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**Common currency, intra-regional trade flows and
economic growth: evidence from CEMAC customs union**

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UNIVERSITY OF THE WITWATERSRAND
SCHOOL OF ECONOMIC AND BUSINESS SCIENCES



**COMMON CURRENCY, INTRA-REGIONAL TRADE FLOWS AND ECONOMIC
GROWTH: EVIDENCE FROM CEMAC CUSTOMS UNION**

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Dissertation Submitted for the Degree of Doctor of Philosophy (PhD) in Economics at
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DECLARATION

I, the undersigned, hereby declare that the work contained in this research report is my original work that I have not previously in its entirety or in part submitted for any degree or examination at any other university. All the sources used or quoted have been indicated and acknowledged as complete references.

Kangami Divine Ngenyeh.....

Date: February, 2018

DEDICATION

This thesis is dedicated to the McHugh family and my grandmother. Without their guidance and support, I would not have been able to identify my path of service.

ACKNOWLEDGEMENTS

This research has been challenging work and at its completion it is necessary to acknowledge the support and assistance of those who have in various ways contributed to its successful completion.

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Special thanks to my wife, son and daughter for their patience and perseverance when I was absent, spending long hours in the library. Considerable thanks to the National Research Foundation (NRF) for granting me the financial support to pursue and complete this dissertation. Also, appreciation goes to my colleagues at African Leadership Academy and Wits School of Economics for their continuous moral support and making my stay in Johannesburg memorable and exciting.

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ABSTRACT

The debate on the merits and demerits of a monetary union and common currency continues to gain momentum among trade experts and policy makers given the referendum “yes” vote by Britain and its almost complete exit from the European Union. Most empirical studies—on developed market economies confirm that the benefits of regional currency outweigh the costs. There have been several attempts by African regional trade blocs to form monetary unions; magnitude of benefits from these remain largely unquantified though. Africa is home to four monetary unions and two existing common currency unions using the West African and the Central African francs CFA, respectively.

This dissertation focusses on the effects of common currency on economic growth and intra-regional trade in the Central African Economic and Monetary Community (CEMAC) customs union. It begins with an introductory chapter that briefly outlines the research problems and objectives. The objectives are three-fold; each of which is addressed in a chapter. In chapter two, we examine the first objective which aims at analysing the relationship between common currency and economic growth. The third chapter investigates the effects of common currency on intra-regional trade—second objective, while the third objective is on CEMAC intra-industry trade flow and this is examined in chapter four.

In chapter two, the regression discontinuity design model is adopted to analyse the effects of common currency on economic growth in the CEMAC customs union. The sharp design method is used as it deals with deterministic function which occurs when a single variable is solely responsible for the treatment effects as opposed to the fuzzy design that has to do with stochastic function. Firstly, the data used in the regression is presented in the form of a diagram. In the sharp regression discontinuity model, graphical analysis acts as a means to visualise the detection problem and increases transparency of the research design. Both parametric and non-parametric methods are used with different bandwidths in the estimation techniques to reconcile between precision and bias in the analysis. Using the per capita gross domestic product as proxy for economic growth, the findings show a negative relationship between common currency and economic growth in the CEMAC region. After performing different tests to take into consideration the sensitivity of the analysis, the results are still statistically significant.

Chapter three empirically examines the effect of common currency on CEMAC intra-regional trade flow. We apply the sample split threshold model developed by Hansen (1996; 2000). The approach adopted allows the classification of the observation in relation to whether or not there exists a threshold value that allows for the effects of common currency on bilateral trade to be established. It also captures the dynamic behaviour of the time series data used in the analysis—sufficiently highlights regime switching created by events or jump phenomena which linear models do not capture. A bootstrap method is also applied to test the presence of threshold and strong evidence is found of the presence of a single threshold in the regression corresponding to the year when the common currency was adopted by CEMAC member states. The regime is determined by a set of observable variables at a given time and each regime is estimated in such a way that allows for the asymptotic properties to be controlled. This also allows for the estimation of the threshold, confidence interval and the level of statistical significance. As a test of sensitivity, the difference-in-difference method of analysis is applied where countries in the CEMAC customs union are considered the treatment group and countries that are not members of CEMAC, but are members of the ECCAS, make up control group. The difference between intra-regional trade flow before and after 1994 in CEMAC and the difference between intra-regional trade flows before and after 1994 in the ECCAS area is calculated. The results show a negative relationship between the common currency and intra-regional trade flow. The implication is that the creation of the common currency in 1994 may not have contributed to intra-regional trade flow in the CEMAC region.

Chapter four examines the third objective by empirically analysing the nature and flow of CEMAC intra-industry trade at the different sectors and product categories using the Standard International Trade Classification (SITC). An augmented gravity model of trade is adopted to analyse changes in the different sectors and product categories from 1995 to 2015; this is the time span for which consistent and useable time series data is available. A time fixed effect variable is included in a fixed effects panel data model to control for unpredictable change in exogenous factors. A within estimator is also included in order to capture heterogeneity of the sample over time. The explanatory variables were regressed against each trade sector of the SITC 1 classification to indicate how each trade sector in the CEMAC region has been affected. The results are contrary to the Rose effect which stipulates that common currency among member states in a trade bloc increases the flow of trade three to four fold. Our results also

show that prior to the formation of the CEMAC customs union, the growth in intra-industry trade was higher than that of CEMAC customs union with the exception of very few sectors.

Chapter five concludes the study with a summary of findings and policy recommendations. The finding provides additional empirical evidence to the ongoing debate of whether the central bank of the CEMAC member states should continue to peg the franc CFA to the Euro. Results from the study reveal that prior to the formation of the CEMAC customs union, the growth rate and intra-regional trade were higher and more significant than that experienced by the region after the common currency was established. Countries of the CEMAC region have not realised the expected gains from the establishment of the common currency. The CEMAC customs union has performed on average poorly compared to its predecessor UDEAC and its regional counterpart such as UEMOA that uses a similar currency with similar exchange rate. The results also show that the exploitation and export of fuel and related minerals generate a significant portion of export revenue and therefore a key driver of trade in the region. An important lesson from the analysis for policy makers is that given the shift of the trade pattern over the years, from having the EU countries as CEMAC's main trading partners to having China and India as their main trading partners implies a need to revisit the initial arrangement. It is advisable for policy makers to pay particular attention to the real value of the currency. Careful study needs to be carried out to determine if there is reason to relax the value of the fixed pegged to a basket of currencies. This will further avoid a situation where continuous deterioration of the trade balance will force member states to bring about deflationary fiscal policies.

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LIST OF ABBREVIATIONS AND ACRONYMS

AIC:	Akaike information criterion
AR:	Autoregression
ATM:	Automatic teller machines
BEAC:	Central Bank of Central African States (<i>Banque des États de l'Afrique Centrale</i>)
BIC:	Bayesian Information Criterion
CAR:	Central African Republic
CEDEAO:	Communauté Économique des États d'Afrique de l'Ouest
CEMAC:	Communauté Économique des États d'Afrique Centrale
CEPGL:	Economic Community of Great Lake Countries
CEPII:	<i>Centre "d'Etudes Prospectives et d'Informations Internationales"</i>
CES:	Constant Elasticity of Substitution
CFA:	Coopération financière en Afrique centrale or Financial Cooperation in Central Africa
CHN:	China
CMA:	Common Monetary Area in Southern Africa
CIS:	Common Wealth of Independent States
COG:	Republic of Congo
COMESA:	Common Market for Eastern and Southern Africa
CRM:	Cameroon
CU:	Customs union
CV:	Cross validation
Diff-in-diff:	Difference-in-difference
EAC:	East African Community
ECCAS:	Economic Community of Central African States
ECOWAS:	Economic Community of West African States
EU:	European Union
GNQ:	Equatorial Guinea
Equa_Guinea:	Equatorial Guinea
EU:	European Union
FDI:	Foreign direct investment
FEA:	French Equatorial Africa
FTA:	Free trade agreement
GAB:	Gabon
GATT:	General Agreement of Tariff and Trade

GDP: Gross domestic product
 HIIT: Horizontal intra-industry trade
 HO: Heckscher-Ohlin
 IIT: Intra-industry trade
 LR: Likelihood ratio
 NAFTA: North American Free Trade
 NLS: Nonlinear least squares
 NTT: New trade theory
 Obs: Observation
 OCA: Optimum Currency Area
 OECD: Organisation for Economic Co-operation and Development
 OLS: Ordinary least square
 PC: Perfect competition
 PTA: Preferential trade arrangements
 RDD: Regression discontinuity design
 Rev: Revision
 RMA: Rand Monetary Area (RMA)
 ROT: Rule-of-thumb
 RTA: Regional trade agreement
 RTAs: Regional trade agreements
 SA: South Africa
 RSA: Republic of South Africa
 SACU: Southern African Customs Union
 SADC: Southern African Development Community
 SE: Standard error
 SETAR: Self-Exciting Threshold Autoregressive
 SITC: Standard International Trade Classification
 SUR: Seemingly unrelated regression
 TCD: Chad
 TT: Total trade
 UDEAC: Union Douaniere et Economique de l’Afrique Centrale or Central African Customs and Economic Union

UEMOA: Union Économique et Monétaire Ouest Africaine or the West African Economic and Monetary Union commonly

UK: United Kingdom

UNCTAD: United Nations Conference Trade and Development

UNECA: United Nations Economic Commission for Africa

USA: United States of America

VIIT: Vertical intra-industry trade

WAEMU: West African Economic and Monetary Union

WAMZ : West African Monetary Zone

WTO: World Trade Organisation

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Chapter One

Introduction

1.1 Rationale

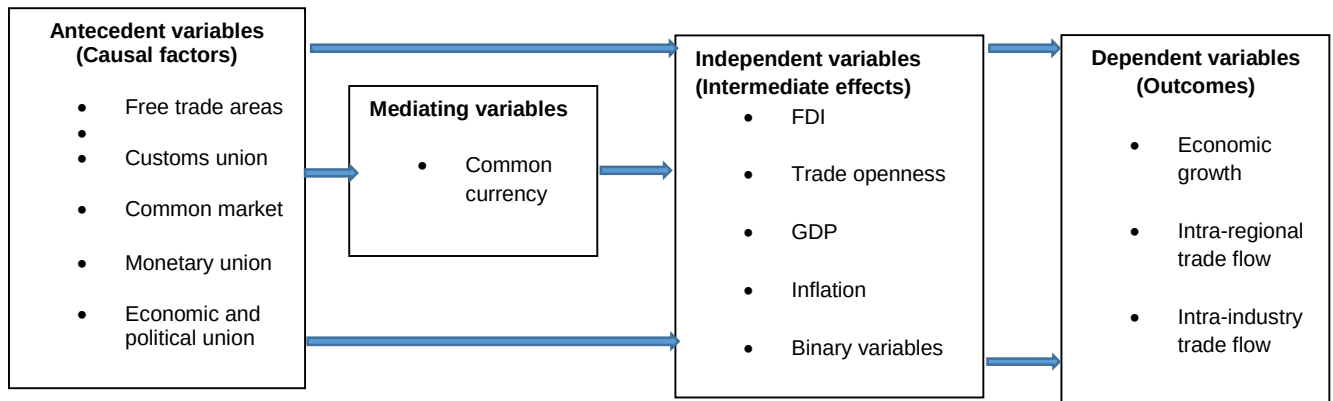
Monetary integration is a widely accepted and established phenomena in Africa; the continent has had a long history of established monetary unions compared to other regions of the world. Monetary integration is an important and strategic opportunity for countries to work together and promote common interest for regional cohesion. It is an example of a regional trade agreement (RTA) that facilitates tariff reductions as stipulated by the General Agreement of Tariff and Trade (GATT); deeper integration under the banner of World Trade Organisation (WTO) through preferential trade arrangements (PTAs); free trade areas (FTAs); customs unions (CU); common markets; monetary union; and economic and political union. The Rand Monetary Area (RMA) in Southern Africa comprising of Lesotho, Namibia, the Republic of South Africa (RSA) and Swaziland, established in 1974 is a typical example of well-functioning monetary union in Africa with a fixed exchange rate system. The franc CFA zone comprising of many Francophone countries in Central and West Africa is another example of monetary union that used to peg their national currencies to the former French franc (Boughton, 1992). The monetary unions above are examples of monetary integration agreements that boast of both common currencies and aspects of pegged exchange rate.

The common currency debates emerged just before the turn of the new millennium after the Euro Zone was fully established. Questions on effectiveness of a common currency union increased after the 2008/ 2009 global financial crisis and picked up momentum again as a result of the British yes vote referendum in June 23, 2016—the BREXIT—as Britain prepared to exit the European Union (EU).

1.2 Conceptual framework

The mechanics of regional integration as well as the role common currency plays in international trade has evolved over the years. The last few years have experienced huge changes in the agreements related to the regional integration. One of the major changes is the advent of trade blocs where member states or a group of countries sign an agreement to reduce or eliminate tariffs, quotas and other protectionist barriers between themselves. These agreements by the different trade blocs are at different stages of economic integration. This concept of regional integration is lucidly analysed by the framework shown in figure 1.1.

Figure 1.1: Analytical framework linking common currency and intra-regional trade flow



Source: Author's formulation

The theory of regional economic integration explores the impact of a fusion of national markets on growth and examines the need for the coordination of economic policies in a trade bloc (Balassa, 1961). The theory became known when Balassa (1961) categorized six stages of economic integration. The first stage is preferential trading area. This particular stage is not a trade bloc. This is where trading partners irrespective of their geographical location agree to reduce or abolish tariffs, quotas and some other protectionist barriers on some goods being traded. If trading countries are closed to each other within a geographical area, it can develop into a free trade area. A free trade area (FTA) is an agreement by member states where tariffs and quotas are reduced on trade in goods. However, each member state is able to impose its own tariffs and quotas on goods it imports from outside the trading bloc (Anderton, 2008).

A customs union on the other hand is where there is free trade within the trading bloc and a common external tariff on goods coming from outside the bloc. Establishing a customs union also involves the suppression of discrimination in the field of commodity movements within the union. A customs union (CU) generally requiring more coordination and a greater loss of autonomy, and therefore can be thought of as a deeper form of integration than an FTA. CU is preferential in nature and may discriminate against non-member states. The primary effect of a CU should be the expansion of trade flows among member states, often at the expense of trade with non-members. The formation of CU can lead to trade creation and trade diversion. Trade creation is said to take place when a country moves from buying goods from a high cost producing country to a low cost producing country within the CU. On the other hand, trade

diversion takes place when a country moves from buying goods from a low cost producer to buying then from a higher cost producer in the CU (Andriamananjara, 2011).

When it comes to a common market, in addition to free flow of goods among member states and a common external tariff, there is relatively free movement of capital and services, but not so advanced in reduction of non-tariff trade barriers. An economic and political union is regarded as the most advanced stage in economic integration. Countries in the union operate in the same way as might regions or areas would in a nation state. Complete economic integration is therefore associated with a political union. The Balassa's theoretical contribution shows that preferential trade agreement and free trade area are at the integration's foundation and starting point of regional integration

In practice, the different trading arrangements do not necessarily evolve in the way described above. The European Union, for example, was never a free trade area, although there were preferential trading agreements between some of its member countries (Anderton, 2008). However, the Balassa model helps us to understand the depth of economic integration which can go from a fairly shallow integration with PTA to a complete economic and political union.

In figure 1.1, the antecedent variables are the different stages of regional integration. The different RTAs are at different stages of the regional integration chart and each RTA can either decide to establish a common currency or decide not to. For example, the EU which is a common currency union and the Central African Economic and Monetary Community (CEMAC) which is a customs union both have adopted a common currency with different policy objectives and motives. The independent variables include foreign direct investment (FDI), trade openness, gross domestic product (GDP) of both the exporter and importer and inflation. Often, researchers include binary or qualitative variables as independent variables. The presence of these binary variables may shift the proposed outcome, and the variables can either take the value of 0 or 1 as this indicates the absence or presence of some categorical effects (Garavaglia & Sharma, 1998). In this investigation, the outcomes are the extent to which the common currency has had an impact on economic growth, intra-regional trade and intra-industry trade.

A closer investigation of south–south regional trade agreements¹ reveals that the majority of them have not met the required level of success compared to north-north RTA. Most regional trade agreements (RTAs) in Africa have constrained intra-regional trade given their composition by small economies, overlapping membership and contradictory policies. Many of these regional blocs are not able to fully enjoy the expected benefits of regional integration.

Underpinned by historical context, the CEMAC customs union is currently made up of six countries: Cameroon, Central Africa Republic, The Republic of Chad, Republic of Congo, Equatorial Guinea and Gabon. Equatorial Guinea was not a member when CEMAC customs union, formerly known as “Union Douaniere et Economique de l’Afrique Centrale” or “Central African Customs and Economic Union” (UDEAC) was formed in 1964². Equatorial Guinea only became an official member on the 1st of January, 1985 (African Development Bank, 2010). One goal for the creation of CEMAC was to boost economic growth in the region through increased intra-regional trade and increased mobility of factors of production. The creation of common currency and the harmonisation of trade regulations and economic policies of all member states were likely to boost economic development and regional trade flow through the reduction in intra-regional trade barriers (Leke, 2012).

1.3 Monetary unions in Sub-Saharan Africa

The colonial era played an important role in the formation of monetary unions in sub-Saharan Africa. This affected the different choices in the formation of monetary union and exchange rates arrangement made after the colonial era. As the era was coming to an end in the 1950s and early 1960s, there were series of arrangements between the colonial masters and their colonies with regard to the type of exchange system to adopt. For example, former British colonies moved from currency boards to flexible exchange rates after their independence whereas a monetary agreement was reached between francophone former colonies and France, in the form of the CFA franc zone (Bénassy-Quéré and Coupet, 2003).

Monetary union occurs when at least two countries share the same currency or member states currencies are pegged to each other at a fixed exchange rate (Anderton, 2008). Whereas, a common currency exists when a group of economies decide to share a common currency and

¹ Regional trade agreements in the southern hemisphere especially those in Africa, Latin America and part of Asia.

² Equatorial Guinea was a Spanish colony before UDEAC was formed.

adopt a common monetary policy. The following sub-sections look at the nature of monetary integration in sub-Saharan Africa.

1.3.1 The CFA Franc Zones

The CFA franc zone is borne from an outgrowth economic and financial arrangements under which France administered to its colonies dating back to 1945. The CFA stands for the Central African and West African CFA franc. These are two separate currencies that are used by the Central African Monetary Community, also known as “Communauté Économique des États d’Afrique Centrale” (CEMAC) and the West African Economic and Monetary Union commonly also known as “Union Économique et Monétaire Ouest Africaine” (UEMOA). The eight member countries in west Africa- Benin, Burkina Faso, Cote d’Ivoire, Guinea-Bissau, Mali, Niger, Senegal and Togo use currency known as the “franc de la Communauté financière d’Afrique” with central bank located in Dakar, Senegal. The six members in Central Africa are Cameroon, the Central African Republic, Chad, the Congo, Equatorial Guinea, and Gabon use the franc de la Coopération financière en Afrique centrale,” and have their own central bank, the “Banque des États de l’Afrique Centrale (BEAC) in Yaoundé, Cameroon”.

Despite the fact that they are separated, both have an exchange rate of 1:1. The currencies are pegged to the Euro at a fixed exchange rate after France adopted the Euro. The CFA franc was pegged at a fixed rate of CFA franc 1:02 to the French Franc, and 1:001 after the 1994 devaluation until the French adopted the Euro. Even though the exchange rate was fixed-peg, there were occasions when the CFA franc was allowed to float against other currencies, but not the French franc (Bénassy-Quéré and Coupet, 2003). This was normally based on the economic performance of the French franc against other major currencies.

Before many African countries had their independence in the 1960s, the French colonies used to have currencies that were linked to the French franc, but a number of these countries left the franc zones after independence. For example, Algeria decided to leave the franc zone in 1964, Guinea left the zone in 1959, Madagascar and Mauritania left the union in 1973, while Morocco and Tunisia left in 1960 and 1958 (ABM, 2012)³.

³ African Business Magazine (2012)

On one hand, it is interesting to see how other countries like the Comoros which is part of the franc zone decided to maintain its own currency that is pegged to the Euro at a completely different rate. On the other hand, countries like Equatorial Guinea, a former Spanish colony and Guinea-Bissau a former Portuguese colony decided to join the Franc CFA zone in 1985 and 1997.

The CFA franc is pegged to the Euro on a fixed parity which is guaranteed by the French treasury (Masson, 2006). This implies that the two central banks in the West African States and Central African States follow and execute the same monetary policies set by the European Central Bank (ABM, 2012). Stasavage (2003) shows that common currency on its own does not improve financial discipline. This is in reference to the CFA franc zone which shows that prior to the devaluation of the CFA in the mid-1990s, suggest that a common currency does not contribute much to fiscal policies discipline.

There is great concern around the contribution of the CFA franc to Africa's long term development since the franc zone was established in 1945 and more importantly the introduction of a common currency in 1994. Since the CFA is now pegged to the Euro on a fixed exchange rate, fundamental disequilibria in the region cannot affect its value. Even when there is significant fluctuation in prices to the region's major exports or when there is political instability in the region as we have seen in the past, still the exchange rate of this CFA franc remains unaffected. Over time, there is a belief that this has paved the way for the region's poor performance. For example, one argument put in place is that farmers and average consumers are worse off since exports have become relatively expensive and most of the products exported from this region are income inelastic. As the world's income increases, there is no significant increase in demand for the primary products that these countries export. Such a system tends to offer cheaper imports that benefited mostly the small middle class and elites of the CFA zone (Omosegbon, 2018).

1.3.2 The West African Monetary Zone

The West African Monetary Zone (WAMZ), also known by its French counterpart as “*Zone Monétaire de l'Afrique de l'Ouest*” (ZMOA) was established in 2002 after the collective efforts of Gambia, Ghana, Guinea, Nigeria and Sierra Leone to introduce a monetary union. Although it is still at its infancy and a common currency is still far from reality, WAMZ is making inroads to set up policies for sustainable regional economic uniformity. It is planned that once WAMZ

is fully established and the working of the institution is properly coordinated, it would subsequently merge with WAEMU to achieve the goal of a single West African currency (Masson, 2006). ECOWAS is also making progress concerning the establishment of a common currency. For example, the organisation recently adopted a Convergence Criteria to gauge on its readiness in adopting a common currency. If the ECOWAS monetary integration programme goes as planned, its long term objective is a merger with the UEMOA to produce a single economic and monetary union (Saka, Onafowokan & Adebayo, 2014).

1.3.3 The Common Monetary Area in Southern Africa

The Common Monetary Area (CMA) which was formerly called the Rand Monetary Area is made up of South Africa, Lesotho, Namibia and Swaziland. It is important to note that member states in the union peg their currencies to the South African Rand on a 1:1 basis and while the rand is allowed to float freely against other international currencies, the volatility of the rand does not affect the exchange rates of these currencies. The CMA has its origin from an informal arrangement during the colonial era when there was a general arrangement between South Africa and its neighbours⁴. The monetary union was somehow attached to the Southern African Customs Union which is the oldest trade bloc in Africa that was established in 1910. This relationship continues until 1921 when South Africa introduced the Rand. In 1974, a currency union was formally established with the signing of the Rand Monetary Area (RMA) in 1974 by South Africa, Botswana, Namibia and Swaziland (Tavlas, 2009). In August 1976, Botswana formally withdrew from the RMA and introduced its own currency, the Pula. The agreement was revised in 1986 that changed the name from the Rand Monetary Area to the Common Monetary Area. Namibia after gaining its independence from South Africa, became latest member of the Common Monetary Area (Jefferis, 2007).

The terms and conditions of the CMA Agreement allowed Lesotho, Namibia and Swaziland to issue their own national currencies⁵. These currencies are pegged at par to the South African rand since their introduction. In addition, the rand is legal tender in each of the other three countries but none of the three currencies is legal tender in South Africa. The fact that the Rand is legal tender in Lesotho, Namibia and Swaziland, implies these countries receive compensation from South Africa for forgone seigniorage (Tavlas, 2009). It is important to note

⁴ Botswana, Lesotho and Swaziland

⁵ The loti that was introduced in 1980 for Lesotho, the Namibian dollar, introduced in 1993 for Namibia and the Lilangeni that was introduced in 1974 for Swaziland.

that the CMA is not a full monetary union as member states maintained individual national currencies and have their own central bank.

1.4. Justification

Since the establishment of the CFA franc zone in December, 1945, the franc CFA has gone through several stages of its development. A currency board type exchange regime was formed in 1946 and over the decades leading to 1994, during which the franc CFA was devalued and pegged to the French franc until 1999 which was then pegged to the Euro (Agbor and Taiwo, 2014). Studies also show how some former French colonies decided to leave the Franc zone and how some other non-French colonies joined the Franc zone over these periods of its existence. After decades of fluctuation in the growth rates that was driven by high commodity prices in the 1970s and 1980s, the CEMAC governments and policymakers have attempted to put measures in place to achieve sustained economic growth. Its name has also seen a change from UDEAC to CEMAC and a common currency instituted in 1994 with proponents arguing that these changes were going to create financial discipline, further economic growth and increase the level of intra-regional trade among member states in the region.

