with: Sixth International Congress of Qualitative Inquiry, University of Illinois at Urbana –Champaign, Urbana – Champaign, IL.

Sene, Seydina, O. (2010). Ongoing Project on FDI, (Foreign Direct Investment, Microfinance-Microcredit and Financial Inclusions in West Africa. Remittances and Economics Literacy. This project is building on the platform of my research with the center for international studies and shriving to involve the African Diaspora in the development process of their respective countries, and their local Communities as well. This project is my 5 years commitment with Clinton Global initiative and we are moving forward.

Sene, Seydina O (Spring 2009). Invited Guest Lecturer: Ongoing project on Remittances and Social Changes. Ohio University and Center for International Studies, Athens, OH.

Sene, Seydina O & Dr. Godwyll (2008). Special Issues on Migration and Development. Paper Presented at the International conference for Education and research, Athens, Grèce.

Sene, Seydina, O. & Dr. W Stephen Howard (Winter 2008). The Economics of Sport: Annual Conference Ohio University

Media

Sene, Seydina, O (Fall, 2012). Market Imaginary featuring Seydina O Sene). Documentary on the Economic of the Market in Developing Countries, Senegal with Dr Joanna Grabski Associate Professor and Chair Art History at Denison University (2012). A feature length documentary film dealing with the concentric embedment of Dakar's Colobane Market in its neighborhood, in the city, and in the imagination. http://denison.edu/academics/art-history/contacts - grabski. Screened first in Dakar, Codesria, Ohio University, and Indiana University Bloomington, North Carolina University Chapel Hill, Colombia University.

Sene, Seydina, O. (Fall, 2010). Interviewed by West Virginia Local News, with the faculty of Business &Economics about diversity on Campus available at http://www.youtube.com/watch?v=dSU0AcAHOHA.

Sene, Seydina, O. & Dr. W Stephen Howard (Winter 2008). The Economics of Sport: Annual Conference Ohio University (presented and interviewed available online at: http://www.ohio.edu/sportsafrica/communicationmedia/ousmane.htm.

HONORS AND AWARDS, SCHORLARSHIPS & OTHERS ACHIEVEMENTS

- 2013–2014: International Summer Travel Fund Award by the Graduate Student Congress Summer Travel Awards. Top selected for dynamic and important research projects to be the first recipients of this prestigious award at the University of Kentucky.

- 2013–2014: Graduate Assistantship Award, University of Kentucky.
- 2012–2013: Graduate Assistantship Award, University of Kentucky.
- 2010–2011: BOT Minority Research Fellowship Award. Selected by the Provost for Academic Excellency.
- Achievement. West Virginia University 2010–2011.
- 2011: Travel Fund Clinton Global initiatives Fellow and project holder Award-San Diego California. CGIU (Clinton Global Initiative, University World Meeting).
- 20011–2012: Graduate Assistantship Award: School of Business & Economics West Virginia University.
- 2009–2010: Fellowship Award: University Enrichment Fellowship: West Virginia University.
- 2008–2009: Graduate research Assistantship Award. College of Business and Economics
- Ohio University.
- 2006–2008 Graduate research Assistantship Award. Center for African Studies, Ohio University
- 2004–2005 African Institute of Management Research Fund Award: African Institute of Management.

SERVICES

- 2012: Invited Reviewer for African Journal of Food, Agriculture, Nutrition and Development.
- 2010–2011: Clinton Global Initiative San Diego, Food Bank.
- 2006 – 2008: Member, Ohio University Ambassador Network.
- 2005 – 2006: Volunteer for Good Work. Inc Poverty Alleviation in the Appalachian Ohio and Homeless Assistance Program, Winter 2008 Ohio University.
- 2004 –2006: Cultural Consultant, Ohio Valley International Center, Ohio University.

PROFESSIONAL MEMBERSHIPS

- Southern Agriculture Economic Association USA **(SAEA**)
- Agriculture, Applied Economic Association USA **(AAEA**)
- Southern Economic Association USA **(SEA**)
- Clinton Global Initiative, University Meeting (**CGIU)**
- Rural Finance and Development World Wide (**RFD)**
- African Studies Associations USA **(ASA)**

LANGUAGES

- French: Native
- English: Fluent
- Arabic: Reading

- Wolof: Native

PROFESSIONAL EXPERTISE, COMPUTER & SOFTWARES:

- **Certificates**: **Words, Excel, Power point, Visual Basics** from Universite Cheikh Anta Diop de Dakar (UCAD), (**UCAD**) /Centre de Calcul Informatique, Senegal
- **Proficient on: EVIEWS, R, STATA, MATLAB, SAS, GAMS, LATEX**