Currency union can create conditions favourable for sustainable economic growth and increase intra-regional trade flow. According to Vickers (2000), this normally happens through different channels of transmission between common currency adoption and a country's real economy. These channels include the following; price stability effects, exchange rate effects, trade and competition effects and policy-making effects. A well-established monetary union can ensure the establishment of the optimum conditions for economic growth and increase intra-regional trade flow through low inflation, resulting in lower long-run interest rates. Low interest rates can boost investment, employment and economic growth. The greater the exchange rate certainty between member states of the single currency arrangement, the greater the international trade and output of member states.

In the case of a common currency, member states in the currency union should even realise a higher level of intra-regional trade as trade cost is further reduced since there is no exchange rate cost. For integration and given the regional currency (CFA franc), the question that might arise is how integrated are the member states of CEMAC custom union since its establishment. To answer the question, this research will approach it from the growth and trade angle and investigate the extent to which creation of the common currency has established conditions for

increased economic growth and intra-regional trade flow in the CEMAC region. Often, intra-regional trade is normally expressed in terms of aggregate exports among member states. Analysis of the determinants of these exports at sectoral level provides important information to policy makers, given that any meaningful exports promotion strategies are done at sectoral level, as opposed to aggregate level.

Common currency is becoming a priority concern for Africa more than ever before. Despite its potential in terms of creating favourable conditions for growth and development, the existing common currency union in Africa has not done much to promote intra-regional trade and economic growth among the countries involved and thus it remains weak when comparing it to other currency unions in the world. Identifying the real effects before and after reforms were carried out in 1994 is an appropriate way to take stock of its existence and inform policy makers on ways to unlock CEMAC economic development.

1.5 Research objectives and research questions

This dissertation assesses the links between common currency, economic growth and intra-regional trade flow in the CEMAC region.

The specific objectives are as follows:

- Investigate the correlation between common currency and the level of economic growth in the CEMAC customs union;
- Examine the effects and causal link of common currency and intra-regional trade flows in the CEMAC customs union; and
- Determine the extent to which the creation of CEMAC customs union has affected intra-industry trade flow in the CEMAC region.

To achieve the specific objectives, the following set of research questions guided the scope of the study:

- What are the mechanisms that the creation of a common currency (franc CFA) has created for the CEMAC region to realise an accelerated growth since its establishment?
- To what extent has the growth in intra-regional trade flow in the CEMAC customs union be attributed to the establishment of the common currency (CFA franc)?

- Which sectors or product categories have benefited the most from the creation of the common currency?

1.6 Research gap and significance

As mentioned above, when joining a common currency, participating countries may be required to relinquish their local currency in favour of a new regional currency. Most of the recent empirical literature on common currency in Africa and the CFA zones in particular has focused on the capacity of member states concerned to satisfy optimum-currency area (OCA) criteria. From an econometric and policy perspective, it is pertinent that analysis of growth and intra-regional trade be carried out using models that are suitable to estimate the average treatment effects of this change in the mid-1990s. This justifies the search for a suitable framework for analysis of this research.

In the CEMAC region, a significant proportion of total trade is with countries outside the region. Past research also measured cross-border trade flow of some primary commodities (Nkendah, 2013, Sneyd et al., 2015, and Diaw & Lessoua, 2013). Other studies looked at the trade performance in the region and country's national output in general (Carrere, 2013). For example, Zhao and Kim (2009) used the structural vector auto-regression method to determine the level of national output in the franc CFA zone given country specific, regional and global shocks. Other empirical works studied the feasibility of a group of countries or trade bloc establishing a monetary union (Adam & Chaudhry, 2014 and Umulisa, 2016). While some authors paid particular attention to the potential effects on trade flow if member states of a trade bloc eliminate their individual currency in favour of a single currency (Frankel & Rose, 2002 and Glick & Rose, 2002).

It is debatable whether the formation of common currency has played a significant role in promoting CEMAC member states economic development. From the desk research, it emerges that very few empirical studies have looked at the relationship and linkage between common currency, intra-regional trade and economic growth in the CEMAC region using the average treatment models and techniques that involves an asymptotic theory for nonlinearity estimations. To identify common currency effects on trade and economic growth, this study applies the average treatment effects approach which compares the growth and trade experience pattern among the countries in the CEMAC customs union before and after the policy change. Most studies normally use single comparisons to support the hypothesis of trade

and income effects. According to Slaughter (2001), single comparisons can actually be consistent with either convergence or divergence. Applying the average treatment can overcome the potential ambiguities of the single-difference studies.

In other parts of the world, focus has been on trade openness through the reduction of tariff and non-tariff barriers of trade blocs using different currencies (Dowrick & Golley, 2004, and Panagariya, 2004). It is based on these emerging studies that this dissertation locates itself and endeavours to fill the gaps within the body of open economy studies. As articulated above, the aim of this dissertation is to analyse the links between common currency, economic growth and intra-regional trade flow. A comprehensive analysis of CEMAC customs union is provided and the application of different empirical techniques to test the hypotheses is also presented. The data used is sourced from World Trade Organisation (WTO), United Nations Conference Trade and Development (UNCTAD) and World Bank statistic databases.

Arising from the three formulated research questions, the dissertation comprises three major chapters that respond directly to each of the questions. Chapter two explores the relationship between common currency and economic growth in the CEMAC region. In this chapter, the sharp regression discontinuity design (RDD) technique is applied to analyse the data. The RDD is used to analyse the causal effects of the common currency on economic growth. The causal role of a common currency on economic growth is identified from exploiting the discontinuity of the individual currency in favour of a regional one. The data is presented graphically to visually identify the point of discontinuity. Presenting data in its raw form in the RDD increases the level of transparency of the research design. The analysis and interpretation of the findings proceeds by presenting both parametric and non-parametric results. Care is taken to minimise the bias produced by low order polynomial and data point closed to the cut-off point (Lee & Lemieux, 2010). Results of analyses seem to suggest that the common currency in the CEMAC region has not managed to establish any significant condition necessary to promote the CEMAC region's economic growth.

In chapter three, the focus of attention is on common currency and intra-regional trade in the CEMAC region. To achieve this goal, the sampling estimation technique and the difference-in-difference econometrics method are applied. The sampling estimation technique provides a better estimation especially in situations where the data has non stationary and cointegration properties (Zapata & Gauthier, 2003). A regime is determined by a set of observable variables

and estimated using the sample split threshold estimation technique. To achieve the set objective, a sample splitting estimation developed by Hansen (1996; 1999; 2000) is applied. To assess the effects of the statistical significance of the model, a bootstrap method is applied that tests for the presence of a threshold. The recently developed sample splitting method by Hansen (2000) systematically uncovers the robust relationship between common currency and bilateral trade. The splitting methods has the advantage of not being as susceptible to curse of dimensionality problems as nonparametric methods. Its functional form allows for increased flexibility and the method of estimation is considered parsimonious. The second approach allows for the test of sensitivity and robustness of the results. A panel approach of the difference-in-difference method of estimation is applied. Under this approach, the effect of a policy change is of interest. This policy change is called the treatment and the basic assumption is that if common currency leads to increase in intra-regional trade flows, then the franc CFA adopted by the CEMAC member states from 1994 should have affected the level of intra-regional trade flows positively. Following the methods of estimation of Giavazzi and Tabellini (2005), the difference-in-difference method estimates the average change in intra-regional trade flow of exposed treatment group.

To build on the previous two chapters, chapter four discusses and analyses trade disaggregation into the three main sectors of agriculture, fuel and manufacturing, and nine product categories according to the Standard International Trade Classification (SITC). The main aim is to fill in the gap of the current literature by identifying econometrically, the effect of common currency integration on intra-industry trade (IIT) flows. The rationale is that, if at all the common currency is negative to aggregate intra-regional trade flow in the CEMAC region, maybe the different sectors or product categories have responded differently to intra-regional trade since the policy change in the mid-1990s. That is why chapter four takes a more disaggregated approach and applies an augmented gravity model to study the trade pattern of intra-industry trade. The approach adopted to carry out the analysis uses a fixed effects panel data model in order to control for any major shocks during the time frame. The within estimator is included in the analysis to take care of heterogeneity of the sample over time (Alturki, 2007). The results provide evidence of weak intra-industry trade in the region and show how CEMAC countries trade more even with the different product categories with non-CEMAC countries.

Drawing from the analyses and findings from the previous chapters, chapter five concludes the study and proposes a set of policy recommendations to policy makers.

1.7 Limitations of the study

As highlighted and supported above, literature on intra-industry trade in the CEMAC region is rare. There are few published studies on bilateral trade within CEMAC member states that are available. The main reason is the lack of data that can be trusted in the field. With that, this study is also limited in its presentation of comprehensive data on the different product nomenclature and as such the dissertation is limited to the Standard International Trade Classification (SITC) revision 1. There is certainty that data on SITC revision 2 and more would have provided an in-depth analysis of how the individual products have been affected by the CEMAC customs union, but after extensive research and investigation, the status is that data on SITC revision 2 and more and data before 1995 on the different sectors are non-existent. Furthermore, comparing CEMAC customs union with the West African Economic and Monetary Union (WAEMU) would have provided more information about the nature or the economic and political effects of the franc CFA in Africa. However, this comparative analysis was not completed due to the fact that, the study is directly on CEMAC and the franc CFA and not Africa in general.

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Chapter Two

The effect of common currency on economic growth

2.1 Introduction

The pursuit of economic regionalism has been one of great importance since the end of the Second World War. Economic regionalism enables countries to come together and sign treaties to form regional institutions in order to carry out mutual projects, and harmonize economic, political and trade policies. The majority of regional integrations around the world consist of countries that share national boundaries. With that it follows that efforts at regional integration in different parts of the world have often focused on removing barriers to free trade and allowing the free flow of goods and services across national borders.

Regional trade agreements (RTAs) have been used to enhance geo-socioeconomic integration between countries whilst still maintaining national borders. This is based on the idea that such agreements address the constraints of low and limited production created by small and fragmented markets (Andriamananjara, 2003). Therefore, it is widely argued that RTAs are valuable tools for countries in the concerned regional bloc to carry out joint projects. For example, gaining free and/or subsidized access to economic resources through countries that are party to the agreement in the event that the host country lacks the technical capacity to exploit the natural resources such as energy and oil (Global Trade Negotiation, 2004). RTAs can also facilitate exchange of ideas and technologies between member states. If the exchange of ideas is directed towards sectors of the economy that lead to higher increasing return, one should expect long term growth in the region (Rivera-Batiz & Romer, 1990).

There are two main RTAs in Africa that have adopted a common currency. These are the Central African Monetary Community, also known as “Communauté Économique des États d’Afrique Centrale” (CEMAC) and the West African Economic and Monetary Union commonly also known as “Union Économique et Monétaire Ouest Africaine” (UEMOA). Studies that analysed the effects of common currency on these two RTAs showed that UEMOA achieved higher growth rate than the CEMAC region. Given the advantages of the adoption of a common currency, it is however still unclear if the common currency has given the CEMAC region any competitive edge over other RTAs in Africa. Analysis by Bénassy-Quér and Coupet (2005) found that neither CEMAC nor UEMOA fulfils the criteria of an optimum currency

area; instead the composition of both into the franc CFA common currency unions are considered more of a colonial influence or characteristic rather than an economic one⁶.

The CEMAC customs union is no stranger to a regional trade agreement (RTA) and countries in the CEMAC region have reaped some discreet benefits through collaborative trade and political agreements. Economic integration was initiated in the CEMAC region before independence under the former administrative grouping or federation entitled French Equatorial Africa (FEA). This federation was predominantly an extension of the French colonial regime in Africa as it was governed by France and comprised of five French territories in Central Africa: French Congo, Gabon, Oubangui- Chari⁷, Chad, and French Cameroon (after World War I).

This chapter aims to assess links between common currency adoption and economic growth in the CEMAC region. The pertinent question in this regard remains as to what extent the growth experiences in CEMAC, pre-and-post adoption of the common currency could be attributed to the franc CFA. In other words, what are the mechanisms that the creation of a common currency (franc CFA) has created for the region to realise accelerated economic growth? This is more of a counterfactual analysis that examines patterns of economic growth before and after the formation of the common currency union.

It is important to highlight gaps in earlier empirical literature on common currency and economic growth that the current study tries to fill. Most of the earlier studies on the CEMAC trade bloc are devoted to examining individual country's trade performances and national output (Carrère, 2013 and Zhao & Kim, 2009). Given the divergence in growth rate, it is also important to address the impact of common currency (franc CFA) on growth rates in the CEMAC trade bloc. Furthermore, some of the earlier studies on CEMAC examined the relationship between inflation and economic performance (Fiodendji, Kamgnia & Tanimoune, 2013), macroeconomic performances and FDI (Djiogap, 2013) and trade flow of some industrial products, using the gravity model (Carrère, 2013).

These past empirical studies have greatly contributed to the monetary union and common currency literature. Surprisingly, common currencies are normally formed by member states in

⁶ Member countries of the CEMAC and UEMOA were all colonized by France and all had previously used the French Franc as domestic currencies. History also has it that member states of CEMAC signed a treaty with France guaranteeing the stability and convertibility of the Franc CFA (Coulibaly, 2014).

⁷ Present day Central Africa Republic (CAR)

a trade bloc by their own volition such as the Euro zone in order to achieve different policy objectives. Evaluating the efficiency and effectiveness of initiating the institution of the common currency and the causal inferences between common currency and economic growth is yet to be carried out. This study aims to fill this gap. The method used in this study is robust, credible and transparent as it considers both the pre-treatment and post-treatment effects at the same time in the analysis. Also, it is highly recognised as a quasi-experiment that normally produces an unbiased estimate in the treatment when executed correctly (Rubin, 1977).

The rest of this chapter is organised as follows:

Section 2.2 looks at the nature of CEMAC macroeconomic performance and shocks. Section 2.3 provides the literature review and sets out the theoretical framework of the relationship between common currency and economic growth. In section 2.4, the methodological framework and data used in the study is described. This section also explains the estimation techniques and the model. Section 2.5 presents the empirical results and findings. Finally, a conclusion is provided along with recommendations in section 2.6.

2.2 CEMAC Macroeconomic Performance and Macroeconomic Shocks

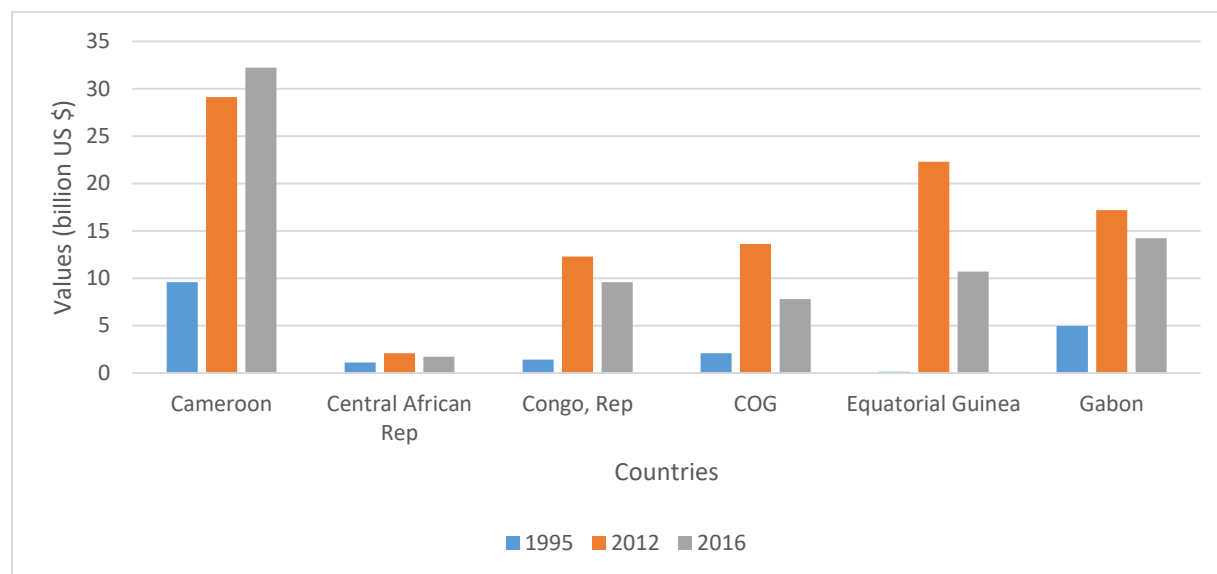
2.2.1 CEMAC macroeconomic performance

Historically, the six member states of the CEMAC customs union have experienced varying macroeconomic performances and conditions. This region had a combined population of approximately 44.9 million inhabitants in 2013 (WTO, 2015). Despite a modest increase in macroeconomic convergence, the average growth rate was approximately eight percent in 1990, five percent in 1995, four percent in 2000, five percent in 2005, six percent in 2010 and five percent in 2012 (UNCTAD, 2013). The high growth in 2010 and 2012 was largely driven by huge capital expenditure by the respective governments in the CEMAC region.

Cameroon is the largest economy in the region in terms of population and Gross Domestic Product (GDP) and the evidence for this can be seen in Figure 2.1. In figure 2.2, Equatorial Guinea has the largest GDP per capita driven mainly by oil export revenue. The inflow of FDI into the CEMAC region increased greatly from 1995 to 2006. This was partly attributed to privatisation of different states-owned enterprises that was pronounced after the structural adjustment programme in the early 1990s. For example, the telecommunications sector was privatised and the region witnessed a series of mergers and acquisitions during the 1990s and

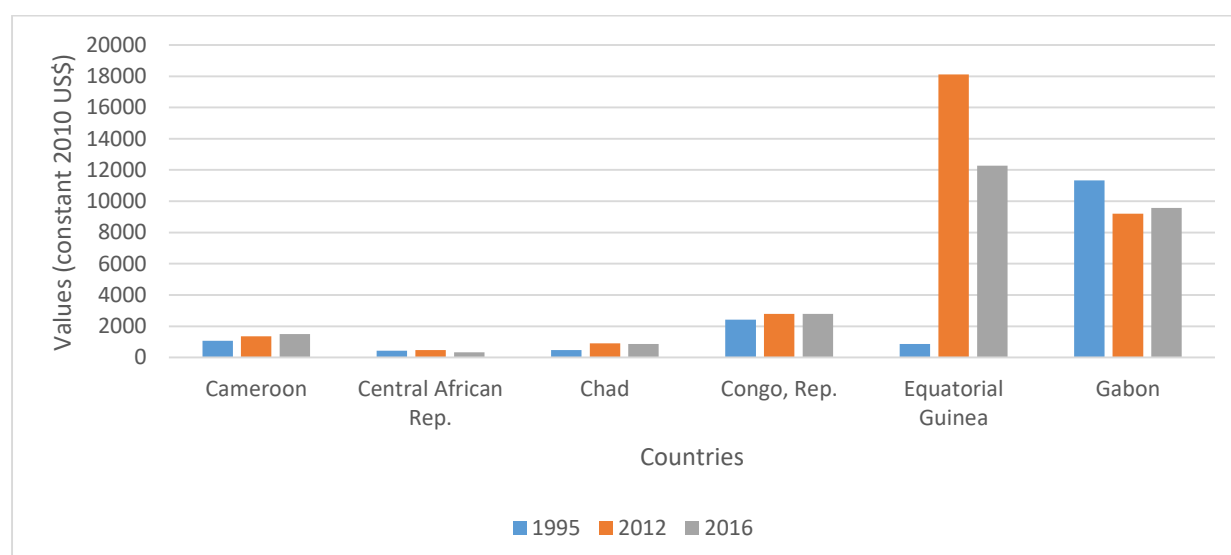
early 2000s (Ngongang, 2012). These events made it possible for inflow of funds into the region.

Figure 2.1: CEMAC member states GDP (current) in US Dollars: 1995, 2012 & 2016



Source: Author's computation using World Bank, World Development Indicators Database, 2017

Figure 2.2: GDP per capita for CEMAC member states (constant 2010 US Dollars) 1995, 2012 & 2016



Source: Author's computation using World Bank Development Indicators Database, 2017

2.2.2 CFA franc and macroeconomic shocks

Historically, the public sentiment leaned towards the idea that the CFA franc was more successful from the 1970s to mid-1980s in its role in managing inflation and promoting economic growth. This is partially due to the fact that member states were using peg currencies to that of the French franc (Bénassy-Quér & Coupet, 2005). The two CFA franc regions were more successful than other non-CFA franc countries in most of Africa and output grew twice as much as inflation rates (Hoffmaister, Roldós & Wickham, 1998). The authors also show how the sources of macroeconomic fluctuation in the CFA franc zone are different from those of non-CFA franc regions in Sub-Saharan Africa. To them, structural dissimilarities are partially responsible for the differences. For example, the heavy reliance on primary commodities for export revenue by most of the countries in the region is a determining characteristic of the region.

The CEMAC monetary union was established on the assumption that the union was going to create financial discipline and member states were to benefit from lower inflation and higher economic growth. The monetary union achieved some of its objectives after its establishment in the 1960s until the mid-1980s where it suffered from major fall in commodity prices. Taking into consideration the price elasticity of exports from the region, the fall in commodity prices severely affected export revenues. The rate of growth in output was much slower than other less developed countries with similar economic structures (Elbadawi and Maid, 1992).

The years leading up to the introduction of the common currency (mid-1980s to 1993), the CEMAC region found itself in heavy external debt. Poor fiscal policies and deterioration of its terms of trade escalated the problem. It all started with the appreciation of the CFA franc as the French franc appreciated against the US Dollar. The region's central banks were in crisis due to heavy lending to states' corporations. These problems led to the devaluation the CFA franc by approximately 50 percent against the French franc in January 1994 leading to the introduction of the regional currency that same year (Bénassy-Quér & Coupet, 2005).

According to Bayoumi and Ostry (1997), the benefits of the establishment of the CFA franc lie in its stability guaranteed by the former French franc and now the Euro. Some of the countries in the CEMAC region are still among the least developed in Africa. These include Chad and Central African Republic. While Equatorial Guinea and Gabon are comparatively healthier, these two states are highly dependent on petroleum products for their export revenue therefore

making their economies precarious due to their reliance on one industry. In the CEMAC region, there is also a clear link between economic growth and the rate of inflation. Since countries in that region depend on foreign countries for a large portion of their export revenue and import revenue, it is likely that part of the inflation is imported (Mantsie, 2012).

2.3 Literature Review and Theoretical Framework

2.3.1 Literature review

Literature on international trade supports the view that trade liberalization leads to economic growth and its impact on growth is still debatable as economists have identified different outcomes. Previous studies in the CEMAC region have paid more attention to trade openness, and very little work has been done on the study of common currency and economic growth. That is why it is necessary to further the debate by analysing the effect of the franc CFA on CEMAC regional growth. These past studies focussed mainly on the EU. For example Sokolowska (2008), Guellec & von Hagen (2000) and Conti (2014) investigate the effects of the Euro on economic growth for countries in the European Union. These authors observe that the Euro since its inception has had a positive influence on EU economic growth. Past research that study the connection between trade flow and economic growth suffers from spurious regressions. In solving this problem, economists normally add appropriate lagged values in a Vector Autoregression model. The side effect of adding lagged values is that it reduces the degree of freedom where the sample size is small (Laurin, 2012).

Fetahi-Vehapi, Sadiku, and Petkovski (2015) estimate the impacts of trade openness on economic growth in South East European countries using the system of Generalised Methods of Moment. They note that countries that reduce barriers to trade enjoy higher economic growth. When convergence is measured in line with correlation of innovation in the gross domestic product, Fielding and Shields (2005) finds no evidence in business cycle convergence. The authors conclude that common currency can lead to higher economic integration among member states than countries that do not share a common currency or even peg their currency to another major one such as the US dollar.

Nawaz, Aziz and Zaman (2014) estimate the impact of trade factors on economic growth using the Seemingly Unrelated Regression (SUR) for South Asian Association for Regional Cooperation countries. They observe a strong correlation between economic growth and net exports, terms of trade and foreign direct investment. Conti (2014) applies the difference-in-

difference framework to estimate the effects of the Euro on economic growth using annual data for seventeen European states. He controls for time trend and country's fixed effects and utilizes GDP per capita as a proxy of economic growth. His conclusion is that the adoption of the Euro by member states has increased their per capita GDP and labour productivity by approximately three to four percent within a specific time frame. While Felbermayr (2005) applies Blundell and Bond's system GMM estimator to evaluate the relationship between the levels of a country's openness and per capita income. He affirms the existence of a strong relationship between trade and per capita income. Applying the SUR model and using data from 1960 to 1997, Kónya (2006) shows that causality between economic growth and exports and between exports and economic growth differs from one Organisation for Economic Co-operation and Development (OECD) country to another. There is a general consensus that a higher level of economic integration will likely increase regional growth, though the benefit to member states is still uncertain.

Sokolowska (2008) examines the economic growth in Italy before and after the country joined the European Monetary Union (EMU) in 1999. A time series-cross section analysis is performed for twenty Italian regions across time lag from 1985-2005. After performing the Chow test to verify whether there is a difference in the growth regression models. The findings indicated that it was the right move for Italy to join the European Union as accession to the common currency market has boosted the Italian economy and its development

Most literature on macroeconomics discusses the empirical determinants of economic growth. The rate of growth is also affected by the inflation rate (Boschi & Girardi 2007, Boujelbene & Boujelbene 2010, and Jalil et al. 2014). Previous studies have analysed different aspects of economic growth, including monetary policy, inflation, financial institutions, and the state of financial development. For instance, He (2011) studies the relationship between international trade, economic growth and inflation. His result shows a positive correlation between international trade, GDP growth and inflation.

In line with inflation rate and economic performance, Fiodendji, Kamgnia and Tanimoune (2013) examine the correlation of inflation and economic performance in the CFA franc regions. Using data from 1991 to 2009 and applying the threshold model, they concluded that the long term relationship between inflation rate and economic performance is nonlinear. They also found out that in WAEMU, the level of investment can act as a channel through which

inflation affects economic growth in an indirect proportion. Pradhan et al. (2015) investigates the relationship between real GDP growth rate, inflation and the stock market for thirty four countries in the OECD area. Their studies reveal positive linkages among the variables from 1960 to 2012. For countries to benefit from steady economic growth, low inflation, and increased intra-regional trade flow, there has to be some level of macroeconomic convergence among member states. If the macroeconomic convergence is so diverse, then the benefits of regional integration will not be felt completely.

Boughton (1992), analyses the effectiveness of the CFA franc zone to find out how well it fits the criteria for a successful currency union. These criteria include but are not limited to factors such as the degree of flexibility of wages and prices; the degree of labour mobility; the similarity between countries from external disturbances; and the degree of intra-regional trade. According to Boughton (1992), CFA franc countries have shown some evidence of downward flexibility of real wages during inflationary periods, but there are more examples of failed attempts to cut nominal wages especially in the public sector-during deflationary periods.

The absence of country-specific shocks limits the need for exchange rate adjustment. This was seen in the 1980s where the CEMAC region went through a major adverse shock that saw a sharp deterioration in the terms of trade. This was mostly attributed to the decline in world prices of commodities exports of which member states in the CFA zone highly depend on as their main exports. This was also the case in 1990s when the CFA franc was devalued and the value of the currency dropped by 50%. Major exports such as beans, cocoa, palm oil and uranium fell by 50% from the 1980s to 1990s, while petroleum, fish meal, phosphate rock, cotton and beef prices fell by approximately 20%. Moreover, intra-regional trade in the CFA franc zone is negligible as member states trade more with the European Union China, India and the United States of America.

Olamide and Maredza (2018) apply the Structural-Vector Auto Regressive model to investigate the interactions between oil price and commodity price volatilities, net domestic credit, inflation rate, exchange rate money supply, monetary policy and growth rate in the Economic Community of West Africa Monetary Union using quarterly data from 1980 to 2015. After testing for the presence of unit roots in order to ensure the stationarity of variables and the long run relationship among the variables, the author concluded that in ECOWAS, monetary shock could have adverse symmetric effect on member states. Also sound monetary policies are

necessary at enhancing the strength of the currencies for it to act as a catalyst to boost production of goods and services. The authors' contribution to the debate on the connection between monetary policy and economic growth cannot go unnoticed. The relationship based on regional currency union, and the transmission to economic growth needs further attention and that is the contribution of this chapter.

To analyse the potential benefits and loss of a monetary union, Debrun, Masson and Pattillo (2005) calibrated a model with actual data to assess proposed ECOWAS monetary unions. The goal was to analyse the main costs and benefits of the proposed monetary union. The authors concluded that for ECOWAS member states to benefit from a common currency, fiscal heterogeneity appears a critical factor. Differences in fiscal distortions can affect incentives for countries to join a given monetary union, and the willingness of existing members to accept new entrants. This has implication for Africa and Nigeria in particular where governments in power tend to channel public resources towards socially unproductive activities and that they are ineffective at raising sufficient tax revenues. Therefore, the proposed currency union among all the countries of ECOWAS, though desirable for most of the non-WAEMU countries, is shown to have less incentives for most of the existing WAEMU members.

Amin (2000) carry out an analysis to identify those factors that affect the growth rate in the CFA franc zone relative to other countries that are not member states of the CFA zone. His analysis shows the monetary and exchange arrangement of the CFA franc places a major rigidity to growth and this rigidity has affected negatively the different aspect of the member states of the CFA franc. The fact that there are varying degrees of growth and economic performance among member states, the imbalances; especially external imbalances, makes it difficult for self-correcting mechanisms.

In another study, Fiodendji et al. (2014) examines the relationship between inflation and economic performance in the CFA franc zone over the period 1991-2009 to understand the mechanism through which inflation affects long-term economic growth in the CFA franc zone. Using a threshold model, the authors concluded that there exists strong evidence of the relationship between inflation and economic growth is nonlinear with a unique threshold. The transmission mechanism through which lower inflation by the central bank can boost growth, is the elimination of uncertainties in the financial markets which in turn attract foreign investments.

In order to derive the net gains from the CFA franc since its establishment in 1945, Niamkey (1994) computes the opportunity costs of maintaining the operations account of the CFA at the French Treasury, in order to compare the costs associated with the interest rates and rate exchange rates risks for both UMOA and BEAC. Using the reserves pooling methodology and data from 1975-1988, results shows that the two franc zones have realised some gains with the respect of degree of pooling. When the opportunity costs of maintaining the operations account, most UMOA countries are net losers. While in the CEMAC zone, Gabon and Chad are net gainers, whereas Cameroon is the biggest loser. The implication of this is that there are more losers than gainers in the CFA Franc monetary cooperation system with 65% reserves pooling.

To evaluate the CFA franc relationship to economic growth, Wane et al. (1996) applies a structural growth equation to incorporating CFA effects on the productivity of investment, using annual data for 26 sub-Saharan African countries covering the years 1974–92. The authors adopted a framework to distinguish economic growth effects of expected versus unexpected changes in both the price level and the money supply. The results suggest that CFA membership experienced a positive impact on growth via a higher productivity of investment during the time frame, but that this effect was limited to the pre-1980 years despite the CFA zone's subsequent superior inflation performance relative to the non-CFA countries. No strong evidence was found to show that structural adjustment program in the early 1990s was more or less adverse for economic growth in the CFA franc zones than for non-CFA franc zone countries.

In trying to answer question as to whether and how the changeover of the pegged CFA franc from the French franc to the euro has impacted the price competitiveness in the CFA zone and the economic growth of the zone, Coulibaly (2014) relies on the Behavioural Equilibrium Exchange Rate framework and panel cointegration techniques to assess the real equilibrium exchange rates and currency misalignment. The author concluded that improvement of macroeconomic fundamentals in the CFA region, better prices from the region and the devaluation in 1994 of the CFA franc managed to contain the real effective exchange rates (REER) of the Euro in the 2000s. Therefore, the change from the French franc to the euro has negligible effect to the CFA regions and other factors must have been in place to affect the macroeconomic performance of member states.

2. 3.1.1 Foreign direct investment and economic growth

The relationship between FDI and economic growth has been one of great discourse among economists. The neoclassical and endogenous growth models provide a basic framework for most empirical studies on the relationship between FDI and economic growth. Empirical studies have shown that FDI can have a profound effect on a country's growth rate. According to Chowdhury and Mavrotas (2006), this relationship can be grouped into FDI and determinants of growth, growth and determinants of FDI, the presence of multinational companies in host's countries and the direction of causality between FDI and economic growth.

The net inflow of capital into developing countries has increased over the past four decades. It is believed that the flow of FDI is driven by the availability and size of the market. Since many developing countries in sub-Saharan Africa have relatively small markets, RTAs can play a vital role in promoting growth in the region. This will enlarge the regional market and attract even more foreign investment from foreign governments and private agencies. In investigating the role of market size, government policy and the nature of political stability influence the flow of FDI. According to Asiedu (2006), the size of a country and the availability of natural resources plays a major role in attracting FDI. In answering the following question: '*what are the determinants of FDI?*', the author observes that quantitative factors such as educated workforce, availability of proper infrastructure and qualitative factors which include stable government, low corruption and efficiency in the legal system play an important role in attracting net inflow of FDI.

In another study, Gohou and Soumaré (2012) investigate the relationship between net inflow of FDI and poverty reduction in regional trade blocs in Africa. The question they pose is whether FDI has the ability to reduce poverty in Africa. Applying the Granger causality Walt test, their analysis shows a direct relationship between FDI and wellbeing in some African states including CEMAC. Also, Attari, Kamal and Attaria (2011) study the bidirectional relationship between foreign direct investment and net exports. They use the gross domestic products of Pakistan as determinants of growth. Applying the vector error correction model (VECM) and Granger causality test, and using data from 1981 to 2009, they obtain a long run relationship between the variables in question. But when Granger causality test is applied, FDI is not necessarily responsible for growth in GDP of Pakistan.

In addition, Hansen and Rand (2006) examine the causal relationship between FDI and economic growth for developing countries. Using log of GDP to represent economic growth, and data from 1970 to 2000, they apply the mean group estimator technique. These authors' analysis shows that the flow of foreign investment into the country in question positively affects the growth rate of the country. It is possible to identify a causal link in the long run from FDI to GDP provided that the host country has reached a certain level of economic development.

Oladipo (2013), in trying to find out the answer to the question if FDI causes long run economic growth in Latin America and the Caribbean, included 16 developing countries in the region and data for thirty years. Using the test of Granger non-causality developed by Toda and Yamamoto, his result shows that FDI does not cause economic growth in all the countries in his study except for a few. He also observes evidence of unidirectional causality in most of the countries in Latin America and the Caribbean from GDP growth to FDI. Zhang's (2001) analysis shows a similar result to that of Oladipo (2013), unidirectional causality of FDI and GDP in some countries in Latin America and East Asia. Also, applying the integration test shows that there exists a long run relationship between FDI and GDP growth.

To conclude, the literature on common currency and economic growth covered in this section confirms a general consensus on the positive relationship between economic integration and regional growth, though the extent to which member states benefit is still debatable. The focus of previous studies on common currency and economic growth has been mainly on the European Union. Other researchers have paid more attention to trade openness and economic growth, growth rate and inflation and FDI and economic growth in other parts of the world including CEMAC. Some recent studies have looked at the potential of an African currency or the possibility of the other regional trade blocs in Africa forming a common currency zones.

2.3.2 Theoretical framework

The theoretical concept on the linkages between regional integration and economic growth in the literature of international trade has been of interest to many economists given its central role in economic development. Previous models of economic growth did not clearly suggest a systematic relationship between economic integration and economic growth. Consequently, it is possible to find a situation where increasing economic integration can have both positive and negative effects on growth rate. Trade theories stipulate that increased openness can promote

economic efficiency and welfare by allowing member states to produce goods with lower opportunity costs. This shift in the production process from one country to another can raise the growth rate of these countries (Pain, 2002).

2.3.2.1 Neoclassical growth theory of economic growth

There have been many theoretical studies of economic growth from the time of Harrod-Domar and Robert Solow in the mid-1950s, to that of the neoclassical growth theories. According to Chaudhuri (1989), the main idea behind the neoclassical growth theory is that with a given technology, assuming the economy is not inherently unstable, an economy will tend to grow with full employment. This can only be constrained by the rate of growth of the labour force and the productivity of capital. Trade openness through RTAs for example, will bring about changes in the level of per capita growth rate⁸ but not the steady rate of growth. Chaudhuri (1989) further states how the neoclassical model of growth provides a framework for some of the distributional implications of growth. The implications include but are not limited to the nature of technical progress and the sources of economic growth. The neoclassical growth model goes as far back to the seminal contributions of Ramsey (1928), Harrod (1939), Domar (1946) and Solow (1956).

After Robert Solow's (1956) work on economic growth which posits to answer questions surrounding the conditions necessary to increase income per capita and the extent to which it continues to increase over time (Solow, 1956), Mankiw, Romer and Weil (1992) came up with a simple economic growth model. They developed an augmented Solow model that includes investment in human and physical capital to explain differences in income per capita. These authors used a simple Cobb-Douglas production function given as:

$$Y(t) = K_j(t)^\alpha H_j(t)^\beta (A_j(t)L_j(t))^{1-\alpha-\beta}, \text{ where } 0 < \alpha < 1, 0 < \beta < 1 \text{ and } \alpha + \beta < 1.$$

A is the total factor productivity. α and β are the capital and labour output elasticities. Y is the gross domestic product and is directly related to productivity, K is capital deployed in the production process, H is the value of total labour input and AL stands for the human capital (Sokolowska, 2008). The equation shows that the level of total output will depend on the productivity of labour and capital. Mankiw et al (1992) assumed a world of $j = 1, \dots, j$ countries,

⁸ See literature review Conti (2014) and Fetahi-Vehapi et al (2015)

where each country is far from another country. They concluded that differences in savings, population growth and productivity⁹ account for differences in growth rate between countries.

2.3.2.2 The Endogenous growth model

Over the last twenty-five years, the endogenous growth theory has become prominent in the literature on international trade and economic growth. The growth model posits that the equilibrium growth rate in an economy is not determined by exogenous factors; research and development that promote innovation and technological progress driven by entrepreneurs is the main source of growth (Arestis, Baddeley & McCombie, 2007; Cieslik & Tarsalewska, 2011). The effects of economic integration on economic growth can be realised through knowledge spill over, market size, and competition effects.

One popular variant of the endogenous growth model is the trade and growth model by Grossman and Helpman (1990). They came up with a dynamic model of two countries of trade and growth that include endogenous technological advancement. In this model, growth is driven by technological progress and economies of scale which results in more goods being produced and available to consumers. Output of the final product is given as follows:

$$Y_i = BA_i L_{Yi}^{-\beta} \left[\int_0^n x_i(\omega)^\alpha d\omega \right]^{\beta/\alpha}, \quad 0 < \alpha, \beta < 1, \quad (2.1)$$

Given that L_{Yi} denotes employment from final goods sector, $x_i(\omega)$ represents the input of intermediate product ω . The parameter A_i indicate productivity in country-specific. The model assumes constant return to scale and also assumes that an increasing degree of specialisation leads to gain in technical efficiency.

To secure greater market share to sell the final goods, firms must adopt marginal-cost pricing. Given the constant B , producer prices satisfy:

$$P_{Yi} = \left(\frac{w_i}{A_i} \right)^{1-\beta} \left[\int_0^n P x(\omega)^{1-\varepsilon} d\omega \right]^{\frac{\beta}{1-\varepsilon}} \quad (2.2)$$

Where $\varepsilon = \frac{1}{1-\alpha} > 1$,

⁹ Differences in education attainment is used to measure changes in productivity

w_i is equal to the wage in country i and $P_X(\omega)$ is the price charge for variety ω . According to Grossman and Helpman (1990), producers of final goods worldwide will have to pay the prices for middle products. Entrepreneur's behaviour is geared toward profit maximisation leading to endogenous technological progress. The Grossman and Helpman (1990) model takes into consideration technology and knowledge in order to generate an endogenous long run growth model.

In trying to answer the question “Why do some countries grow faster than others?” and “how have the underlying forces of growth changed over time?” Helpman (1992) shows that the analysis of the neoclassical growth theories has been more concern with capital accumulation. The main view of these theories could only partially explain variation of economic growth when presented with data. Moreover, these neoclassical growth theories were not able to give a convincing argument to explain technical progress.

The implication is that the endogenous growth model captures many realistic aspects of a firm's innovation processes. It considers the fact that progress is not uniform across the different sectors of the economy and research and development responds to profit incentives (Grossman & Helpman, 1991). The model also shows how research and development can bring new products to the marketplace months earlier and make further research in production less costly. These products can allow firms to specialise in the production process and thus increase productivity in the final production thus making the firm competitive in the international market.

Due to the limitations of the neoclassical growth theories, researchers on economic growth started to shift their attention from static to dynamic models. The research of Romer (1986) and Lucas (1998) gave birth to a new wave of economic growth that heavily relies on the learning-by-doing mechanism by Arrow's (1957) model of economic growth. Although Helpman's (1992) model gives an incomplete description of the macroeconomic theory of endogenous growth model, the author's model on sustainable long-run growth pays attention to product innovation in the economy. The model came up with a variety of implications relating structural features to long-run growth rates. The implications include but are not limited to policy issues like real interest and economic growth, macro fluctuations with regard to innovation based growth that can proceed smoothly or in bursts. The author also looked at

innovation based growth that entails a constant reallocation of labour that can have a profound effect on unemployment and economic growth of countries that depend on international trade.

2.3.2.3 Economic growth and monetary union

The economic rationale of a common currency in relation to its effects on economic growth and trade has been the subject of numerous theories and studies with no real consensus reached. The debate started in the early 1960s during the time of Robert Mundell who came up with the optimum currency areas theory (Mundell, 1961). This theory laid the foundation of the effects of a common currency within a geographical area.

Assuming that by means of an appropriate regional macroeconomic policy, a regional central bank is established and member states' local currencies are replaced with the regional one, what would the effect of this replacement have on the overall growth pattern of the region? To answer the above mentioned question, certain conditions are put in place. These conditions are necessary to facilitate the recruitment of members into the monetary union and for the benefits to be felt. According to De Grauwe (2006), these conditions include firstly, macroeconomic shock symmetry across the region. Secondly, the labour markets must be flexible enough to withstand the shocks; and thirdly, the level of trade flow between member states should be high enough. These conditions are in line with the criteria put forward by classical theory of optimum currency areas when countries in a particular region want to form a monetary union. These criteria include but are not limited to a high level of openness, mobility of the labour force, symmetry of the level of macroeconomic shocks among member states and the possibility of fiscal transfers convergence (Criste, 2013).

Since monetary union can be viewed as the foundations for the real economy, the effects of monetary union on economic growth of an economy or trade bloc is indirect and will depend ultimately on how well the real economy works. According to Vickers (2000), currency union and monetary policy in particular can create conditions favourable for sustainable growth and this is through price stability. In answering the question whether monetary union has any implications for the rate of growth of the real economy, the author identifies four channels of transmission between common currency adoption and a country's economic growth. These channels include; price stability effects, exchange rate effects, trade and competition effects and policy-making effects.

Importantly high inflation can also have significant negative effects on saving and capital accumulation through interactions with the tax system and high inflation has generally been associated with volatility and uncertainty. This discourages investment as firms are not sure of the return on investment. Commitment by the regional central bank and member states of a monetary union to price stability reduces the risks of low investment and savings. Monetary union helps to contain the costs of high and uncertain inflation if it brings price stability to countries that would otherwise find it harder to secure and maintain price stability.

A well-established monetary union can ensure the establishment of the optimum conditions for economic growth through low inflation, resulting in lower long-run interest rates. Low interest rates can boost higher investment, employment and economic growth. The greater the exchange rate certainty produced between member states of the single currency arrangement, the greater the international trade which leads to increase in output. Despite the potential benefits, opponents of monetary union posit that it will result in adjustment costs, together with the loss of monetary and exchange rate policy instrument. This is likely to increase instability among countries, resulting in exposure to asymmetric external shocks beyond the capability of a central bank using only one policy instrument: interest rates (Anyanwu, 2003).

In a monetary union, nominal exchange rate variation among member countries does not exist. Therefore, the value of the currency cannot be altered to increase aggregate demand. The effect of monetary union on growth therefore depends in part on how well other institutions and policies support economic flexibility. In terms of trade and competition effects, currency unions can lead to a large increase in international trade. Increase in exports will increase aggregate demand and boost both employment and production. By improving resource allocation, specialisation, scale economies can further make domestic firms to become internationally competitive. The policy-making effects will complement the other above listed channels. A good macroeconomic framework for fiscal policy can respond well to asymmetric shocks within the common currency area.

Joining a monetary union can lead to increase cost in terms of low economic growth as countries in a monetary union grow at different rates. For example, adopting a similar argument put forward by De Grauwe (1997) to further the analysis: Suppose Cameroon and Gabon are members of a currency union, and Cameroon's gross domestic product (GDP) is growing at six percent per year, while Gabon's GDP is growing three percent per year. Suppose also that

the income elasticity of Cameroon's imports from Gabon is unitary and that Gabon's income elasticity of imports from Cameroon is also unitary. This means that Cameroon's imports from Gabon will grow at six percent a year, whereas Gabon's imports from Cameroon will grow at three percent per year. This will lead to a balance of trade difficulties for Cameroon, whose exports are growing slower than its imports. Cameroon will have to reduce its price of its exports to Gabon through devaluation to avoid chronic deficits or Cameroon can implement contractionary policies. The first option is, of course, not possible in a common currency union. Secondly, the common currency used by both Cameroon and Gabon is also pegged to the Euro at a fixed rate. This implies that Cameroon has to follow relatively contractionary policies, which can have an adverse impact on economic growth. Thus, a monetary union can impose a growth cost on the fast growing member country.

Pattichis (2001) shows how countries that join a monetary union lose the ability to change the price of their currency. The author's analysis shows that on one hand, if member states want to sustain their current growth rates without a need to carry out deflationary policies, the actual growth rate of these countries must be lower than or equal to their balance of payments equilibrium growth rate. On the other hand, these countries can encounter actual costs when joining a monetary union if the actual growth of member states is currently higher than their rate of growth which is consistent with balance of payments equilibrium. Therefore, to avoid further costs member states need to become innovative and improve the quality and diversify the production of goods and services they produce for export. Moreover, to overcome the constraints imposed on national demand management policies in a monetary union which stifle growth, member states of the union will have to think more of a long term where supply side policies become the main objective of member states.

Following McCombie and Thirlwall (1997) theoretical model to show the relationship between common currency and economic growth, the model is given as follows:

$$M_t = (P_{ft}E_t / P_{dt})^{\theta} Y_t^{\pi} \quad (2.3)$$

$$X_t = (P_{dt} / P_{ft}E_t)^{\eta} Z_t^{\varepsilon} \quad (2.4)$$

Given that t is the time, E_t , is the exchange rate and this is expressed normally as the domestic price of foreign currency. P_{dt} and P_{ft} are the domestic and foreign prices. Y_t is the domestic income, while Z_t is the foreign income, ϑ is the price elasticity for imports and η is the price elasticity for exports. Lastly, π and ε are the income elasticity for both the imports and exports.

Accordingly Pattichis (2001), $\vartheta < 0$, $\pi > 0$, and $\varepsilon > 0$, and the growth rates of imports and exports are given as follows:

$$m_t = \vartheta(P_{ft} + e_t - P_{dt}) + \pi y_t \quad (2.5)$$

$$x_t = \eta(p_{dt} - e_t - p_{ft}) + \varepsilon z_t \quad (2.6)$$

In equation (2.5) and (2.6) the lower case letters represent rates of change. Given the equilibrium condition for balance of payment where:

$$(P_{dt}X_t = P_{ft} + m_t + \varepsilon_t) \text{ represent the growth rate of exports value equal imports value, that is}$$

$$p_t + x_t = p_{ft} + m_t + e_t \quad (2.7)$$

When equation (2.5) and (2.6) is substituted into equation 2.7, this gives the long run growth rate which is consistent with the balance of payment equilibrium.

Given that y_{bt} is the balance of payment equilibrium, the equation can be written as follows:

$$y_{bt} = \{(1 + \eta + \vartheta)(p_{dt} - p_{ft} - e_t) + \varepsilon z\} / \pi \quad (2.8)$$

Given the above equation, the assumption is that over time, the relative price stays the same in a common currency, that is

$$y_{bt} = \varepsilon z_t / \pi \quad (2.9)$$

McCombie and Thirlwall (1997) show that in a common currency, the relative prices may not change in a larger proportion. According to Pattichis (2001), the above model also captures non-price competition due to difference in income elasticities of demand as a result of differences in the nature, quality and differences in the characteristics of the traded goods.

Looking back at the theoretical example of Cameroon and Gabon who are both members of the currency union, that is, if Cameroon's income elasticity of export demand is lower than that of Gabon, this will imply Cameroon's exports have an inferior non-price characteristics compared to that of Gabon.

The implication of equation (2.9) is that fast growing countries are those that have a high level of product and process innovation which produces goods and services of high quality, thus leading to high export value. Countries with high growth rate tend to have high income elasticities of demand for their exports and inelastic demand for imports. If this is the case, member states can achieve high growth without the need for currency depreciation.

From the above analysis, fast growing countries are those that strive to increase both the quantity and quality of their factor inputs making them innovative and producing export goods of high quality. As a result, when the income elasticity of the product increases, there is increase in the demand for member states' products. Unfortunately, this is not the case with CEMAC, where producers in this region are less innovative and policies geared toward growth have not yet achieve the required success. Moreover, the region exports goods from the extractive industry with low income elasticities.

2.3.2.4 Optimum currency area

The theory on Optimum Currency Area (OCA) dates back to the classic works of Mundell (1961), McKinnon (1963) and Kenen (1969). The OCA theory laid some of the fundamental criteria necessary for the establishment of the currency area. An OCA can be seen as a currency union within a geographical area in which member states either maintain separate national currencies pegged to each other's currency at a fixed rate with full convertibility of the respective currencies or when countries in that union share a common currency (Mundell, 1961). One major factor taken into consideration is the fact that member states in a currency union surrender their individual monetary policies in favour of a regional one. The homogeneity condition must ensure that any external shocks should affect members of equal proportion. Moreover, policies such as interest rate and national budgetary balance should not affect member states negatively in an OCA (Fingleton, Garretsen & Martin, 2015). One way to reduce the effects of external shocks is that the production structure should be diversified in a currency union as well as the export base. Countries that specialize in one or two commodities will likely witness a deterioration in their terms of trade in the event of an eventual shock than

those that have a production structure that is diversified (Gurtner, 1999). Moreover, countries in a currency union with similar production structures find it easier to cope with symmetric shocks.

Magnifico (1973) argues that OCAs should not only be limited with the external macro-geographical area of the currency union, but the union should also consider the internal geography of member states since the homogeneity of member states raises very important issues at the regional level. Looking at homogeneity closely, the question that should be asked is whether member states fulfil the conditions of flexibility, symmetry and integration. For symmetry, are the countries similar in size? Or do member states react or are they affected when there is a demand shock? Countries in a currency union that are subjected to similar terms-of-trade shocks can fulfil the OCA criteria than those that are prone to asymmetric shocks. This is because the similarity in member states terms-of-trade shocks makes it easier to implement a common monetary policy and there is no need for exchange rate adjustment between member states (Mundell, 1961). Under the condition of flexibility, how flexible is the labour and the wage rate in the currency area? In originating the concept of an OCA, Mundell (1961) argued that the mobility of factors of production is a partial substitute for wage–price flexibility. This is because real factor prices in response to disturbances affecting demand and supply can be moderated by labour mobility. For integration, given the regional monetary and fiscal policy, how integrated is the fiscus to support monetary integration? Taking a closer look at the above questions, it is clear the CEMAC custom union is far from being an OCA.

An alternative to wage flexibility in an OCA is when the degree of factor mobility is high enough to allow for adjustments within the zone. For example, when workers become unemployed in Gabon, is it possible for them to get a new job in Cameroon, thus preventing wage decline in Gabon? If the answer is “yes”, then this type of flexibility has the advantage of eliminating inflationary wage pressure in the country that is booming in the region. Therefore, in an OCA, the price and wage flexibility between countries must also be high enough to offset rigidities, so that less unemployment can be experienced in the area as period of recession in one country will see labour moving to the other countries in the union with less unemployment (Gurtner, 1999).

In line with common currency union and economic performance, careful attention needs to be paid if at all there has been a convergence in regional productivity and employment growth

among the CEMAC members. With frequent non-tariff barriers and inconsistent rules applied by the custom officials, it is unlikely that there has been an increase in symmetry across regions in their exposure to fluctuations and increase in productivity and employment growth. If labour and capital are insufficiently mobile within a common currency area, then flexibility of the external price of the regional currency cannot be expected to perform the stabilization function (Mundell, 1961). As a result, a common currency will not achieve its objective of promoting economic growth through increase aggregate demand. This is common where there is varying unemployment and inflation rates of member states within the union.

In analyzing whether the CFA Franc zone is an example of the OCA, Couharde et al. (2013) argue that it is not clear where the CFA countries stand in respect of OCA analysis. Despite the fact that the region has successfully maintained a currency union till date, the region has failed to meet a number of important OCA criteria and that the OCA criteria are too restrictive for monetary unions that were formed on political rather than economic ones. The authors further suggest an alternative measurement of the CFA zones based on sustainability rather than on its optimality. After assessing the convergence process of real exchange rates towards equilibrium for the CFA zone and a control group of other sub-Saharan countries, they concluded that the inter-country differences can be attributed to heterogeneity in both specialization patterns and inflation persistence. The fact that adjustment of real exchange rate does not break due to weak diversity in production specialization, the CFA zone can be more accurately described as a sustainable currency area rather than an optimal one.

According to McKinnon (1963), high degree of openness plays an important role in determining an optimum currency area. That is when a significant proportion of total production is tradable in an open economy, then the economy will not suffer from greater price instability if it adopts a fixed exchange rate to correct external deficits. This is ideal in a situation where a significant percentage of trade is among members of a trade bloc. According to Algbokhan (1992), when there is a high degree of trade among member states in a trade bloc, the above situation seems appealing as there's a possibility of exchange rate saving. This is not the case with trade blocs in Africa where the degree of bilateral trade is relatively low. Although most African countries are open economies since they depend mostly on foreign trade, they do not quite satisfy the McKinnon criterion of openness. Therefore, intra-African trade needs to increase significantly before the criterion of open trade can be useful in justifying optimum

currency areas for Africa. In the case of CFA currency zone, additional complication arises from the fact that the CFA franc is pegged to an external reference currency, the Euro.

Because of the limitations of the earlier work on OCAs in trying to identify the characteristics that an economy should satisfy prior to joining a monetary union, a new wave of theories of OCAs is emerging and one of the most prevalent is the endogenous optimum currency area. It places focus on changes in economic structure and performance that may result from participation in a monetary union. The endogenous OCA has identified two main transmission channels through which a common currency may affect an economy's performance. These channels operate via increased trade integration and enhanced credibility. When member states in a monetary union increase the level of intra trade flow, there is increase efficiency and transfer of knowledge. In terms of trustworthiness, a regional central bank can increase the level of credibility if it provides checks and balances in political systems (Tavlas, 2009).

Another important lesson drawn from the above analysis is the fact the production structure CEMAC region is not diversified. CEMAC countries depend on primary production, narrow export base and a lack of appropriate marketing channels. This makes their economies vulnerable to external shocks.

Common currency can facilitate transfer of technology across borders and if put in to better use, it can go a long way to influence the member state growth rate (Costa-i-Font, 2011). Nominal rate of exchange can also act as a means to absorb some of the external shocks which are spread unevenly across the region with the adoption of a common currency. According to Miles (2006), if the external shock is sufficiently large, it can lead to misalignment or overvaluation of the exchange rate which can harm total exports and prices of domestic products.

Kenen and Meade (2008) posed the question on whether it is possible for a monetary union to affect member states' growth rate. In answering the question, they hypothesise that many factors need to be taken into consideration. On the one hand, countries within a monetary union are free from volatility and uncertainty in exchange rates. This can raise market confidence and attract foreign direct investment. Increased investment leads to more production of goods and services that can generate economic growth.

On the other hand, fixed exchange rates or a common currency does not give member states the option of devaluing their currency in response to shocks. This makes it difficult for individual states to carry out deflationary monetary policies in order to counterbalance any occurrence of macroeconomic shock. This will likely have a negative impact on the growth rate. The growth process of countries in a monetary union will depend on the exchange rate regime. The fixed exchange rate regime is assumed to lower transaction cost of capital, which results in higher accumulation of physical capital and increased potential output (Edwards & Magendzo, 2003). The pursuit of noninflationary monetary policies will likely enhance regional central bank credibility. This can build confidence in the region, raise productivity and attract foreign direct investment (Frankel & Rose, 2000).

Adopting a single currency eliminates some major transaction costs. This reduction in costs can enhance further trade and investment in the region, thus raising member states' output. Costs can also be saved from dealers' margins in a competitive market. Minford (2004) states that when a country joins a common currency area, it will likely incur some additional transaction costs from changing domestic currency to the new regional currency and reprogramming the vending and the automatic teller machines (ATMs) to adopt a new accounting system. This is a once-off cost that countries in a common currency union will incur in the short to medium term. Monetary unions can also enable governments to avoid unnecessary spending that can increase the rate of inflation and minimise the problem associated with large exogenous shocks. In this case, the host country would be unable to devalue the currency relative to foreign currencies (Cham, 2011).

Recent trade theories are now taking into consideration the importance of imperfect market situations. Under the imperfect market situation, the impact of scale economies, diversification in the production structure, spill over of endogenous organisation techniques and innovative ideas across national borders are included in the analysis of regional integration and economic growth. Economic growth in the long run will therefore depend on openness to trade, technological transfer and flow of ideas among trading partners (Pain, 2002).

To conclude, the theoretical literature on common currency and economic growth covered in this section has briefly analysed some of the key theories of economic growth from the time of Harrod-Domar and Robert Solow in the mid-1950s to the time of neoclassical and endogenous growth theories. It has also examined the optimum currency areas theory by Robert Mundell

and how it is related to economic growth. The section has also outlined the conditions that should be put in place for a common currency to effect real GDP positively. These conditions are not limited to macroeconomic shock symmetry and labour markets flexibility, but also the level of trade flow between member states.

2.4 Data and Methodological Framework

In this section, the method used to estimate the regression equation and the process of data collection is explained. we explain the method used to estimate the regression equation and the process of data collection is explained. A regression discontinuity design model is used, which is a pre-test/post-test design of a quasi-experiment, to determine how the elimination of member states' local currency in favour of a regional one has affected the region's economic growth.

2.4.1 Model specification

In the empirical analysis, a non-parametric approach of the Regression Discontinuity Design (RDD) modified to estimate the average treatment effects of the adoption of common currency on economic growth is adopted. A parametric approach to complement the results is also analysed. Economic growth is usually explained in terms of gross domestic product per capita. The given data is on the time frame, $t = 1, 2, \dots, T$, and group, $i = 1, 2, \dots, N$. The key issue when analysing the effect of common currency on regional growth is to identify its effects apart from those determined by other variables.

The estimation technique used in this chapter is the sharp RDD. The RDD is used to analyse the causal effects of the common currency on economic growth. The causal role of a common currency on economic growth can be identified from exploiting the discontinuity of the individual currency in favour of a regional one. This was done in a small neighbourhood around the year 1994 when it was instituted. The RDD technique was introduced in 1960 by Thistlethwaite and Campbell. The model is a pre-test/post-test programme-comparison cluster strategy where subjects are assigned to the programme on the basis of a cut-off point. This works best when subjects are exposed to a once-off implementation policy and comparison is carried out before and after the program implementation (Kalyanaraman, 2009).

There has been a surge in the usage of RDD by empirical researchers in recent decades. RDD is not just considered like any other evaluation strategy. It is believed to have more credibility

than other estimation strategies such as instrumental variables (Lee & Lemieux, 2010). RDD has been used to analyse different areas in Economics such as education to test class size on examination pass rate (Angrist & Lavy, 1999; Asadullah, 2005), labour market to estimate effects of training programs on employment rate and earning (Battistin & Rettore, 2002), political economy to look at the expenditure tax revenues on local government (Ferreira & Gyourko, 2009). Other areas where the RDD model has been used extensively include Healthcare in terms of child mortality and educational attainment (Ludwig & Miller, 2007; Snyder & Evans, 2006), Crime with focus on Juvenile offenders (Hjalmarsson, 2009). Davis (2008) also used the RDD model to measure hourly air pollutants on the environment.

In this model, the attention is around the threshold value where the average treatment effect of the covariate is identified. RDD can follow two different paths: discontinuity at a point- where there is a cut-off point or jump as a result of the causal effect of the treatment administered and local randomisation where subjects just before the cut-off point and those immediately after the cut-off point are random. In the situation of local randomisation, it is assumed that subjects just before and after the cut-off point are similar in characteristics (Jacob et al., 2012).

In order to interpret the causal effect, the first thing to do is identify any discontinuity of the expected outcome from the cut-off point. There are two types of RDD in the literature namely sharp and fuzzy design (Pellegrini et al., 2013). Sharp design deals with the deterministic function which occurs when a single variable is solely responsible for the treatment effects, while fuzzy design has to do with stochastic function. This chapter deploys the sharp design as given below. The description of the model is closely related to that used by Pellegrini et al., (2013) and the basic framework was developed by Imbens and Lemieux (2008).

Let $Y_i(1)$ and $Y_i(0)$ denote the potential of region i , where $Y_i(0)$ is the outcome of economic growth before the implementation of the common currency in 1994. $Y_i(1)$ is the outcome of growth after implementation of the common currency and the main interest here is comparing $Y_i(1)$ and $Y_i(0)$. For this to happen, we calculate the difference $(Y_i(1) - Y_i(0))$. It is practically difficult to observe the difference between $Y_i(1)$ and $Y_i(0)$ together at the unit level due to the problem of causal inference (Imbens & Lemieux, 2008). For each unit i , the outcome is observed corresponding to the average treatment effects of $Y_i(0)$ and $Y_i(1)$. Given a simple regression equation to represent the evaluation problem,

$$Y_i = \alpha + \beta_0 W_i + \beta_1 r_i + \beta_2 r_i W_i + \varepsilon_i \quad (2.10)$$

$$W_i = \gamma_1 * Z + \mu$$

α = the average outcome value for those in the treatment group

Y_i = outcome measure for observation i

r_i = rating variable for observation i at the cut-off point

ε_i = stochastic random term which is independent and identically distributed

β_0 = marginal impact coefficient at the cut-off point.

Let W_i denote the treatment variable, with $W_i = 1$ if member state adopted the common currency in 1994, otherwise $W_i = 0$. The outcome which is the per capita GDP growth for the CEMAC region can be written as:

$$Y_i = (1 - W_i)Y_i(0) + W_i Y_i(1) = \begin{cases} Y_i(0) & \text{if } W_i = 0 \\ Y_i(1) & \text{if } W_i = 1 \end{cases} \quad (2.11)$$

As mentioned earlier, the sharp discontinuity design with assignment W_i is a deterministic function of one of the covariates X_i which is greater than the cut-off point. That is:

$$P\{Treatment(W_i)\} = \begin{cases} 1 & \text{if } X_i \geq c = Z \text{ where } c = 1994 \text{ (the eligibility threshold)} \\ 0 & \text{if } X_i < c \end{cases}$$

The treatment effect is a deterministic function at c as we only know Y_i . c is a cut-off point which indicates a discontinuity because no matter how close X_i gets to c , there is no effect until $X_i = c$. According to Angrist and Pischke (2009), RDD captures any causal effect in the regression. It does this by clearly distinguishing the nonlinear and discontinuous function, $1(x_i \geq x_0)$ from the linear function x_i .

Following Lee and Lemieux's (2010) approach, the regression equation on the left hand can be rewritten given the cut-off point as follows:

$$Y = \alpha_l + f_l(X - c) + \varepsilon, \quad (2.12)$$

And that on the right hand side as:

$$Y = \alpha_r + f_r((X - c) + \varepsilon) \quad (2.13)$$

Using pool regression technique as a direct way of expressing the treatment effects of both sides of the threshold from equation (2.12) and (2.13):

$$Y = \alpha_l + \tau D + f(X - c) + \varepsilon, \quad (2.14)$$

$$\text{Given that } \tau = \alpha_r - \alpha_l \text{ and } f(X - c) = f_l(X - c) + D[f_r(X - c) - f_l(X - c)] \quad (2.15)$$

The standard errors of the treatment can be derived from equation (2.15). To allow the regression function to differ from both sides of the cut-off point, Lee and Lemieux (2010) recommend the addition of interaction terms D and X in the equation.

From equation (2.8), we have:

$f_l(X - c) = \beta_l(X - c)$, and $f_r(X - c) = \beta_r(X - c)$, we can now rewrite equation (2.14) as:

$$Y = \alpha_l + \tau D + \beta_l(X - c) + (\beta_r - \beta_l)D(X - c) + \varepsilon \quad (2.16)$$

All the countries with a covariate of at least c are assigned to the treatment¹⁰. Given $\alpha_l = \lim_{x \uparrow c} E[Y_i / X_i = x]$ and $\alpha_r = \lim_{x \downarrow c} E[Y_i / X = x]$. To find the average casual effect or outcome of the treatment at the point of discontinuity;

$$\lim_{x \downarrow c} E[Y_i / X_i = x] - \lim_{x \uparrow c} E[Y_i / X_i = x] \quad (2.17)$$

Equation (2.17) reduces the problems of nonlinearity being mistaken for discontinuity. This occurs in a situation where we might assume a jump at the threshold whereas it is unaccounted for nonlinearity in the counterfactual conditional mean function (Angrist & Pischke, 2009).

¹⁰ In our case, the treatment is the institution of the common currency (Franc CFA).

At the discontinuity point, the average causal effect of the treatment is given as:

$$\tau_{SRD} = E[Y_i(0) - Y_i(0) / X_i = c] \quad (2.18)$$

The estimated treatment effect can be assessed by comparing the average treatment value of regional growth moving very close to either direction before and after the common currency at $X = c$. Applying the OLS will be inefficient and will lead to no causal relationship in cases where the treatment effect varies across the countries in question (van der Klaauw, 2002). The average treatment effect in the population can be estimated in a situation where the assignment is randomised.

To justify the averaging, another assumption is necessary where the relationship between X and Y is smooth around c . According to the literature, this is called “continuity of conditional regression functions” (Pellegrini et al., 2013) and can be written as:

$$E[Y(0) / X = x] \text{ and } E[Y(1) / X = x] \text{ are continuous at } X = c.$$

In this case, continuity is only useful at $X = c$ and given the assumption that:

$$E[Y(0) / X = c] = \lim_{x \downarrow c} E[Y(0) / X = x] = \lim_{x \downarrow c} E[Y(0) / W = 0, X = x] = \lim_{x \downarrow c} E[Y / X = x] \quad (2.19)$$

Increasing the interval if the assignment variable is related to the outcome variable around the cut-off point will lead to biased results. More observations can be used to draw conclusions from above and below the cut-off point c (van der Klaauw, 2002). The value of the counterfactual outcome of $X = c$ represent the limit of the conditional predicted value of the outcome before the introduction of the common currency.

Considering the period after the introduction of the common currency to member states of the CEMAC region:

$$E[Y(1) / X = c] = \lim_{x \uparrow c} E[Y / X = x] \quad (2.20)$$

The average effect is given as:

$$\tau_{SRD} = \lim_{x \uparrow c} E[Y / X = x] - \lim_{x \downarrow c} E[Y / X = x] \quad (2.21)$$

In the above SRD design,

$$\tau_{SRD} = \mu_r(c) - \mu_1(c) \quad (2.22)$$

Assuming a distance h on either side of the discontinuity point, according to Imbens and Lemieux (2008), a linear regression function can conformably be added to the observations as follows:

$$\min_{\alpha_1, \beta_1} \sum_{i: c-h < X_i < c} (Y_i - \alpha_1 - \beta_1 \cdot (X_i - c))^2 \quad (2.23)$$

and

$$\min_{\alpha_r, \beta_r} \sum_{i: c \leq X_i < c+h} (Y_i - \alpha_r - \beta_r \cdot (X_i - c))^2 \quad (2.24)$$

The value of $\mu_1(c)$ is then estimated as:

$$\hat{\mu}_1(c) = \hat{\alpha}_1 + \hat{\beta}_1 \cdot (c - c) = \hat{\alpha}_1, \quad (2.25)$$

Also, the value of $\mu_r(c)$ is given as follows:

$$\hat{\mu}_r(c) = \hat{\alpha}_r + \hat{\beta}_r \cdot (c - c) = \hat{\alpha}_r \quad (2.26)$$

The average treatment effect can now be estimated from the above two equations.

$$\tau_{SRD} = \hat{\alpha}_r + \hat{\beta}_1 \quad (2.27)$$

This is an example of a local linear regression method.

2.4.1.1 Graphical analysis

In RDD, graphical analysis is of utmost importance and should be part of the analysis as it acts as a way to visualise the identification problem (Imbens & Lemieux, 2008). The expected value of the outcome at the point of discontinuity can assist in measuring the treatment effect. When the raw data is presented in the form of a diagram, the research design becomes more transparent. Graphical analysis presents many advantages. Presenting data in its raw form in the RDD increases the level of transparency of the research design. It shows clearly if the “break” in the cut-off point is large enough. Graphical analysis also enables us to identify

observation points that are distant from other functional forms and why different answers are derived from different functional forms (Lee & Lemieux, 2010).

According to Jacob et al. (2012), in RDD, four types of graphs are normally drawn to explain different aspects of importance. The first graph enables us to picture the degree of treatment and to determine if the design is sharp or fuzzy. The second graph enables the researcher to evaluate the internal validity of the RDD. The graph can be used to plot the outcome and rating variable to explain the relationship between the two variables. The third graph enables us to figure out if the rating around the cut-off point was subjected to any form of manipulation. Lastly, the fourth graph helps us to picture the magnitude of the impact from the outcome and rating variable and can indicate if in the functional form, any relationship exists between the outcomes and ratings.

In plotting the individual graph and given that the data point is noisy, the discontinuity at the cut-off point can be difficult to identify along the distribution. A smooth plot is normally presented to overcome the problem of noise¹¹. To do this, Jacob et al., (2012) came up with the following steps to present the smooth plot:

- Firstly, it is necessary to create a bin to divide the rating variable into equal sized intervals.
- The average value of the outcome variable must be calculated including the midpoint of the rating variable.
- The mean outcome values for each bin must be plotted on the Y-axis and the rating values for each bin must be plotted on the X-axis.

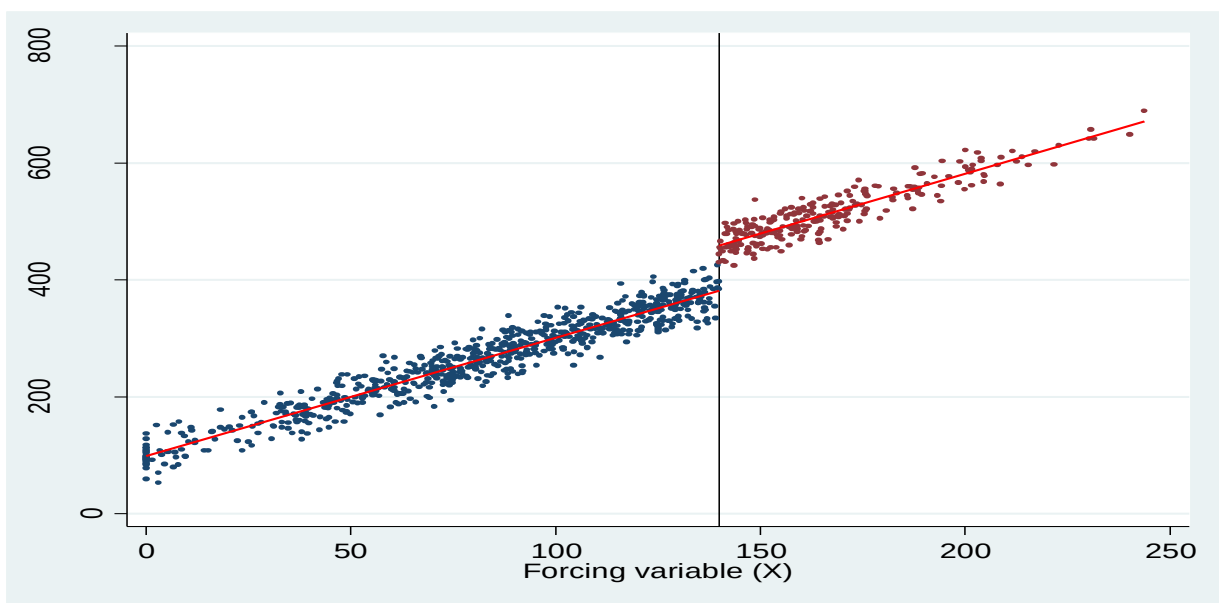
Given the above, the bandwidth can now be constructed to estimate the regression function around the boundary. This will enable us to analyse the impact of the treatment effects from the cut-off point. Once the bandwidth is identified, τ_{SDR} can then be estimated using local linear regression approaching c from right and approaching c from left. τ_{SDR} is an example of a nonparametric regression since we are interested in the regression function at the single point called the boundary point. Local linear regression reduces bias in the estimation and it allows the intercept and slope coefficient to differ from either side of the threshold. It also helps resolve some of the problems encountered using the polynomial functions and kernel

¹¹ Data bouncing around the cut-off point.

regression in the RDD. This problem stemmed from estimating the regression at a particular point and the bias found in kernel regression of the treatment effect (Lee & Lemieux, 2010). Local linear regression also enables the functional form to be correctly specified (Jacob et al., 2012).

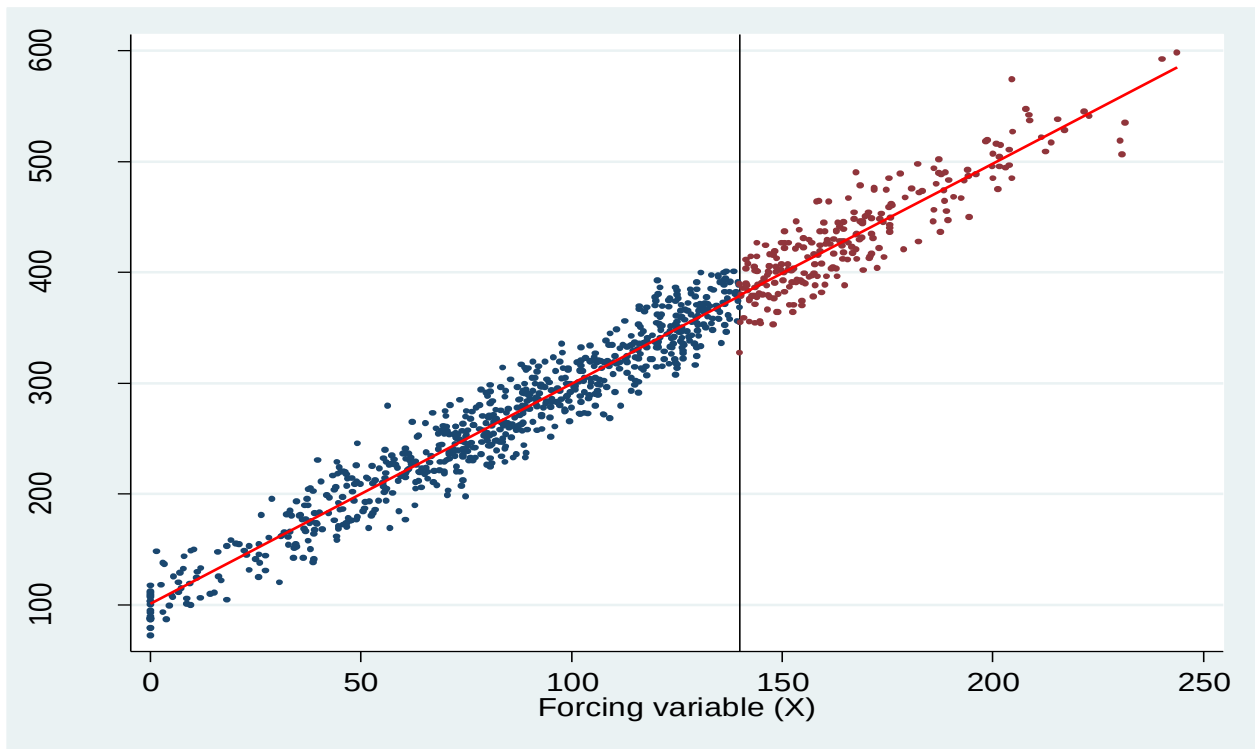
Figure 2.3a below shows an example of a linear graph with treatment effect. We can see clearly the jump at the discontinuity point around the threshold of 140. On the other hand, figure 2.3b shows the case where there is no discontinuity at the cut-off point.

Figure 2.3a: Linear graph with treatment effects



Source: Author's computation using a scatter plot

Figure 2.3b: Linear graph with no treatment effect



Source: Author's computation using a scatter plot

2.4.1.2 Bandwidth selection

Bandwidth in RDD is normally given as h . In a nonparametric estimate, the problem in choosing a bandwidth involves identifying a balance between precision and bias. If h is very small, the bias in the model will approximately be small but with little precision and if h is relatively large, then the bias will likely be large with a more precise estimate (Jacob et al., 2012). In a nonparametric model, different bandwidths are applied and the dataset is allowed to pick a particular bandwidth. This enables the resulting curve to fit well in the dataset (Fan & Gijbels, 1996).

A rectangular and triangular kernel is adopted with chosen bandwidth as it is easier to interpret. There are two main choices of bandwidth in the literature of econometrics. Researchers can opt for the constant bandwidth also known as the global bandwidth or they can opt for a variable bandwidth (Fan & Gijbels, 1996). Also, researchers can choose between two procedures. The first procedure expresses the optimal bandwidth giving an unknown joint distribution. Here it follows two steps; the rule-of-thumb (ROT) estimates the bandwidth across the data range and secondly, the bandwidth from the ROT is used to estimate equation from the cut-off point (Lee

& Lemieux, 2010). The second procedure is to use the cross validation procedure to estimate the appropriate bandwidth.

To see how the bandwidth h fits the data, the estimated regression uses observations with values of X on the left hand side of the cut-off point given as $X_i(X_i - h \leq X < X_i)$ for observations of $X_i < c$, and observations of on the right of $X_i(X_i < X \leq X_i + h)$ around the cut-off point ($X_i \geq c$). We use the data to the left of the cut-off point of regression to predict values around the boundary point and data to the right to predict values to the right. According to Ludwig and Miller (2005), each bandwidth is presented with point estimate and standard error.

Since this chapter applies the SRD design and following Imbens and Lemieux's (2008) method of bandwidth selection, the equation is given as follows:

$$\tau_{SRD} = \lim_{x \downarrow c} \mu(x) - \lim_{x \uparrow c} \mu(x) \quad (2.28)$$

Where; $\lim_{x \downarrow c} \hat{\mu}(x) = \hat{\alpha}_r(c)$ and

$$\lim_{x \uparrow c} \hat{\mu}(x) = \hat{\alpha}_l(c)$$

Where $\hat{\alpha}_l(x)$ and $\hat{\beta}_l(x)$ can be stated as follows:

$$(\hat{\alpha}_l(x), \hat{\beta}_l(x)) = \arg \min_{\alpha, \beta} \sum_{j | x-h < X_j < x} (Y_j - \alpha - \beta \cdot (X_j - x))^2 \quad (2.29)$$

$(\hat{\alpha}_r(x), \hat{\beta}_r(x))$ can be written as follows:

$$(\hat{\alpha}_r(x), \hat{\beta}_r(x)) = \arg \min_{\alpha, \beta} \sum_{j | x < X_j < x+h} (Y_j - \alpha - \beta \cdot (X_j - x))^2 \quad (2.30)$$

The interest here is to estimate the bandwidth h , the analysis therefore places more focus on $\lim_{x \downarrow c} \mu(x)$ which minimises:

$$Q_r(x, h) = E \left[\left(\lim_{z \downarrow x} \mu(z) - \hat{\alpha}_r(x) \right)^2 \right], \text{ at the boundary point where } X = c.$$

If the left hand side is considered, the above equation can be written as:

$$Q_l(x, h) = E \left[\left(\lim_{z \downarrow x} \mu(z) - \hat{\alpha}_l(x) \right)^2 \right], \text{ at } X = c$$

Placing our focus on one bandwidth for both sides of the cut-off point

$$\begin{aligned}
Q(c, h) &= \frac{1}{2} \cdot (Q_l(c, h) + Q_r(c, h)) \\
&= \frac{1}{2} \cdot \left(E \left[\left(\lim_{x \uparrow c} \mu(x) - \hat{\alpha}_l(c) \right)^2 \right] + E \left[\left(\lim_{x \downarrow c} \mu(x) - \alpha_r(c) \right)^2 \right] \right)
\end{aligned} \tag{2.31}$$

The bandwidth h for a given regression of the SRD design is given as follows:

$$\hat{\mu}(x) = \begin{cases} 0 & \hat{\alpha}_l(x) & \text{if } x < c \\ 1 & \hat{\alpha}_r(x) & \text{if } x \geq c \end{cases} \tag{2.32}$$

Where $\hat{\alpha}_l(x)$, $\hat{\beta}_l(x)$, $\hat{\alpha}_r$ and $\hat{\beta}_r(x)$ are solved from equation (2.29) and (2.30).

According to Fan and Gijbels (1996), the cross validation criterion (CV) is given as:

$$CV(\lambda) = n^{-1} \sum_{i=1}^n \{Y_i - \hat{m}_{\lambda,i}(X_i)\}^2 \tag{2.33}$$

Imbens and Lemiieux's (2008) further simplified equation (2.33) is as follows:

$$CV_Y(h) = \frac{1}{N} \sum_{i=1}^N (Y_i - \hat{\mu}(X_i))^2 \tag{2.24}$$

The cross validation choice for the bandwidth is therefore:

$$h_{CV}^{opt} = \arg \min_h CV_Y(h) \tag{2.35}$$

The expected value of h for the CV is

$$E[CV_Y(h)] = C + E[Q(X, h)] = C + \int Q(x, h) f_x dx \tag{2.36}$$

Our main focus is to figure out what happens around the threshold point, therefore, $CV_Y(h)$ is computed with values X around the cut-off point.

2.4.2 Data sources

The data used for the analyses are applicable to a balanced panel of the six countries (Cameroon, Chad, Central African Republic, Republic of Congo, Equatorial Guinea and Gabon), that span the 44-year period from 1970 to 2013. Fewer variables than what would ordinarily have been expected were used in the empirical model because of its counterfactual nature. In assessing the impact of a policy objective, the simplified model appears more efficient than more complex econometric models (Pellegrini et al., 2013). The controlled variables used in our growth and trade analysis are as follows:

Gross Domestic Products per capita (Y_i). The level of GDP per capita is used as a proxy to determine the level of economic growth. The dataset is derived from UNCTAD Statistics database. A dummy variable (CEM_{ij}) for common currency is included. It takes the value of 1 from 1994, when member states adopted the franc CFA and zero otherwise.

In order to isolate the possibility of other variables causing the change in economic growth, other controlled variables are added in the regression. These variables include foreign direct investment (FDI). The FDI is considered the net inflow of the transfer of skilled personnel, marketing skills, financial and intangible assets such as technologies and the net inflow of fixed assets. The data is derived from the World Bank development indicators. Another variable of interest is inflation rate ($RELP$). This is the inflation rate of member states considered in the study. The inflation rate is the annual change of the costs of basket of goods and services acquired by the average consumers measured by the consumer price index (CPI). The year to year inflation rate is used in order to get rid of seasonal component of specific country's series. The CPI is a weighted average of indexes that uses the Laspeyres formula of several groups of consumer goods (World Bank, 2015). The data is derived from the World Bank Development Indicators Statistics database.

We control for secondary school enrolment rate as proxy for human capital, physical capital accumulation and the labour force participation rates (Fetahi-Vehapi et al., 2015).

2.5 Empirical Results and Interpretations

A presentation of the summary statistics of the outcome and forcing variables is provided below given the period when the CEMAC instituted the common currency. If year ≥ 1994 then we expect to see a jump in economic growth. Outcome is the level of GDP per capita (cempc). The dataset has a total of 44 complete observations as shown in table 2.1.

Table 2.1 Summary statistics of the main variables

Variable	Obs	Mean	Std. Dev.	Min	Max
cempc	44	901.7132	464.0242	174.3896	2000.595
CEMdummy	44	.4545455	.5036862	0	1
year	44	1991.5	12.84523	1970	2013

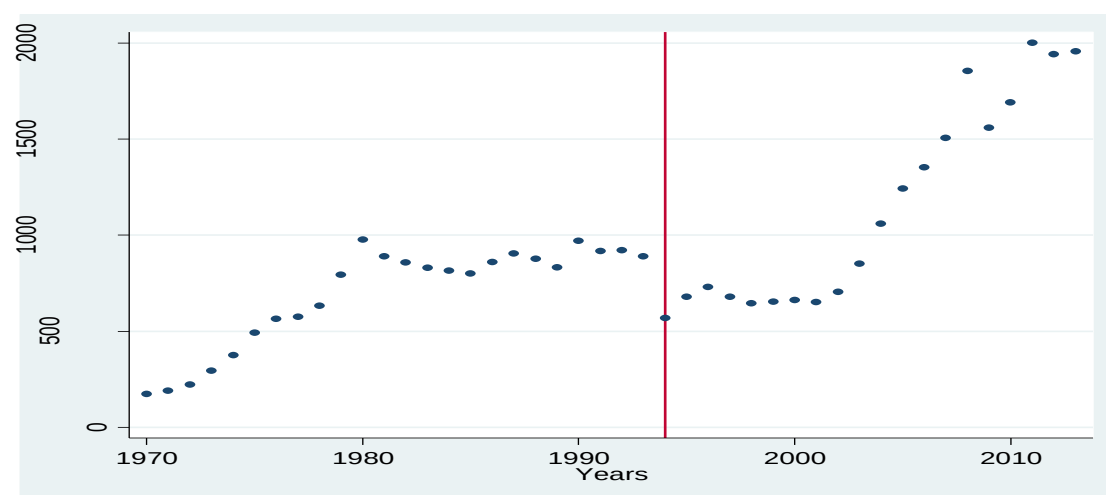
Source: Author's computation

Table 2.1 presents the summary statistics of the three variables of interest; average CEMAC GDP per capita, years and CEMdummy which takes the value 1 from 1994 and zero otherwise. The table also shows the number of observations, mean and standard deviation.

2.5.1 Graphical analysis

To further explore the data, we use the *rdplot* and *cmogram* to construct the sharp RD design. The result of a scatter plot of our data is presented in figure 2.4, where the treated and the non-treated groups are clearly visible. As mentioned earlier, the treated group is the average level of per capita growth (*cempc*) from 1994 and the non-treated group is the average per capita before the implementation of the common currency.

Figure 2.4: CEMAC GDP per capita growth year (1970-2013)



Source: From author's computation using scatter plot

The evaluation of the treatment effect aims at providing evidence of the presence of a jump in terms of average CEMAC GDP per capita. This happens from 1994 and the cut-off line sharply separates treated and not treated regions. Relaxing the linearity assumption and applying the polynomial function of the forcing variable in the regression gives more weight to points far from the cut-off points. Following Gelman and Imbens (2014) quadratic function, the result in figure 2.4 looks slightly different as presented in figure 2.5.¹²

¹² According to (Bloom, 2012), plotting individual data points create some erratic behaviors or noise as the data points seem to bounce.

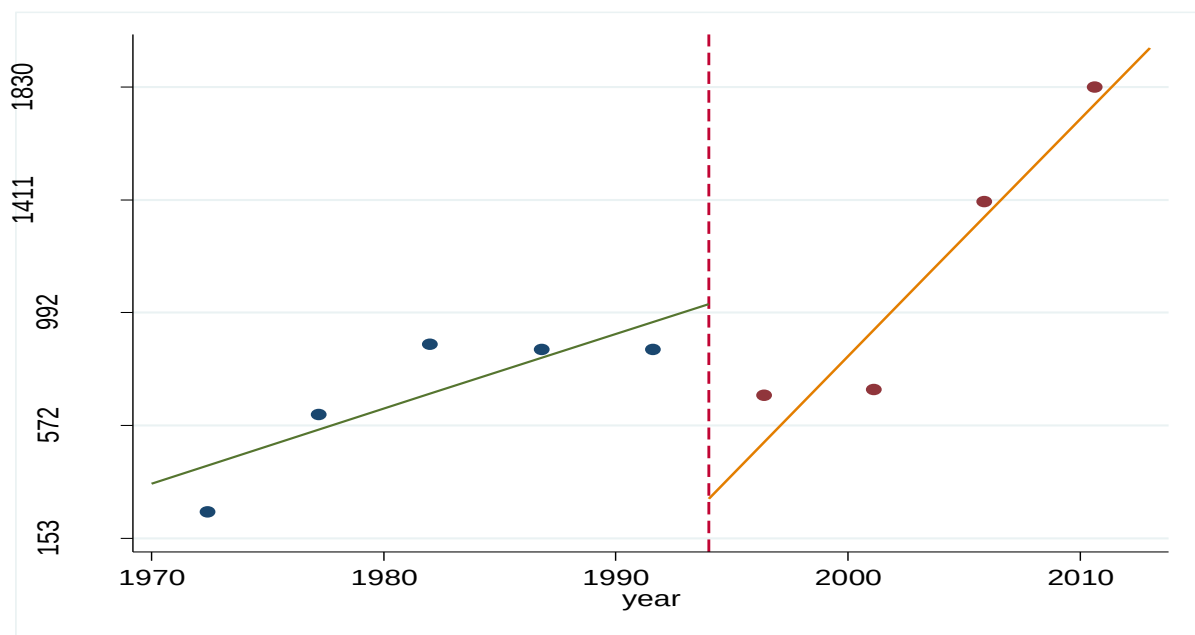
Figure 2.5: CEMAC GDP per capita growth (1970-2013)



Source: From Author's computation

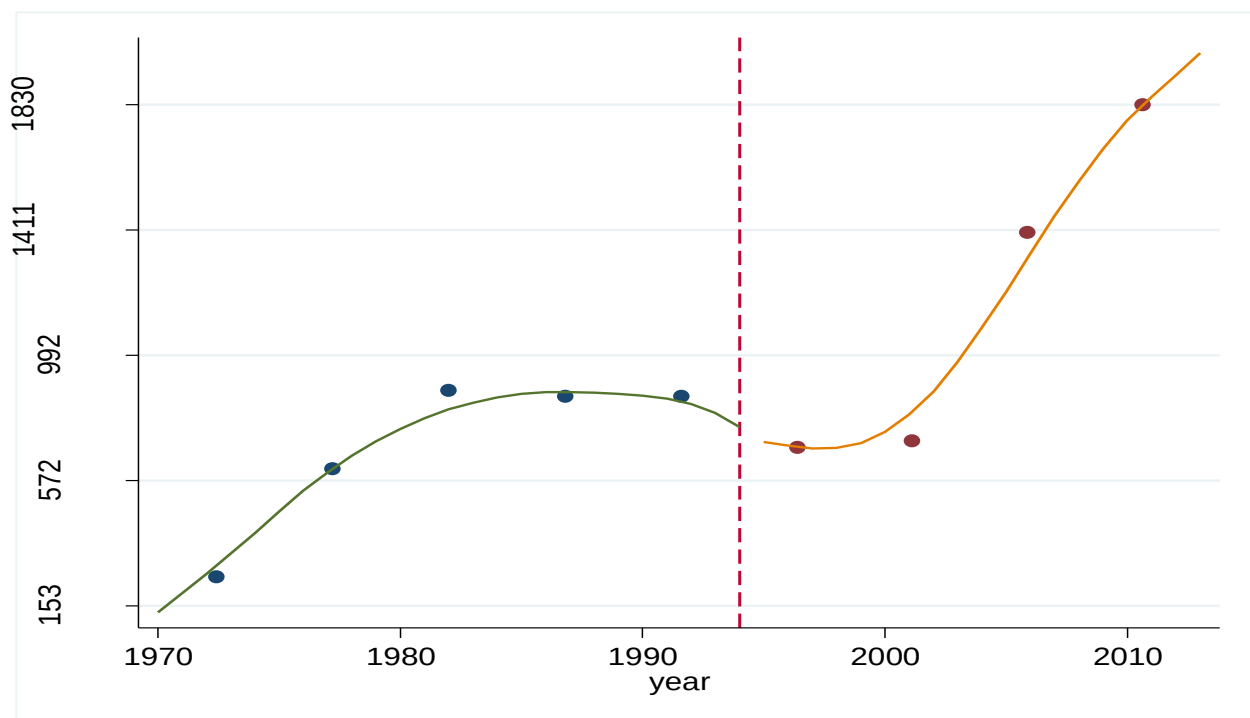
Using a bin graph with linear plot and smoothing as shown in figure 2.6a gives a better picture of the jump at the point of discontinuity. In figure 2.6b, when the lowess smoothing is applied, the jump becomes less visible. Parametric approach poses the risk of the possibility of using an incorrect functional form in the treatment effect (Pellegrini et al., 2013). Lowess fits which is normally considered a one-sided kernel estimation is likely to have poor properties around the boundary. Instead, we use local regression as a smoothing method in a kernel weighed local polynomial to minimise bias in the model. Adding smooth regression lines which is based on polynomial fits makes the jump more visible (Imbens & Lemieux, 2008). This is shown in figure 2.7.

Figure 2.6a: RDD data represented by linear trend



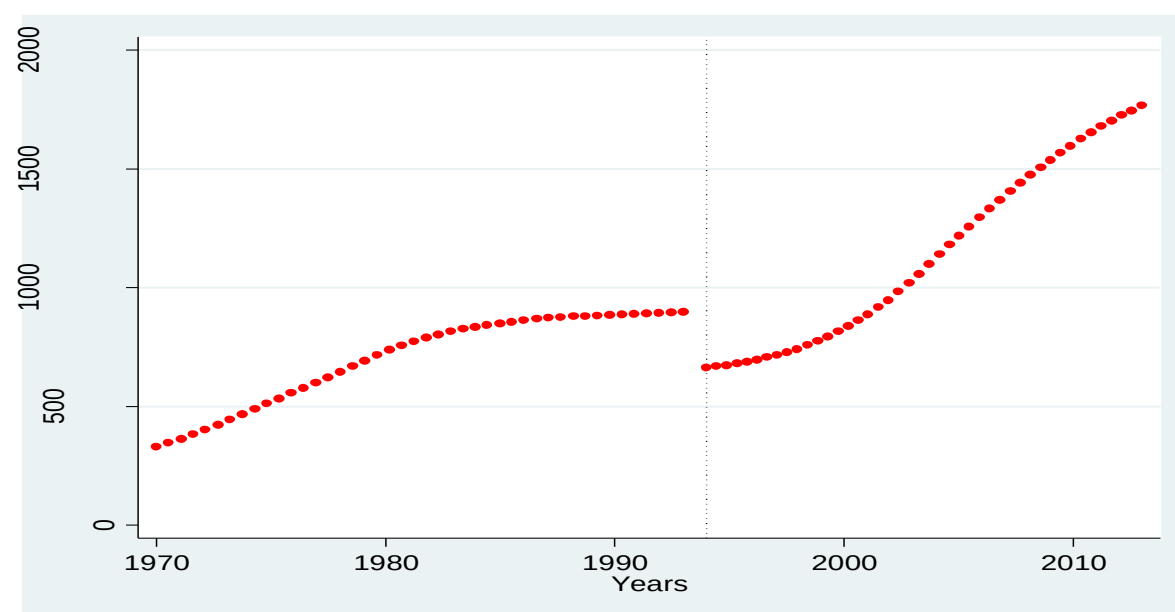
Source: From Author's computation

Figure 2.6b: RDD data represented by lowess fits



Source: Author's computation

Figure 2.7: Kernel-weighted local polynomial



Source: Author's computation

Figure 2.7 clearly shows a situation where on average, the change in policy of the franc CFA in 1994 so far has not created a positive environment for countries in the CEMAC region to realise increase in economic growth. There is a fall in the average gross domestic product per capita around the threshold point.

2.5.2 Parametric approach

In estimating a parametric approach, the right functional form is of great importance for the outcome and forcing variable relationships. To do this, different polynomial fits are introduced in the forcing variable. Since low order polynomial and data point are closed to the cut-off point produces bias, it is advisable to present both parametric and non-parametric results. One acts as a complement to the other (Lee & Lemieux, 2010). In the first instance, all the observations are used to model the outcome to increase precision of our model. In doing so, the results of the outcome around the boundary point derive their strengths from observations far from the cut-off points. The result is presented in table 2.2.

Table 2.2: Parametric estimates of CEMAC economic growth using different polynomial fit.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	cempc	cmrpc	cafpc	tcdpc	cogpc	gnqpc	gabpc
Dependent variable: per capita GDP							
1.CEMdummy	-273.9*	- 397.0** *	24.35	59.68	-536.9*	-527.2	-1,013
	(155.9)	(128.5)	(64.11)	(71.25)	(315.1)	(3,229)	(1,404)
x_c	-92.36	-8.781	-182.3***	-147.2***	115.2	-20.76	-1,020
	(104.5)	(86.11)	(42.97)	(47.76)	(211.2)	(2,165)	(940.8)
x2_c	-30.62	-4.530	-45.83***	-39.91***	24.98	-9.400	-391.7*
	(24.62)	(20.29)	(10.12)	(11.25)	(49.76)	(510.0)	(221.7)
x3_c	-3.776	-0.933	-4.397***	-4.113***	2.046	-1.018	-50.21**
	(2.439)	(2.010)	(1.003)	(1.115)	(4.930)	(50.53)	(21.96)
1.CEMdummy#c.x _c	311.6**	184.0	209.6***	263.3***	5.993	1,726	2,706**
	(132.0)	(108.8)	(54.30)	(60.35)	(266.9)	(2,735)	(1,189)
CEMdummy#co.x 2_c	0	0	0	0	0	0	0
	(0)	(0)	(0)	(0)	(0)	(0)	(0)
1.CEMdummy#c.x 2_c	-62.68	- 65.63**	33.82**	-14.65	-67.18	-751.8	-350.0
	(37.36)	(30.79)	(15.37)	(17.08)	(75.53)	(774.1)	(336.4)
Constant	833.8***	920.8** *	274.8***	100.9	1,232** *	373.6	5,344***
	(139.5)	(115.0)	(57.38)	(63.77)	(282.0)	(2,891)	(1,256)
Observations	44	44	44	44	44	44	44
R-squared	0.980	0.966	0.945	0.981	0.975	0.973	0.935

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.2 present the results of all observations from the dataset of the CEMAC region as a whole and the individual countries that make up the region. The OLS estimates show the result with different forms of polynomial. The variable of interest is CEMdummy which represents the effect of the common currency on CEMAC economic growth. The coefficient for CEMdummy is negative but statistically significant for the CEMAC region (cempc) as a whole. For the individual countries, CEMdummy is negative and significant for Cameroon (cmrpc) at one percent significant level and 10 percent significant level for the Republic of Congo (cogpc). It is statistically insignificant for Central African Republic (cafpc), Chad (tcdpc), Equatorial Guinea (gnqpc) and Gabon (gabpc).

From table 2.2, the negative impact is more for the Republic of Congo (cogpc) than for Cameroon (cmrpc), while that of CEMAC (cempc) is even less. All observations were used in the regressions and the findings suggest that the all the policies that were carried out in the mid-1990s, that is from the change of name from UDEAC to CEMAC, devaluation of the CFA franc and the institution of the common currency have not provided a favourable condition for economic growth in the region. The CFA franc has not created a favourable condition where member states in the CEMAC region can benefit from accelerated economic growth. These conditions can be translated to the transmission mechanism to which common currency contributes to economic growth.

From table 2.2, the coefficients for Central African Republic, Chad, Equatorial Guinea and Gabon are insignificant indicating that the policy change did not have any real effects on these countries. Chad was more of an agrarian economy from the 1960s to the late 1990s. The dynamics of its export only change when oil was discovered in the mid-1990s and exploitation began in 2004 which was expected to stimulate investment in other sectors of the economy. Equatorial Guinea on the hand was also a relatively poor economy until huge oil reserves were discovered in the mid-1990s. This can also give an indication why the policy change in the 1990s did not affect the region's growth. The coefficient for Gabon's economics growth (gabpc) is insignificant from table 2.2. While the real growth in Gabon has fluctuated since the 1980s, Gabon saw its GDP dropped by half in 1986 after a dramatic fall in the world price for oil. Then its GDP suffered another blow in 1994 when the CFA franc was devalued causing its value to drop in half¹³.

¹³Encyclopedia of the Nations (2018)

Dropping-off some of the polynomials to adjust first and second degree polynomials and also to restrict the windows around the cut-off point to estimate the treatment effects, the sample observations dropped from 1970-2013 to 1985-1999. The result is shown in table 2.3. The treatment effect is still negative and highly significant for the CEMAC region as a whole and most of the individual countries except for Chad and Equatorial Guinea.

Table 2.3: Parametric estimates of CEMAC economic growth using different polynomial fits with restricted sample

	Eq (1)	Eq(2)	Eq(3)	Eq(4)	Eq(5)	Eq(6)	Eq(7)
Dependable variable: per capita GDP							
VARIABLES	cempc	cmrpc	cafpc	tcdpc	cogpc	gnqpc	gabpc
1.CEMdummy	-324.0*** (66.90)	-388.1*** (77.81)	-116.1** (45.16)	-30.51 (24.48)	-361.9*** (95.47)	-199.2 (197.9)	-1,968** (738.2)
x_c	-10.22 (28.27)	7.170 (32.89)	-36.73* (19.09)	-27.02** (10.35)	-69.23 (40.35)	18.33 (83.64)	115.9 (312.0)
x2_c	-1.877 (3.067)	1.889 (3.567)	-4.291* (2.071)	-3.507** (1.122)	-10.84** (4.377)	0.954 (9.072)	-9.370 (33.84)
CEMdummy#co.x_c	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
1.CEMdummy#c.x_c	136.8** (52.57)	85.21 (61.15)	71.13* (35.49)	53.85** (19.23)	284.9*** (75.02)	272.0 (155.5)	1,103* (580.1)
CEMdummy#co.x2_c	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
1.CEMdummy#c.x2_c	-25.97* (11.06)	-19.21 (12.86)	-5.499 (7.465)	-0.562 (4.046)	-43.40** (15.78)	-23.74 (32.71)	-298.8** (122.0)
Constant	899.1*** (55.46)	927.7*** (64.51)	411.1*** (37.44)	209.2*** (20.29)	1,019*** (79.15)	411.0** (164.0)	6,337*** (612.0)
Observations	13	13	13	13	13	13	13
R-squared	0.944	0.957	0.944	0.839	0.940	0.877	0.758

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

From table 2.3, the negative effect of the CFA franc for Gabon can be seen clearly as the coefficient of CEMdummy (-1,968) is negative but highly statistically significant at 5%. This implies that when the sample observation is dropped and attention is paid around the cut-off point, the effect of the policy change is more felt in Gabon as explained above. This is also true for Centre African Republic (cafpc) as the coefficient is also negative and statistically significant at 5%. There is a declined in economic growth between 1985 and 1995. Despite the changes that took place in the CEMAC customs union with regard to the CFA franc, low

commodity prices accentuated this decline in GDP coupled with Government mismanagement and corruption around this same period¹⁴.

There was no change in the case of Chad and Equatorial Guinea when the number of observations were restricted and focus was placed around the cut-off point to bias. The coefficients for these two countries are still insignificant indicating that the implementation of the common currency and the devaluation of the CFA did not have any real effects on the growth rates of these economies. For the CEMAC region as a whole, the negative impact is greater when the window is restricted. The coefficient (CEMdummy) moves from -273.9 at 10 percent significant level in table 2.2 to -324 at one percent significant level in table 2.3. When attention is paid closed to the cutoff point the negative impacts are more significant. This is seen clearly in table 2.3 when the number of observations are reduced from 1970-2013 to 1985-1999. Gabon felt the impact more than the other CEMAC member states as the value of GDP per capita is -1968. While the least affected is the Central African Republic with only -116.1 fell GDP per capita.

2.5.3 Nonparametric approach

To avoid using incorrect functional form, the analysis and findings are also presented using a nonparametric approach. In this approach, the local kernel regressions function is applied as it uses data around the cut-off point reducing the level of bias in the model (Jacob et al., 2012). According to Lee and Lemieux (2010), the regression of the kernel estimates of the outcome on the forcing variable is a local mean for the results of values of the forcing variable at the cut-off point. Since different kernel functions are applicable in the RDD, the triangular kernel is ideal in this case as it is considered optimal when estimating the local linear regressions at the cut-off point to estimate the average treatment effect (Fan & Gijbels, 1996). The rectangular kernel is employed in this analysis for comparability purposes. Following Lee and Lemieux's (2010) framework, more weight is put on observations close to the cut-off point by estimating the values of the regression function to the right and to the left of the cut-off point and then considering the difference. The results are shown in table 2.4 where a bandwidth of 10 and triangular kernel are used. When different bandwidths are used, there is very little alteration with the results. From table 2.4, the difference is negative and significant where R2 is the regression estimate to the right and L2 is the regression estimate to the left of the cut-off point.

¹⁴ Encyclopedia of the Nations (2018)

Table 2.4: Non-parametric treatment effect at X= 1994

R2	L2	dif
683.37281	886.59917	-203.2264

Source: Author's computation

The difference between the above two limits R2 and L2 as in equation (2.21) is given as:

$\tau_{SRD} = \lim_{x \uparrow c} E[Y / X = x] - \lim_{x \downarrow c} E[Y / X = x]$, equals the average treatment effects around the cut-off point. All the subjects that were assigned to the treatment received the treatment. Since there is normally a trade-off between bias and precision, the level of bias is reduced by using a linear regression imputing bin on both sides of the cut-off point. According to Lee and Lemieux (2010), imputing bin in the linear regression gives a better prediction at the cut-off point and this reduces bias present in the regression to a greater magnitude. In table 2.4 the difference is negative with a value of -203.2264. This implies the CFA franc on average has failed in its capacity to support a conducive environment where CEMAC regional as a whole and member states in particular could take advantages and fast track the growth rate in the respective countries.

To further illustrate the assertion made, three different bandwidths of Local Wald Estimation are reported which can be considered as an informal test of sensitivity and to check robustness of estimates as shown in table 2.5. Using the triangular and rectangular kernel, the effects of the franc CFA on economic growth is negative and statistically significant. Applying a bandwidth of 5 provides an estimate of around -262 which is statistically significant at one percent level. Doubling the size of the bandwidth to 10, the negative effects are more pronounced making the discontinuity even stronger.

Table 2.5: Nonparametric estimation using different bandwidths and kernel types¹⁵

Local Wald Estimation		
Variables	Eq(1) Cempc (tri)	Eq(2) Cempc (rec)
Bandwidth	Triangular kernel	Rectangular kernel
10	-292.9*** (46.46)	-323.8*** (46.48)
5	-261.9*** (43.95)	-296.3*** (71.09)
20	-509.7*** (75.75)	-673.8*** (95.41)
Observations	44	44

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

According to Pellegrini et al, (2013), wider bandwidth leads to a higher smoothness around the cut-off point and it is useful in reducing the unevenness of observations that can be found around the jump. When we apply the rectangular kernel allowing the bandwidth to stay the same, the results are slightly higher and statistically significant at one percent.

2.5.4 Robustness check

To confirm the robustness of our results, sensitivity analysis is carried out using Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC) and the F-test. The AIC indicates whether the data used in the analysis fits the model better than another. The problem with AIC is that if all the subjects do not fit the model neatly, the AIC cannot indicate the problem. Jacob et al. (2012) suggest the use of the F-test to determine the appropriate model to use. Once this is done, it is necessary to increase the precision by adding a predetermined baseline characteristics and dropping outer data points in sequence from the lowest and highest rating distribution values (Jacob et al., 2012). Other covariates are controlled to make sure that they are not responsible for the jump and thus affect the treatment around the point of discontinuity.

¹⁵ Differences between treated and non-treated regions

In appendix table 2.6, Eq. 3 in column 4 shows that the controlled variables such as CEMAC foreign direct investment (cemfdi) and CEMAC total population (cempop) are not statistically significant. CEMAC inflation (ceminf) and CEMAC labour force (cemLF) are statistically significant at 5 and 10 percent. This stipulates a direct positive relationship between CEMAC economic growth and its labour force and inflation as stipulated in the literature. The jump as a result of the common currency is still negatively and statistically significant at one percent. Looking at the P-value of the F-test, we can comfortably reject the null hypothesis and conclude that the institution of the common currency in CEMAC in 1994 did have a negative impact on the region's growth and that the model used does provide a better fit.

In appendix figure 2.8, the jump around the cut-off point becomes more visible when we use the binned graph to show the mean of CEMAC GDP per capita. When Ipoly and triangular kernel are used as shown in appendix figure 2.10, we can see a positive jump of CEMAC FDI after 1994. This is partly due to the discovery of oil in the region that attracted foreign direct investments. After 1994, the steep increase in FDI is visible. Devaluation of the franc CFA also made it cheaper for foreign funds to flow into the region.

2.6 Conclusion

In this chapter we have analyzed the effects of common currency on CEMAC economic growth. A counterfactual approach, the regression discontinuity design (RDD), is used to estimate the effects of the common currency on all the six member states and the region as a whole using per capita GDP to represent economic growth. The data sample covers the period from 1970 to 2013.

The sharp design version of the RDD approaches was adopted in this chapter; informed by the fact that all member states in the CEMAC region instituted the common currency as opposed to only a few countries in the region. This implies that the probability is equal to 1 for these countries receiving treatment with rating above the threshold or cut-off point. Fuzzy RDD is not the most ideal technique in our case because it works well only when the probability of member states receiving the treatment is not equal to one below or above the cut-off point (Jacob et al., 2012). It is useful in a situation where some members that are qualified for the treatment are not part of the treatment. Also, some members that are not qualified for the treatment are currently being treated.

The focus of attention is on the treatment effects around the threshold and the difference between above and below the cut-off point produces the outcome. In the case of CEMAC, all member states adopted the common currency and all qualified since they are all active members of the CEMAC trade bloc. That's why the sharp RDD is ideal in this case. Both graphical and non-graphical analysis (equations) are deployed in the estimation technique. The graphs show clearly a negative jump around the cut-off point. Applying the Kernel-weighted local polynomial even makes the jump clearer showing a drop in GDP per capita. In the non-graphical analysis, both parametric and nonparametric approaches are used to make sure the results are robust. The results reveal that the imposition of the common currency has had an inverse relationship with the region's economic growth as a whole.

In the parametric approach, when the degree of polynomial is increased, the variable for CEMAC common currency is still significant and negative but the results are less significant for the majority of the individual countries in the region except for Cameroon that is significant and negative at one percent. For the Republic of Congo, the effect is also negative and significant at 10 percent. Reducing the degree of polynomial makes the results even more significant for most of the member states except for Chad and Equatorial Guinea. The nonparametric method also confirms the results from the parametric approach as the difference between the post-pre-period is also negative and significant. When different bandwidths are used in the analysis applying both the triangular and rectangular kernel, the results are still significant at one percent. Lastly, when other variables are controlled before and after the implementation of the common currency, the common currency coefficient is still negative and only the variable for labour force is positive and significant at 10 percent.

2.7 Policy Implications and Recommendations

One of the criteria for an OCA is the homogeneity condition to ensure that any external shocks should affect member states of a trade bloc of equal proportion. This is not the case with member states of the CEMAC customs union where the effect of external shocks is felt differently by member states. For example, Gabon realised a high growth rate of 9.5% in the 1970s and early 1980s before succumbing to oil-price instability and international borrowing. Also, in 1986 Gabon saw its GDP drop by half after a dramatic fall in the world price for oil and it suffered another shock in 1994 when the CFA franc was devalued. Section 2.3.2.4 shows how four channels of transmission can enable common currency adoption to translate to a

higher level of economic growth. These channels include; price stability effects, exchange rate effects, trade and competition effects and policy-making effects.

Despite the fact that the CFA franc have fulfilled some aspect of the OCA to a lesser extent, it is still far from being an OCA. For example, some CEMAC states have benefited from lower inflation that has contributed to macroeconomic stability. Also, the convertibility of the CFA franc is guaranteed by the French Treasury and the fact that it is pegged at a fixed exchange rate to the euro has created some certainty in terms of financial discipline. However, the downside of the fixed exchange rate is that it has contributed to increased economic costs of adjustment as it has increased unemployment as a result of lack of competitiveness of CEMAC economies due to the inability of member state to alter the value of the currency to compete competitively in the international market. The endogenous OCA theory identified two main transmission channels through which a common currency may affect an economy's performance. These channels operate via increased trade integration and enhanced credibility. When member states in a monetary union increase the level of intra trade flow, there is increased efficiency and transfer of knowledge. This is not the case with the CEMAC customs union where the level of intra-regional trade flow is negligible¹⁶. Tariff and non-tariff barriers have contributed largely to the low level of intra-regional trade. Political instability in the CEMAC region has weakened a regional central bank's ability to increase the level of credibility in its inability to provide checks and balances in political systems in the CEMAC region.

Close attention should be paid to the fixed exchange rate of the CFA franc against the euro. Decades ago it made some economic sense to peg the CFA franc to the Euro as the EU was considered to be the CEMAC main trading partner. Since the pattern of trade has changed, China and India are now the main trading partners, a common currency pegged to the euro at the fixed exchange rate will disadvantage the CEMAC customs union. Currently, these countries trade much less with Europe, so that a fixed exchange rate to the euro would have affected member states trade balance negatively. Conversely, CEMAC countries trade a lot with Asia, so that a switch to an alternative exchange rate arrangement would subsequently raise income levels of member states and improve member states' trade balance.

¹⁶ See chapter three

Recently, the debates of the valuation of the CFA franc has intensified and there has been speculation of possible devaluation of the CFA franc during the CEMAC Heads of State Summit held in Ndjamena, October 25, 2018 due to poor macroeconomic fundamentals disequilibrium on the region's balance of payments. Slow progress of reforms and the deterioration of budget balances and the increase in public debt drew wide speculations of the CFA franc devaluation. However, devaluation did not take place as the BEAC central bank governor brought to the attention of the public that there was no reason why CEMAC risks devaluation as the current economic situation in the CEMAC zone is not anywhere near that of 1994, the year of the last currency devaluation¹⁷. According to the central bank governor, CEMAC countries' foreign exchange reserves currently have a coverage rate of about 60%, compared to only 13% in 1994. Prior to the 1994 devaluation and the institution of the common currency, CEMAC zone was in recession, with a growth rate of -1%, while the projections for 2018 are 1.7%, and just over 3% for 2019.

It is clear from the analysis that the common currency adopted in 1994 by the CEMAC member states has on average not contributed to the region's growth rate. Other variables of interest must have contributed to the region's economic growth. Policy makers should be careful when adopting policy changes like common currency. The creation of a common currency such as the Euro was successful and benefited the Euro zone in general though some member states up to date still face numerous challenges. In the case of the recently witnessed 2016 Brexit referendum, various analyses and conclusions are on the table about the future of the Euro. But it is clear that not all regional trade blocs are aimed at establishing a monetary union anytime soon.

Many factors have to be taken into consideration and the most important factor for policy makers to look out for is whether the degree of integration of factors of production is high. In other words, for common currency to have a significant positive effect in any RTA, the movement of factors across member state national borders should be quite high with very little barriers. If the degree of integration among the countries in question is relatively weak, then the benefits of eliminating individual currencies in favour of a regional one would not be felt completely. Economic resources at the regional level should be devoted to increasing the level

17 Business Cameroon (2018)

of cohesion among member states so that they can be fully exploited and utilised in such a way that will benefit the trade bloc.

In the case of CEMAC customs union, the analysis of this chapter and what other researchers have shown, the region does not satisfy the criteria of optimum currency. Despite the fact that the effects of common currency on economic growth is indirect, the CFA franc has not managed to create a favourable environment for growth to take a giant leap. The pegged CFA franc to the euro is not helping the region to improve its trade balance. This is because member states of the CEMAC customs union trade more with countries in Asia rather than the EU as was the case in the past.

Policy makers should also set up a committee to study the true value of the CFA and recommend to the BEAC central bank the pros and cons for the present exchange rates to the euro and determine if there is need to change taking into consideration the fundamental macro disequilibria of CEMAC member states.

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P1&dq=The+Economics+of+Monetary+Union&ots=zah1OSJ4pk&sig=bhrgtlqqEGH_59xpNaAbNV0N_OE#v=onepage&q=The%20Economics%20of%20Monetary%20Union&f=false]

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Appendix

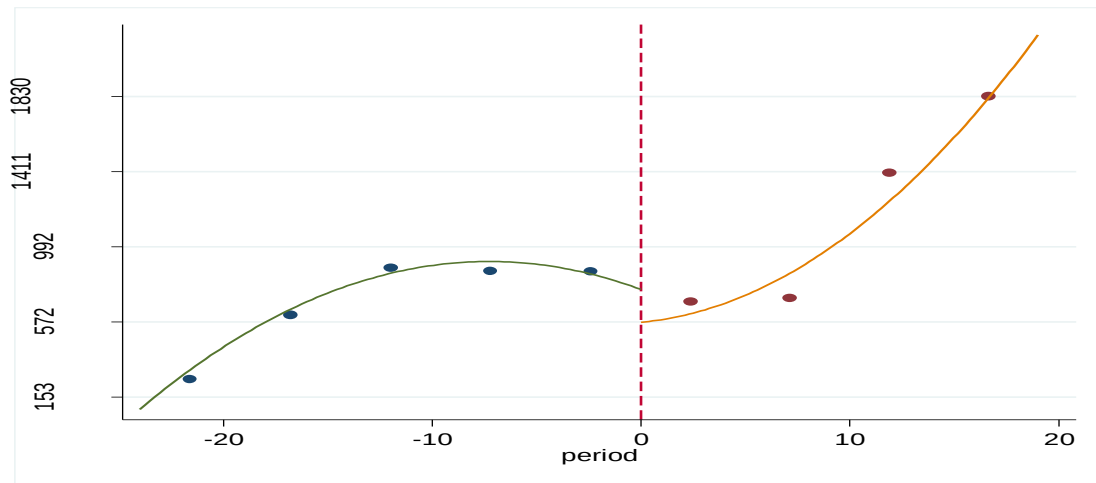
Table 2.6: Proof of robustness using the AIC and BIC tests with controlled covariates

Column 1	Column 2	Column 3	Column 4
Variable	before 1994	From 1994	Before & after 1994
	Eq 1	Eq 2	Eq 3
CEMdumy	(omitted)	(omitted)	- 924***
Cemfdi	-0.0489	-0.0358	0.00866
cemLF	0.282	-3.83	1.04*
Ceminf	-1.97	9.29	11.1**
cempop	-0.103	1.69	-0.344
_cons	730**	- 4738*	-579
r2	0.403	0.917	0.894
r2_a	0.104	0.894	0.873
Aic	140	252	415
Bic	143	257	423
N	13	19	32

Legend: * p<.1; ** p<.05; *** p<.01

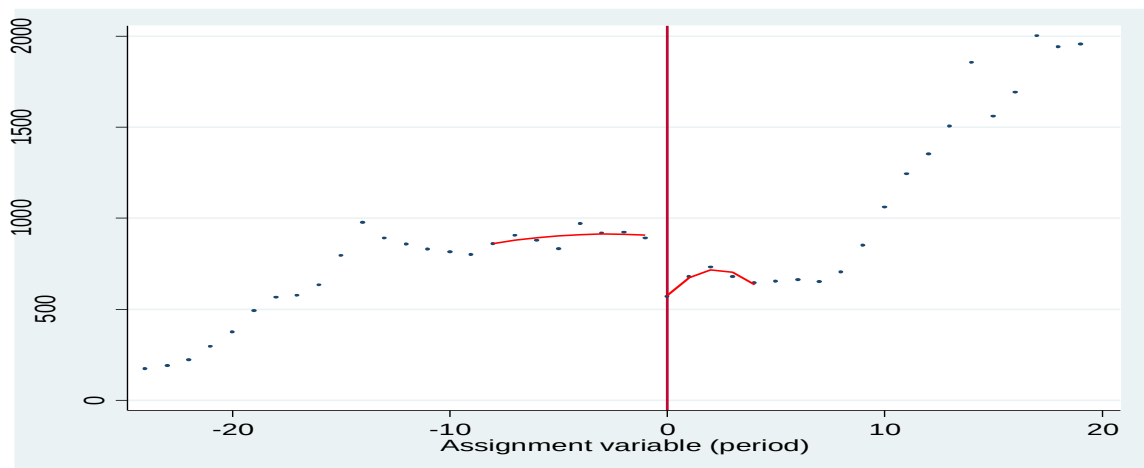
Source: Author's computation

Figure 2.8: Binned graph showing mean of CEMAC GDP per capita



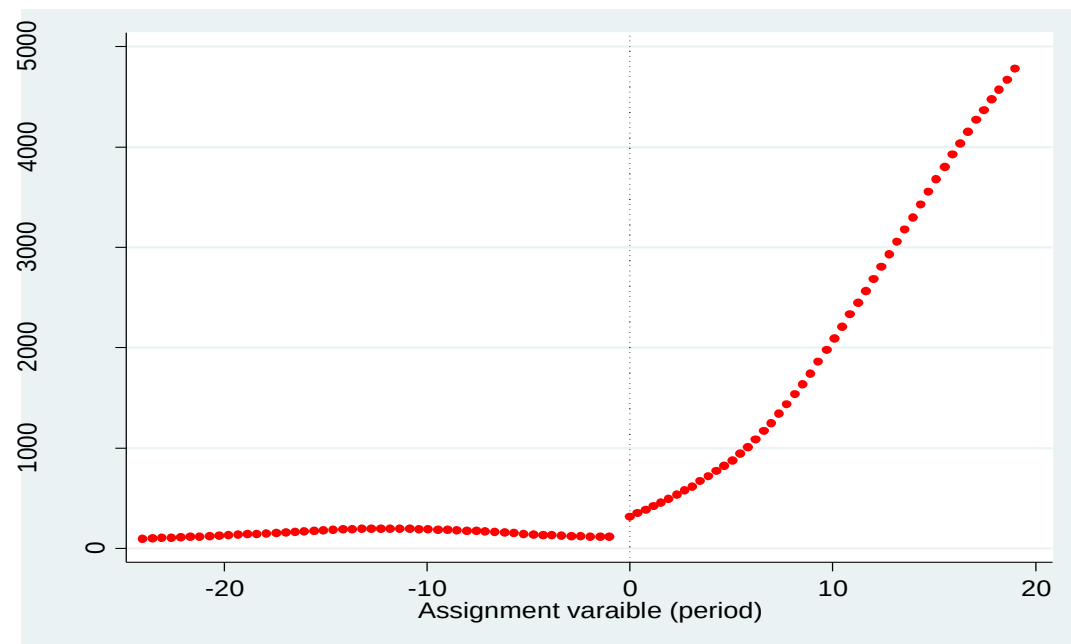
Source: Author's computation

Figure 2.9: Window and second degree polynomial showing the erect around threshold



Source: Author's computation

Figure 2.10: CEMAC Foreign Direct Investment



Source: Author's computation

Chapter Three

Effects of common currency on CEMAC's intra-regional trade flow

3.1 Introduction

The impact of any monetary union on trade has been and continues to be an important aspect of the literature of international trade. The debates continue to get deeper especially at this time when the benefits of economic integration are being debated by policy makers, for example, the controversy that exists over the feasibility of common monetary policy around a given geographical proximity, particularly after European Union (EU) recent economic struggles. As mentioned in chapter two we see Britain preparing to exit the European Union after the referendum held in June 2016. Although the United Kingdom (UK) was never a member of the common currency (the Euro), the majority of British people were unsure of the true benefits of common currency. As a result, instead of deepening their commitment, they decided to pull out from the union. The effects of common currency on intra-regional trade also depends on the objectives of member states and whether the union is among developed economies, developing economies or a mixture of both.

The share of intra-regional trade in total trade flow in Africa is relatively small compared to other parts of the world. This is attributed to high tariff and non-tariff barriers, high trade costs and lack of product diversification (UNCTAD, 2013). In a report from UNCTAD (2014), the share of intra-regional trade in exports to total exports between 2007 and 2011 was only 11 percent of the African continent. The same report shows that it was 21 percent for Latin America and 70 percent for the EU. Although some parts of Africa¹⁸ have enjoyed the presence of a monetary union long before the EU, the success of these monetary unions cannot be compared to that of the European Union as the EU has had a very high level of intra-regional trade, well developed financial institutions and a high level of factor movement long before the Euro zone was established in 2000.

The Central African Economic and Monetary Community known by its French counterpart as “Communauté Economique et Monétaire des Etats de l'Afrique Centrale” (CEMAC) is made up of six States: Cameroon, the Central African Republic, Chad, the Republic of the Congo,

¹⁸ The franc CFA in West and Central Africa are two common currency areas while in Southern Africa, we also have the common currency area of Lesotho, Namibia and Swaziland. The currencies of these states are linked one for one with the South African Rand although individual state maintained currency sovereignty.

Equatorial Guinea and Gabon. In 2016, the CEMAC customs union had a population of 50.8 million people and a gross domestic product (GDP) of US\$ 67.7 billion (UNCTAD, 2014). The region covers a total surface of around 3 million km². Five out of six countries in the CEMAC region are oil exporters. Only Central African Republic in the region export mostly diamonds and timber. The oil sector represents 54 percent of regional government revenue. In addition, 29 percent of regional GDP and approximately 79 percent of regional exports come from the oil sector (World Bank, 2018). Together with the larger Economic Community of Central African States (ECCAS) and the mainly inactive Economic Community of Great Lake Countries (CEPGL), CEMAC presents one of the Central African Regional Communities established to promote cooperation and exchange among its members.

The creation of common currency (franc CFA) in the Central African Monetary Community was intended to facilitate commercial exchange and reduced transaction costs of member states, enable the region to benefit from lower prices and increased intra-regional trade. Head of States agreed to converge and monitor national economic policies, to coordinate sectoral policies and to progressively create a single market¹⁹ thereby by establishing an economic and monetary union. The birth of CEMAC in 1994 replaced UDEAC with the goal of giving a new impetus to regional cooperation. CEMAC member states agreed to initiate a comprehensive reform process. The impact of the franc CFA on intra-regional trade has been one of great concern because of the obstacles of member states commitment in implementing regional objectives. The CEMAC region thus far finds it challenging to build capacity to raise the growth potential and explore ways in which it can benefit from increased intra-regional trade and financial integration (Gulde & Tsangarides, 2008).

Although the CEMAC trade bloc is a customs union, uneven application of regional rules and policies have constrained the region's intra-regional trade. This is compounded by poor structural reforms and tariff policies that member states rarely adopt. The increased activities in the oil sector in the CEMAC region in the late 1990s, led to improved economic performance in the region. With increased value of oil exports, total exports of goods grew by approximately 34 percent of GDP in the same period. The main contributing factor for that sudden increase in export value was the surge in both petroleum prices and increased oil production (Martijn &

¹⁹ To see a high level of free movement of persons, goods, capital, and services

Tsangarides, 2007). The same report also shows that intra-regional trade was less than two percent of total GDP and approximately 1.5 percent of total trade in the mid-1990s.

The countries of the CEMAC customs union have been hit hard by a series of severe shocks of recent times: from a sharp decline in oil prices, civil and political conflicts in some parts, the migration of refugees, famine and droughts in some of its member states. Countries in the region are finding it difficult to raise the level of economic growth to an acceptable level as it is at its lowest level in 20 years. Regional international reserve is declining to a record level to finance increasing imports.

The CEMAC region as a whole has witnessed uneven share of total trade. An analysis of the annual percentage change in total trade shows that the percentage of imports of goods and nonfactor services was 40.4 percent in 2011, 42.1 percent in 2012 and 40.8 percent in 2014 (IMF, 2016). The annual percentage change in the value of exports of goods and nonfactor services were 56.5 percent in 2011, 58 percent in 2012 and estimated at 50.5 percent in 2014. Countries in the European Union used to account for close to 52 percent of CEMAC imports between 1994 and 2005. Since then, there has been a decline in imports from the EU and imports from Asia have been increasing and now account for a significant part of CEMAC total imports (UNCTAD, 2014).

The composition of CEMAC exports is mostly natural resources and primary commodities. Export of crude oil accounts for close to 90 percent of total exports in Chad, Republic of Congo and Equatorial Guinea. Central African Republic depends heavily on the exportation of diamonds and wood, while agriculture and timber account for a significant part of Cameroon's exports. In Gabon, the value of crude oil exports accounted for more than 76 percent of its total exports followed by timber in 2005 (Ngeleza & Muhammad, 2009). Oil share of overall GDP was more than 31 percent in 2015 and 22.7 percent in 2016. In 2016, the main exports were oil, manganese and processed wood which accounted for 34.3 percent of total exports (IMF, 2016).

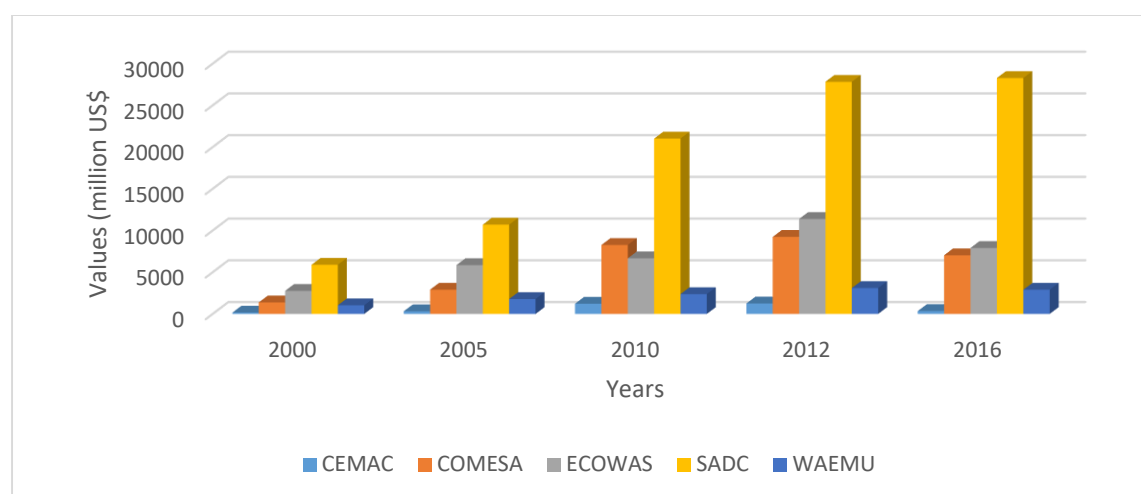
In spite of the historic advantages and a favourable natural resource endowment, against all expectations, enhanced intra-regional trade has proven to be a challenging goal in the CEMAC area (Gankou, 2004). While low intra-regional trade is a feature of many regional groupings in the developing world, the level in CEMAC is lower even in comparison to their regional

counterpart of the French West African Economic and Monetary Union (WAEMU)²⁰, as shown in figure 3.1. From figure 3.1, the total value (exports) of CEMAC intra-regional trade in 2016 was approximately US\$343 million. This was only 11 percent of total WAEMU intra-regional trade that stood at US\$2904 million in 2016. A closer look at the percentage by destination in the CEMAC indicates that intra-regional trade stood at one percent in 2005 and increased to approximately three percent in 2009 and dropped to two percent in 2013. WAEMU percentage by destination was five percent in 2005, thirteen percent in 2009 and 15 percent in 2013 (Geda & Seid, 2015).

Total intra-regional exports were approximately two percent of total exports while intra-regional imports were four percent in 1995. In 2012, intra-regional exports remained at two percent while intra-regional imports increased marginally to six percent (UNCTAD, 2013). Intra-regional trade was 10 percent of total trade for WAEMU, while the share of intra-regional trade was more than five percent of total trade in 1997 for COMESA and SADC (Martijn & Tsangarides, 2007). The value of total exports was estimated at 314 billion US dollars in 2008 which was slightly more than the 2007 value of 256 billion US dollars (Guèye, 2010). There is the possibility that the official figures do not fully reflect the correct level of intra-regional trade in the CEMAC region due to the magnitude of unrecorded trade that takes place across borders of member states. However, if an adjustment is made taking into consideration the level of unrecorded economic activities, intra-regional trade will still remain quite insignificant.

²⁰ Also known by its French acronym as Union Economique et Monétaire Ouest Africaine (UEMOA)

Figure 3.1: Exports of selected intra-regional trade blocs in Africa (million US\$)



Source: Author's computation using WTO Statistics Database

3.2 Justification and problem statement

Monetary union and exchange rate system can be judged by the extent to which the system encourages or discourages world trade. In general, the less volatile the currency movement, the less likely that international trade will be discouraged. Common currency on the other hand can be considered even a better system when it comes to intra-regional trade. Common currency can address the problems with multiple currencies and exchange rate fluctuations that affect intra-regional trade flow. The impact of common currency on intra-regional trade is normally viewed in terms of lowering transaction costs, facilitating payments, and hence increase in cross border trade (African Economic Brief, 2016). These factors are considered as some of the fundamental benefits of common currency. The effectiveness and success of a common currency depend on institutional integration and cultural similarity (Ro'I & Sénégal, 2012).²¹

Three popular questions are drawn from the literature of common currency and trade flows. The first is in regard to the use of fixed-effects 'within' estimators in panel-data context, since the within estimator exploits variation over time to answer the question 'what is the trade effect of a country joining (or leaving) a currency union?'²² The second broad question that

²¹ In some cases, colonial tie is used as a proxy for measuring cultural similarity.

²² See Glick and Rose (2002)

researchers have endeavoured to provide an answer to can be contrasted with the cross-sectional question of how much more trade is conducted by countries within unions as opposed to trade between non-members countries?²³ The third question still in line with common currency and trade flows pertains to how much additional trade can a country realise as a result of joining a monetary union?²⁴

The importance of trade within trade blocs is paramount because it is the first step towards economic and political integration (Alva and Behar, 2009). Given the low share of intra-regional trade flows in the CEMAC customs union, an important policy question is “how much has intra-regional trade increased in the CEMAC customs union in comparison to the trade the region would have experienced if it had not adopted the common currency? The current study attempts to answer this question by analysing and quantifying the intra-regional trade flow before and after the event changes in the mid-1990s. Although, we have the value of trade of the CEMAC countries, we cannot obtain the value of trade that would have been experienced if they had continued without the monetary policy change in 1994. To provide adequate response to the above question, we adopt the difference-in-differences estimation framework. This approach compares the experiences of countries affected by the introduction common currency with the experiences of those which are not affected but similar in resource endowment, culture and institutional factors.

The analysis of this chapter also placed focus on the nonlinear relation between intra-regional trade flows and common currency (CFA franc) in the CEMAC customs union. Since time series data of macroeconomic variables are often found in the form of nonlinearity, sample split threshold model is introduced to model the dynamics in time series data. Thus, this chapter attempts to add to the literature partially by investigating the nonlinear relationship between CEMAC intra-regional trade flow and common currency. This is achieved through the adoption of sample splitting method to systematically uncover the robust relationship between common currency and intra-regional trade. Sample splitting methods such as threshold regression allow for increased flexibility in functional form and it is not as susceptible to curse of dimensionality problems as nonparametric methods (Kourtellos, Tan & Zhang, 2007).

²³ See Micco et al. (2003)

²⁴ See Fourie and Santana-Gallego (2009)

While the CEMAC customs union has seldom been chosen for such an exercise, we think that, given the policy changes that took place in 1994 with regard to the CFA franc, an analysis will provide original insights regarding the issues of how CEMAC intra-regional trade flow fared in comparison to other countries with similar characteristics in the central African region that did not adopt the franc CFA. The empirical studies focusing on intra-regional trade flow in the CEMAC attempt to identify trade's effect mainly through a single or bilateral comparison. The difference-in-differences method adopted in this chapter attempts to overcome the potential ambiguities of the single-difference studies. Despite its limitations, this approach tries to build earlier studies.

Difference-in-differences model has been used in the past to examine tax reforms (Eissa, 1995) and the evaluation of job training programs (Heckman et al., 1998). It is appropriate in the context of the effect of intra-regional trade and common currency because countries in the central African region belong to a bigger trade bloc called Economic Community of Central African States (ECCAS). This include all countries in the CEMAC customs union. The structure of the policy change is such that member states of the CEMAC customs union adopted the policy change and are strongly affected by the reform in 1994 and so form a natural 'treatment' group while the other member states of ECCAS which are largely unaffected since they did not adopt the CFA franc form a natural 'control' group. However, the countries that form the control group may have systematic differences from the countries of the treatment group and these differences may be reflected in their value of trade.

The findings of this research will add to the debate on the effects of common currency on economic growth and intra-regional trade flow. They potentially stand to equip policy makers and decision making institutions with tools and techniques to estimate the treatment effects of a common currency on intra-regional trade.

The remainder of this chapter is organised as follows:

Section 3.3 looks at some of the challenges facing CEMAC intra-regional trade and the trend in net flow of FDI into the region. In section 3.4, the literature review and theoretical framework of the relationship between common currency and intra-regional trade are analysed. Section 3.5 describes the theoretical model, the estimation technique and the data used in the analysis. The results are presented in section 3.6 and conclusion given in section 3.7, while policy recommendation is presented in section 3.8.

3.3 Challenges Facing CEMAC's Intra-regional Trade

Lack of product diversification is one of the numerous challenges facing the CEMAC region. The region produces mostly primary products and depends heavily on oil exports for most of its foreign exchange earnings. There is a lack of trade complementarity among member states. Inadequate infrastructure such as modern telecommunication networks coupled with poor roads and limited highways tend to reduce a firm's level productivity (Ancharaz, Mbekeani & Brixiova, 2011). This makes the region less competitive and attracts a low level of investment as investors find the region unattractive. Also, member states tend to trade more with the European Union and Asian countries²⁵, importing mostly final goods and services while exporting primary commodities. Uncompetitive manufacturing sector, low productivity in agriculture and a high concentration in the minerals and oil sector are some of the reasons for low intra-regional trade (Ngeleza & Muhammad, 2009).

CEMAC member states are highly vulnerable to external shocks such as fluctuation in world commodity prices. This, therefore, increases the cost of fiscal policy adjustment, worsening the poverty level and creating an unfavourable economic structure. Another important factor to mention is the fact that the French treasury is holding approximately fifty percent of CEMAC foreign reserves in order to guarantee the convertibility of the franc CFA against the Euro (Caceres, Poplawski-Ribeiro & Tartari, 2013). This reduces the level of flexibility of the Central Bank (BEAC) to undertake its monetary policy duties efficiently to mitigate different macroeconomic problems in the region. Examples include using monetary policies to manage the high level of unemployment and balance of trade deficits. Policy makers in the CEMAC region, moreover, have been devoting resources to policies aimed at preserving its special economic and political relationship with France (Zhao & Kim, 2009). This continues to impose serious constraints on attempts to institute regional cohesion policies.

In terms of macroeconomic challenges, deteriorating terms of trade in the CEMAC region over the years have compounded by fiscal indiscipline. This has made the deficit in the current account to grow to six percent while fiscal deficit grew to nine percent of GDP in 2015. The fall in oil prices contributed to this increase in deficit and this has worsened the proceeds from oil exports by approximately 32 percent (TRALAC Trade Law Centre, 2016).

²⁵ Mostly China, India and Thailand

According to Oliva (2008), non-tariff barriers have also played a major role in deterring the flow of goods and factor mobility across borders. In theory, the preferential tariff rate that was supposed to be applicable to CEMAC's intra-regional trade is officially zero percent, but a number of surcharges that were not envisaged in CEMAC tariff regime, are often placed on exports and imports moving from one CEMAC country to another. This has rendered the CEMAC region subject to discretionary practices by member states' governments and making intra-regional trade non-transparent and complex. Non-tariff barriers in the CEMAC region are higher than that of WAEMU and other RTAs in Africa. These include numerous cumbersome and costly procedures of qualitative measures. Examples include bureaucratic licencing procedures, and technical specifications, delays at the borders, additional documentation, and corruption by customs officials (Oliva, 2008).

3.3.1 Foreign direct investment

The CEMAC region saw a drop in Foreign Direct Investment (FDI) in the 1980s and 1990s. CEMAC witnessed a fall in investment and many foreign investors actually pulled out investment from the region. The region started to see inflow of FDI in the early 2000s. According to Guèye (2010), between 1985 and 1991, Cameroon lost close to sixteen million US dollars in FDI and in 2002 realised an increase in FDI of close to 83.1 million dollars. In 2014, the net inflow of FDI as a percentage of GDP was slightly less than one percent. The lowest percentage net inflow of FDI in the past 39 years was minus one percent in 1990 while the highest was six percent in 2002 (Index Mundi, 2015). In Central African Republic, FDI was positive and slightly worth less than 10 million dollars in 1993 but suddenly fell to approximately 4.3 million dollars in 2002. According to the World Bank (2016), the net inflow of FDI in 2015 for Central African Republic was less than one percent of the country's GDP. Another interesting point to note is that, the inflow of FDI into Chad in the late 1990s was due to the discovery of oil and the construction of the Cameroon-Chad Pipe Line project that brought foreign revenue into the region. Another reason for the increase in FDI towards the end of the 1990s was due to massive privatisation carried out after the structural adjustment program in the 1990s. According to Ngongang (2012), countries in the EU were the main investors in the CEMAC region in 2002 and 2004. Since then, some Asian economies has increased their investment significantly in the CEMAC region. For example, since 2015, China is among the top three investors in the CEMAC region (WTO, 2016).

3.3.2 Regional financial integration and factor mobility

Regional financial integration is one of the processes where there are broadened and deepened financial links within a particular region or trade bloc. In the case of CFA franc zones, the CEMAC region, for example, does not have a well-developed and integrated financial market. For a regional financial market to operate smoothly, there is need for a single permit to operate banks, but in the CFA franc zones, in addition to the single permit called “*agrément unique*”, each member state in the region requires private financial institutions to apply for additional permits from the different ministries of finance before they are allowed to operate any banking institution (Wakeman-Linn & Wagh, 2008). The financial system is still largely underdeveloped and the banking sector dominates in the region holding close to 85 percent of the region’s financial assets and liability as of 2006 (Wakeman-Linn & Wagh, 2008). The non-banking financial institutions and insurance companies account for the remaining 15 percent. The average ratio of the M2 money to GDP and private sector credit to GDP are relatively low and stood at 15.2 percent and seven percent below that of sub-Saharan Africa which stood at 33.6 and 17.4 percent in 2006 (African Development Bank, 2010).

According to Oliva (2008), mobility of factors of production is limited in the CEMAC region. Despite the absence of formal migration barriers, labour mobility is still very negligible. The lack of common visa requirements and the high unemployment level in the region are contributing to the low level of labour mobility within the region. Despite cultural and ethnic similarities among member states, free flow of labour across national borders is still a huge concern and has not benefited intra-regional trade as expected before the institution of the common currency (Gankou & Ntah, 2008).

3.4 Literature Review and Theoretical Framework

3.4.1 Introduction

The general belief is that the pegged CFA franc to the Euro helps in creating macroeconomic stability in the region. In the 1980s, the CFA franc zone outperformed fellow sub-Saharan African countries, in terms of stable monetary institutional framework. The key question is how has CEMAC region leveraged this stable monetary framework to grow faster, attract investments, and promote intra-regional trade flow? Despite numerous political and economic instabilities such as coups, civil wars and the devaluation in the 1990s, the CFA zone has persisted. The most important benefit of a common currency is that it can promote a trade and

investment among member states and especially mitigating the risk small economies in the region might face due to vulnerability to exchange rate fluctuations outside the region. Common currency can enhance intra-regional trade by reducing transaction costs. A common currency could promote trade and investment among countries as it eliminates the costs of obtaining information about prices in different currencies.

On the other hand, this may lead to loss of nominal exchange rate as a policy tool for adjusting to country-specific external shocks such as volatility in commodity prices. If control of monetary policy is surrendered to a regional central bank, macroeconomic policies such as interest rates can be geared more toward maintaining stability within the union than for each individual member.

3.4.2 Literature review

The launch of the Euro in 1999 strengthened the notion among economists that regional trade blocs sharing a common currency see a reduction in their trade costs. Early studies emphasise the type of exchange rate system suitable for international trade. Economists like Mundell (1961), place emphasis on optimum currency areas, estimating the benefits of fixed exchange rate systems among potential trading partners. The main thesis of his argument is that countries that are integrated through international trade and allow free flow of factors of production should consider fixed exchange rates for cross border transactions. Mundell is one of the pioneers in the study of optimum currency areas. Flexible exchange rates can have potential harmful effects to international trade and create uncertainty in the market. Since then, other theoretical and empirical works have followed in the same vein until the ground-breaking work of Rose in 2000.

The literature of monetary union has evolved over time from the time of Mundell (1961) to the late 1980s and early 1990s which saw a turning point with the creation of the Euro zone. Monetary union gained prominence and became a fact of life in large part of the EU. The work of Mundell (1961) laid the theoretical foundations for the establishment of the European Monetary Union. His theory of optimum currency areas is regarded as one of his most significant scientific contributions in the area of monetary union since the 1960s (Swoboda, 1999). Mundell (1961) theory of the Optimum Currency Area envisaged a new global monetary system from a regional stand point rather than from a national one. This new global monetary system is one where countries within a particular region that are highly involve in trade can

determine the type of exchange rates that sort them to reduce the costs involved in bilateral trade. Mundell raised the all-important question: “On what economic ground could the decision by various regions of the world adopt a common currency be based?” The idea behind the question is that that member states in a trade bloc should start looking at the advantages of a common currency. He takes the example of North America where he asked the question on whether Western Canada and Western United States join to create a Western Currency, would benefits the sub-region. This example highlights the fact that Western Canada and Western USA trade more with each other than other states within their respective countries. Mundell develops a cost benefits approach to highlights some of the advantages of a common currency within a trade block that is not limited to reduction in transaction costs.

Paul De Grauwe is another author that can be single out as one who have written vastly on the economics of monetary union and trade. In one of his earlier papers, De Grauwe (1975) devised a framework that allows for a systematic analysis of the conditions for a successful monetary integration. His analysis was based on two alternative assumptions that he developed concerning the Phillips curve which has to deal with the trade-off of unemployment and inflation rates and the monetarist views and assumptions. The rationale behind these two assumptions was to find out how these two alternative views affect the feasibility of a monetary union. Applying different forms of graphical analysis, the author realized that countries with balanced growth and equalizing national productivity growth rates stand a chance of forming a monetary union. The analysis also shows that differences in nominal wage rate changes should reflect differences in productivity growth rates in a monetary union.

Most of De Grauwe’s recent works are related to the Euro zones and how other trade blocs can learn from the European Union. For example, De Grauwe and Ji (2015) analyse the similarities and the differences in the fragility of the European Monetary System (EMS) and the Eurozone. The authors test the hypothesis that the fragility of the EMS arose from the absence of a credible lender of last resort in the foreign exchange markets while in the Eurozone, the fragility was as a result of the absence of a lender of last resort in the long-term government bond markets that caused the fragility. The authors apply the fixed-effect econometric model to compare the fragility of the two monetary regimes. Their analysis show that in both the EMS and the Eurozone during crises periods, the movements of the interest rate spreads tend to be dominated by self-fulfilling market sentiments that lead to deviations of the spreads from their underlying fundamentals.

In another paper, De Grauwe (2016) applies the theory of optimal currency area to attempt to answer the question of whether the economic conditions for a successful monetary union are satisfied in East-Asia. He looked at the conditions put forward by the theory of the OCA and attempt to find out if East-Asia appears to be as much an optimal currency area as the Eurozone. Despite the feasibility of East Asia establishing a monetary union, the lack of supranational institutions in Asia to act independently is a major obstacle. Accordingly, monetary union requires very intrusive political unification and that the recent crisis of the Eurozone has once more put on the debate about the sustainability of the Eurozone. According to De Grauwe (2016), Asia will not benefit any time soon from a common currency because of lack of political unification and the region will have to live with increasing fluctuation of the exchange rates.

Rose (2000) estimates the effect a common currency has on bilateral trade flow applying the gravity equation. The goal is to assess the effects of exchange rate volatility and currency unions on international trade. He uses a large cross-country panel data set from 1970 to 1990 and including 86 countries, his findings reveal that RTAs using the same currency tend to trade three times more than those with multiple currencies. His paper is one of the first to study the effect of a common currency on intra-regional trade flow. Although Rose's estimates have been the subject of criticism, they have laid the foundation for the study of the relationship between a common currency and intra-regional trade. Trade blocs that adopt a common currency will go a long way to eliminate volatility caused by fluctuation in exchange rates. This will reduce trade costs and will enhance intra-regional trade (Cieřlik, Michałek & Mycielski, 2012).

Frankel and Rose (2000) argue that common currency union can lead to substantial stimulus to trade by promoting bilateral trade. Their theoretical model exhibits no clear evidence of trade diversion of trade away from non-members created by the formation of a currency union. Their study paid particular attention to the importance of geography in the formation of a currency union as countries that share the same border tend to naturally trade with each other. The authors use economic and geographic panel data for over 200 countries with observations from almost 8,000 country-pair at five-year intervals from 1970 through 1995. Applying an augmented gravity model and controlling for common language, land border and membership in a free trade area, the authors find that currency union boosts total trade and that the formation of a currency union can triple trade flow among member states. In a similar study, Frankel and Rose (2002) use meta-analysis to explain the effect of common currency on trade. Their results

show that trading partners using the same currency realise a substantial increase in trade flow and this increase can vary from 30% to 90%.

In the same vein, Fotopoulos and Psallidas (2009) use the difference-in-difference estimation technique and the gravity model to quantify the increase in trade for countries that adopted the Euro. Using data from 1995 to 2007, their approach compares the experiences of countries that adopted the Euro with the experiences of those that did not adopt the Euro. The results from the analysis shows that the Euro has a positive effect on the bilateral trade of the European countries irrespective of the methods of two estimation techniques used. But the magnitude of the results from the difference-in-difference technique is different from that of the gravity model. The results also show no evidence of trade diversion.

In another paper, Giavazzi and Tabellini (2005) empirically analyse the effects of liberalizations on economic performance, on macroeconomic policies and on structural policies. Using a difference-indifference estimation and using data from a sample of 140 countries, over the period 1960-2000. The conclusion drawn from the study shows that countries tend to do really well in terms of growth, investment, trade volume and macro policies when they first liberalize their economy. Moreover, when these countries tend to make the transition to a democracy faster than those that adopt the two reforms in the reverse order. This finding can be interpreted in two alternative and non-mutually exclusive ways. The authors ascertain that the positive feedback between economic and political liberalizations could run in both directions, and that it is difficult to establish a precise direction of causality between economic and political reforms.

Looking closely at the CFA franc region, Bangake and Eggoh (2009) assess the impact of currency unions in the CFA franc zones on intra-regional trade. The authors use aggregate data on trade flow from 1980-2005 and apply the panel techniques to estimate a gravity model of trade. Their aim is to explore whether the two existing CFA franc zones in West and Central Africa have a measurable intra-regional trade. The results from their analysis indicate that members of West African CFA franc zone trade more among themselves than those in the CEMAC region.

To find out if common currency in the franc CFA zones and the Caribbean intensifies economic integration among member states, Fielding and Shields (2005) consider four key indicators: trade intensity, volatility in the real exchange rate, domestic prices and real GDP. Their results

show a positive relationship between common currency and bilateral trade. Umulisa (2016) applies the Tobit and OLS gravity models to show that common currency does not significantly affect bilateral trade among trading partners in Africa. His study shows that variables such as the GDP of member states, distance, deeper economic integration and common border are strong determinants of intra-regional trade.

Carrere (2004) applies the Hausman-Taylor (1981) method of estimation, using data from 1962 to 1996 to estimate the level of trade creation in the CEMAC region. Her results show that the CEMAC regional trade bloc has not significantly led to intra-trade creation, although there is some evidence of increased trade flow. Applying the gravity model technique to determine the level of trade creation and trade diversion in the CEMAC region, with trade data spanning from 1990 to 1993 and from 1995 to 2000, Gbetnkom (2008) shows that the GDP growth rate of member states plays a significant role in promoting bilateral trade flow.

In comparing features of the CFA franc area with the Eurozone, Zhao and Kim (2009) attempt to model national outputs as determined by global, regional, and country-specific shocks using the structural vector auto-regression method. They find that country-specific shocks play a very important factor in determining domestic outputs of members of the CFA Franc zone while in the Eurozone, regional shocks are seen to be more important. This is why in the CEMAC customs union, member states are structurally different from each other and therefore are more likely to be negatively affected by asymmetric shocks.

Ntembe and Tawah (2012) use the gravity model to investigate the determinants of bilateral trade between CEMAC economies and their major trading partners. The authors use panel data to control for individual heterogeneity of individual countries in the region to find out the extent to which monetary integration contributes to the expansion of bilateral trade. The results show the common border, distance, GDP, common language and real exchange rate variables are important in explaining bilateral trade in the CEMAC region.

Bayoumi and Ostry (1997) found that the CFA franc has not given the franc zone any significant advantage over other sub-Saharan countries that do not use the CFA franc. The authors also found that intra-regional trade among the CFA countries is not significantly different from that of other sub-Saharan countries. CFA franc economies used to trade more with France mainly as a result of the convertibility of the CFA franc to the French franc at fixed parity creating trade diversion. This is because a substantial part of trade flows would probably

be diverted towards other countries if that arrangement did not exist. Over the past two decades the pattern of trade flows in the CFA franc zones has dramatically changed from Franc and other EU countries being the number one trading partners to China and India.

The above analysis shows how the literature on monetary union has been widely explored since the 1960s, but focus has been paid mostly the Eurozone and how other regions can learn or have learned from the EU. Numerous examples from East Asia are also given with limited examples in line with the proposed theme of this study are given. Indeed, none of the studies on CEMAC customs union paid attention to the nonlinear relationship between common currency and intra-regional trade, and none seem to have apply a quasi-experiment to study the differential effect of a policy change or treatment on a 'treatment group' versus a 'control group. With the French franc no longer in existence, and the CFA franc pegged to the Euro, the question that arises is “what role is the common currency playing to accommodate all these changes in the pattern of trade in CEMAC customs union in particular?” The section on methodology will throw more light on the question.

3.4.2 Theoretical framework

3.4.2.1 Common currency and intra-regional trade

Throughout the past century, international trade has gone through several stages of development. Recently, there has been a surge of regional integration across the globe as distance and borders no longer play distinguishing roles in cross border trade. This surge has led to a wide range of theories, models and different research methods to estimate the rationale of regionalism. International trade is presumed to be costlier than domestic trade. There are additional costs from tariff and non-tariff barriers imposed by governments of the countries involved in cross border trade (Nawaz, Aziz & Zaman, 2014). Monetary integration goes a long way in reducing such barriers with the expectation that the process would lead to trade creation that enhances the welfare of both domestic consumers and producers.

Early trade theories were used to analyse trade flow in different capacities. One of the main problems with early theories was that they focused mainly on interregional trade. Very little was said about intra-regional trade (Bergstrand & Egger, 2006:433). These theories included, but were not limited to, the Heckscher-Ohlin (HO) and the Ricardian models. However, these two trade models explained different components of trade volume and had gained theoretical

support in the past. The models have received very little empirical success due to their poor empirical content (Costinot, Donaldson & Komunjer, 2012:606). Early analysis of the Ricardian model did not consider geography and distance as important factors determining the pattern of international trade.

The HO assumed a world where there are two countries, each endowed with a factor of production (land and labour). In this model, trade flow between two countries is not affected by the size of the country. Each country would produce the goods that required the cheapest factors of production. Other goods needed could be obtained from countries with lower opportunity costs in production (James, 1993). The model is also referred to as factor-proportion theory. It shows how the level of international trade is dependent on differences in factor endowments between countries.

Since its development by the two Swedish Economists, Eli Heckscher and Bertil Ohlin, the theory has been the subject of a wide range of empirical testing. The HO model has been used to test the North-South trade and the case of missing trade. Krugman and Obstfeld (2006) show how the HO model is too limited in scope in predicting other areas of trade. Success of the HO model remains vital in understanding the effects of income distribution on trade.

When a group of countries decides to form a regional trade agreement, for example a customs union, member states choose a common external tariff with the rest of the world. Following Feenstra's (2004) theoretical model, if member states in a customs union are denoted by $i = 1, \dots, C$. Before the union, countries in the trade bloc have tariff equal t^{i0} . Let p^{*0} denote the world prices, and m^{i0} is the total flow of imports of country i and $x^*(p^{*0})$ denotes the net export vector from outside the region. Taking into consideration the summation of total imports from within the customs union, the equilibrium condition is given as:

$$\sum_{i=1}^C m^{i0} = x^*(p^{*0}) \quad (3.1)$$

After the formation of the customs union, a unified tariff (t^1) is applied. This implies that zero tariff applies to goods bought within the customs union. Also, let m^{i1} denote imports of country i .

$$\text{Therefore, } \sum_{i=1}^C m^{i1} = x^*(p^{*0}) \quad (3.2)$$

The prices p^{*0} and total exports from outside the customs union $x^*(p^{*0})$ remain constant due to agreement from the customs union that the rest of the world is not affected by the agreement. According to Feenstra (2004), the question to ask is whether the gain from the formation of the customs union will be extended to member states. The theoretical gain depends on many factors. Evidence shows that there are welfare-improving customs unions and trade diversion customs unions.

A common currency is believed to reduce transaction costs and therefore increase economic activities by promoting the exchange of goods and services (Costa-i-Font, 2011). The theoretical literature on monetary unions supports the view that common currency increases regional trade. Micco, Stein and Ordóñez (2003) identify three transmission mechanisms in which a common currency can affect trade. Firstly, volatility in nominal exchange rate is non-existent and it reduces the uncertainty surrounding cross border trade. Although it is possible to hedge the exchange rate, it does not come cheap as cost is involved. Secondly, a common currency enables member states to get rid of the costs involved in exchanging national currencies when trading across national borders. Thirdly, member states enjoy long term benefits through increased market transparency, enabling firms in the monetary union to adequately compete with each other. It can even strengthen the value of the currency, enabling some of the weaker states to hedge exchange rate risks in their transaction costs with countries that are not registered members of the common currency union.

Using the North American Free Trade Area (NAFTA) as a case, evidence from empirical literature suggests that trade between Canada and the United States is smaller than trade between two states in the USA. According to Kenen (2003), the difference is not due to tariff and transport costs or differences in size. The difference is as a result of the currencies involved in the exchange. When each country uses its own currency for international trade, calculating total costs and setting the right price of the goods and services can be difficult and inefficient. Kenen (2003) believes that when cross border trade involves more than one currency, there is a possibility of national bias when making strategic decisions as to where innovation and production can take place. Countries with individual currencies will have limited access to factor endowment and they will have to depend on foreign trade to source them. If these

countries do adopt a common currency and increase the level of integration, member states can have more access to other countries' resources. That is why larger countries have a greater prospect of growing faster in trade than smaller countries (Frankel & Rose, 2000). A common currency can also turn the regional bloc into a unified market if there is high level of intra-regional trade among member states.

Reduction in trade costs encourages countries to trade with each other. Producers are encouraged to produce more. The new trade theory (NTT) goes a long way to propagate this view. NTT brings to light the importance of increasing returns to scale, imperfect substitution to trade and the importance of endogenous technology. According to Frankel and Rose (2000), and in line with the NTT, countries that reduce barriers to trade, trade more with other countries. Through interaction with trading partners, new ideas are exchanged, *ceteris paribus* increasing the level of innovation.

A persistent feature of the common currency debate is the conviction that most trade happens with countries in geographic proximity. The next section shows what role gravity plays in the literature of international trade by looking at the size of bilateral trade flows between any two countries approximated by a law called the gravity equation. The emergence of the gravity equation was as a result of the failure of the Ricardian and HO models to provide the role of country size in the structure of bilateral trade flows.

3.4.2.2. The gravity model and common currency

The common feature of the Heckscher-Ohlin (HO) model and monopolistic model is that there is complete specialisation in the production of differentiated products. The pattern of such trade can be described by the gravity model (Feenstra, 2004). The gravity model has existed for some time and Jan Tinbergen was one of the first to use this model to analyse the flow of international trade in 1962. The gravity model of trade was inspired by Newton's gravitational force theory, which stipulates that volume of trade between two countries is proportional to the size and distance of the countries in question. The model has been used to analyse other areas of interest including the flow of migration and foreign direct investment (Martinez-Zarzoso & Nowak-Lehmann, 2003:295). According to Vandekamp (1997), the gravity model helps in anomalies in trade and has achieved both empirical and theoretical successes in explaining various types of regional and international trade flow including international capital flow and exchange rate policies.

The gravity model has gone through different stages of development as an empirical model since its establishment in the 1960s. The model was long criticised until late in the 1990s when it gained both theoretical and empirical success. According to Frankel (1997:49), the success of the gravity model in explaining bilateral trade flow is due to its empirical success in predicting trade flow, strong theoretical background supported by modern trade theories and a growing interest among economists in analysing international trade flow. The gravity model has been backed by several theoretical models (Stark, 2000; Canavari, 2009) to explain the relationship between a common currency and the pattern of trade flow. These theories include trade costs, national technological differences, product differentiation and monopolistic competition in trade.

In deriving a theoretical gravity equation and assuming the presence of border effects such as transport costs and tariffs, Feenstra (2004) adopted the Constant Elasticity of Substitution (CES) utility function. According to Feenstra (2004), the utility function is given by:

$$U^j = \sum_{i=1}^C \sum_{k=1}^{N^i} (c_k^{ij})^{(\sigma-1)/\sigma} \quad (3.3)$$

Where c_k^{ij} is the value of exports from country i to country j of good k .

In this model each country produces a variety of unique products. Total exports from i to j is similar to the total consumption of good k to country j . Another assumption is that all products exported by country i sell for the same price (p^{ij}) in country j . With prices p^{ij} equal across varieties of goods, the total consumption in country j is also equal across products $k = 1, \dots, N^i$ sold by country i , then $c_k^{ij} = c^{ij}$.

Given this assumption, the utility function can be modified as follows:

$$U^j = \sum_{i=1}^C N^i (c^{ij})^{(\sigma-1)/\sigma} \quad (3.4)$$

Where c^{ij} is the consumption of any product by country j from country i . Feenstra (2004) shows that the representative consumer maximises equation (3.4) subject to budget constraint as follows:

$$Y^j = \sum_{i=1}^C N^i p^{ij} c^{ij}, \quad (3.5)$$

Y^j = aggregate expenditure (income) in country j .

To derive the demand for each product c^{ij} we can maximise equation (3.4) subject to equation (3.5) as follows:

$$c^{ij} = (p^{ij} / P^j)^{-\sigma} (Y^j / P^j) \quad (3.6)$$

P^j is country j 's overall price index, defined as;

$$P^j = \left(\sum_{i=1}^C N^i (p^{ij})^{(1/(1-\sigma))} \right) \quad (3.7)$$

From equation (3.6) and (3.7), we can derive the total value of exports from country i to j , as follows:

$$X^{ij} = N^i Y^j \left(\frac{p^{ij}}{P^j} \right)^{1-\sigma} \quad (3.8)$$

The above expression gives a simple derivation of the gravity model, where bilateral trade in exports from country i to country j are proportional to the products of the two countries' GDP (Feenstra, 2004). The sizes of both countries are measured in terms of GDP. Trade between the two countries tends to diminish with distance between the countries in question (Krugman & Obstfeld, 2006).

Krugman and Obstfeld (2006) also reiterate how the gravity model is ideal in assessing the impact of the formation of regional integration on international trade flow. According to the model, member states of successful trading agreements are likely to trade more among themselves and the monetary union further enhances trade among member states. Recent studies have shown that the gravity model suffers from two main fundamental flaws. These problems stem from the usage of a logarithm in linear form to solve the problems of bias estimates due to misspecification and the presence of missing data (Gómez-herrera, 2013). The presence of missing data or zero flows have normally been dealt in the gravity equation by ignoring the zeroes. But Linders and De Groot (2006) shows that ignoring the zero flows is at odds with proper econometric modelling and should not be ignored. The authors suggest the use of sample selection model, as it allows potential trade between trading partners and zero flows to be explained jointly. Applying the fixed effect model of the gravity equation also helps in correcting the misspecification bias (Linders & De Groot, 2006).

The analysis given in section 3.4.2 shows that the formation of a custom union can be welfare enhancing or welfare diversion. Given the different institution changes that can take place in a trade bloc such as establishing a common currency by member states can have a profound

impact on the pattern of trade flow among member states and trade between countries in the trade bloc and the rest of the world. In this particular situation, the focus is to establish the link between common currency and the pattern of trade flow in the CEMAC region before and after the institution of the policy changes that took place in the mid-1990s.

With the rapid change in technology, the global economic structure is creating immense transformations in the way nations and multinational corporations organize production and distribution of goods and services. The application of sophisticated technologies has increased the rate of technical progress which can be expected to reduce transport costs over time, yet most studies of bilateral trade based on the gravity model find distance effects to be increasing rather than decreasing. A voluminous literature has studied the impact and determinants of bilateral trade flows using the gravity model, according to which trade increases with economic mass and decreases with distance. A puzzling feature of this research is that, despite the apparent technical progress in the transport industry, distance appears to be increasing rather than decreasing therefore acting as a deterrent to international trade²⁶. Coe et al. (2007) and Bleaney and Neaves (2013) analysis of the true impact of transport cost to international trade show that transport-cost effects in international trade are truly declining.

Given the above challenges with gravity model, this chapter adopts alternative estimation techniques that allow us to compare the difference in outcomes after and before the intervention in the CEMAC Customs union in 1994. We also adopt techniques that have the potential to minimize biases into the analysis of intra-regional trade flow that may result from assuming linearity and stationarity.

3.5 Research Methodology

This section describes the methodology used to analyse the data and it also explains the types of data and how they were collected. Two different estimation techniques as indicated in section 3.4 are used. The first is the sample split model which is used to test the hypothesis as to whether the institution of the policy change indeed creates a regime on the bilateral trade flow in the CEMAC region. The second method which is the difference-in-difference estimation technique is applied as a test of sensitivity of the variables used as well as to test

²⁶ See Berthelon and Freund (2008) and Brun et al., (2005)

whether the results from the difference-in-difference model complement the Threshold Autoregressive model.

3.5.1 Econometric specifications

3.5.1.1 Sample split threshold model

Most studies in empirical econometric modelling normally assume that the relationship between variables are linear. In recent years, arguments have been presented based on irregularities observed in economic and financial time series. Due to these irregularities, it is suggested that nonlinear specification maybe a more realistic representation of data generation processes. In the following analysis, we cannot ignore the existence of a possible non-linear relationship of the effect of common currency on intra-regional trade given the span of time. In addition, the nonlinear models provide a better fit than linear models, and are more appropriate when there are structural breaks and regime changes (Ajmi, Balcilar & Gupta, 2015). One of the best way to do this is to adopt the sample splitting technique. In the literature of nonlinearity, sample splitting techniques play an important role in semi-parametric and nonparametric models by constructing estimates with prescribed influence functions when the observations are independent and identically distributed (Schick, 2001). One contribution to existing literature from this study is thus in the use of sample splitting and threshold estimation developed by Hansen (1996; 1999; 2000).

This chapter examines an alternative way by which common currency influences bilateral trade flow. Following Hansen (1996) and more recently Hansen (2000), we employ a data-sorting method which allows the data to endogenously select regimes using different variables. Sample splitting models have wide application in economics. Most estimation methods are confined to regression models, which require that all right-hand-side variables are exogenous (Caner & Hansen, 2004). The model applied in this section can be viewed as a generalization of the simple threshold regression framework of Hansen (1996) and Hansen (2000) to allow for the indigeneity of the threshold variable and regime specific heteroskedasticity. Hansen's method can test the statistical significance of regimes selected by the data (Papageorgiou, 2002). It is important to note that Hansen (2000) threshold parameters in a threshold regression can be estimated using least squares strategy.

Sample splitting methods has its own limitations. One major problem that has been identified so far in the literature is the sequential nature of the splitting process. In a sample split model, as the number of split increases, the choices of threshold variables and split values made in initial sample splits are never revised. The implication is that any mistake made at the earlier stages of the sampling process will be carried forward into subsequent splits. The outcome will then lead to unstable regimes classification (Kourtellis et al, 2007). In this particular case, the test is for a single threshold, and hopefully this avoids the problems of multiple threshold values and split regimes.

According to Hansen (2000), the equation is formally stated as follows:

$$y_i = \phi_1' x_i + e_i, \quad q_i \leq \gamma, \quad (3.9)$$

$$y_i = \phi_2' x_i + e_i \quad q_i > \gamma, \quad (3.10)$$

Given that q_i is the threshold variable. This variable enables the equation to be split into two groups called regimes. e_i is a regression error.

Given that the observed sample is $\{y_i, x_i, q_i\}_{i=1}^n$. According to Hansen (2000), y_i and q_i are real-valued and x_i is an m -vector.

Depending on the threshold value of q_i , equation (3.9) and (3.10) allows the regression parameters to differ and q_i given as a continuous distribution. In order to write the model in a single equation, first of all, the dummy variable is given as $d_i(\gamma) = I\{q_i \leq \gamma\}$

$I\{\bullet\}$ is the indicator function. If $x_i(\gamma) = x_i d_i(\gamma)$, equation (3.9) and (3.10) can be merged to form:

$$y_i = \phi' x_i + \delta_n' x(\gamma) + e_i \quad (3.11)$$

Where $\phi = \phi_2$. To express the model in matrix notion, Hansen (2000) define the $n \times 1$ vectors y and e by stacking the variables y_i and e_i , and the $n \times m$ matrices X and X_γ by stacking the vectors x_i and $x_i(\gamma)$. Given the above, equation (3.11) can be written as follows:

$$Y = X\theta + X_\gamma\delta_n + e. \quad (3.12)$$

θ , δ_n , γ are regression parameters estimated using the least square technique. Wang (2015) shows that the estimated threshold value γ is the value that minimises the residual sum of square (RSS). According to Ibrahim and Alagidede (2018), the least squares (LS) estimators (θ , δ and γ) minimises the sum of squared errors of equation (3.12) which is define as follows:

$$S_n(\theta, \delta, \gamma) = (Y - X\theta - X_\gamma\delta)'(Y - X\theta - X_\gamma\delta) \quad (3.13)$$

Given equation (3.13), the threshold value γ is restricted to a bounded set $\left[\gamma, \bar{\gamma}\right] = \psi$.

The LS estimators (θ , δ and γ) are best estimated applying the concentration method where γ is the value that minimises $S_n(\gamma)$. It should be noted that $S_n(\gamma)$ takes on less than n distinct values and can be estimated as follows:

$$\gamma = \underbrace{\arg \min}_{\gamma \in \psi} S_n(\gamma)$$

3.5.1.1.1 Testing for the presence of a threshold

To assess the effects of the statistical significance of the proposed model, a bootstrap method is applied to test for the presence of threshold. The null and alternative hypotheses of the threshold model is given as follows:

$H_o : \gamma = \gamma_0$ is the null hypothesis of no threshold and

$H_a : \gamma_1 \neq \gamma_0$ is the alternative hypothesis of the presence of threshold.

Given that $\psi_n = \psi \cap \{\chi_1\chi_2, \dots, \chi_n\}$ while the slope estimators can be computed as $\theta = \hat{\theta}(\hat{\gamma})$, and $\delta = \hat{\delta}(\hat{\gamma})$. The hypothesis $H_o : \gamma = \gamma_0$ can be tested using the likelihood ratio (LR) test of Hansen (2000) as follows:

$$LR_n(\gamma) = n \frac{S_n(\gamma) - S_n(\hat{\gamma})}{S_n(\hat{\gamma})} \quad (3.14)$$

The likelihood ratio test of H_o is rejected for large values of $LR_n(\gamma_0)$. According to Ibrahim and Alagidede (2018), the reliability of γ depends on where precisely it lies within the

confidence interval. The confidence intervals is constructed using an inversion Wald or t statistics. According to Hansen (2000), The Wald statistics can demonstrate very poor finite sample behaviour in situation where the asymptotic sampling distributions depend on unknown parameters. Accordingly, one solution that Hansen (2000) developed is to construct an asymptotic confidence regions based on the likelihood ratio statistics.

Since this technique is applied to a balanced panel data, Hansen (1996) suggests that the following bootstrap procedure should be followed. The independent variables X_{it} and the threshold variable q_{it} are treated as given and at the same time making sure their values are fixed in repeated bootstrap samples. The procedure is as follows:

1. Obtain the residual $\hat{e}_{it}^*$ by fitting the model under alternative hypothesis (H_a).
2. Obtain a new residual v_{it}^* , by making a cluster resampling $\hat{e}_{it}^*$ with replacement.
3. New series can then be generated under the H_a data generating process $y_{it}^* = X_{it}^* \beta + v_{it}^*$ where β can take arbitrary values.
4. Calculate the bootstrap values of the likelihood ratio statistics using $y_{it}^* = X_{it}^* \beta + v_{it}^*$ by fitting the model under H_0 and H_a .
5. Next, steps (1-4) are repeated a large number of times to calculate the percentage of draws for which the stimulated statistic under the null hypothesis exceeded the actual statistics. The one obtained from the original sample is the bootstrapping p – value and the null hypothesis can be rejected if the p – value is too small compared to the desired critical values of one percent, five percent and 10 percent.

3.5.1.2 Difference-in-difference estimator: panel approach

Difference-in-difference (diff-in-diff) analysis is a quasi-experimental method that normally considers two periods called the baseline and follow up periods. Under this approach, we are interested to know the effects of a policy change. This policy change is called the treatment and the basic assumption is that if common currency leads to increase in intra-regional trade flows, then the franc CFA adopted by the CEMAC member states in 1994 should have affected the level of intra-regional trade flows. Our sample is divided into two groups. The first is CEMAC member states that adopted the common currency (treatment group). The second

group is made up of countries that are not members of the CEMAC trade bloc, but belong to a larger trade bloc with similar characteristics that did not adopt the common currency (control group).

Following Giavazzi and Tabellini's (2005) methods of estimation, the diff-in-diff method estimates the average change in output for the treatment group that was exposed to the treatment. To do this, Zuccardi Huertas (2013) proposes two main steps:

Step 1: The average output value is calculated before and after the treatment. This will remove biases that might have resulted from unobserved time phenomena and permanent time trends affecting both groups.

Step 2: The difference between the treated and the control groups is calculated. This step is vital as it removes biases caused by unobserved individual phenomena that are not related with the treatment.

To meet this goal, the diff-in-diff method should match the trade effect among the CEMAC member states before and after the institution of the common currency in 1994 with other countries in Central Africa who are members of a larger trade bloc called Economic Community of Central African States (ECCAS). The ECCAS countries are non-members of CEMAC, which we called the control group. The idea is to collect the same data for the control group that did not institute the common currency and compare the pattern of intra-regional trade in CEMAC before and after 1994 and intra-regional for ECCAS before and after 1994. The difference between intra-regional trade flows before and after 1994 for CEMAC and ECCAS is calculated.

In the analysis of the impact of the adoption of the franc CFA on CEMAC intra-regional trade, intra-regional trade flows in country i in region s at time t is denoted by $\exp_{ist}$. In the potential outcome notation, $\exp_{0ist}$ is used as outcome in period t under no treatment (that is intra-regional trade flows in country i before the introduction of the common currency) and $\exp_{1ist}$ is outcome in period t under treatment (intra-regional trade flows after the introduction of the common currency).

In CEMAC, we see $\exp_{1ist}$ after 1994 and $\exp_{0ist}$ before 1994.

Assume that $E[\exp_{0ist}|s,t] = \gamma_2 + \lambda_t$

Where $s \in \{CEMAC, ECCAS\}$ and $t \in \{< 1994, \geq 1994\}$

And we assume that $E[\exp_{1ist} - \exp_{0ist}|s,t] = \delta$

Then, we can now rewrite our model as follows:

$$\exp_{ist} = \gamma_s + \lambda_t + \delta D_{st} + \varepsilon_{ist} \quad (3.15)$$

Where D_{st} is a common currency dummy variable²⁷ for CEMAC member states and can be expanded as follows:

$$D = \begin{cases} 1 & \text{if individual country is treated} \\ 0 & \text{if individual country is a control} \end{cases}$$

And $E[\varepsilon_{ist}|s,t] = 0$

In this case, ECCAS time-difference is given as

$$\begin{aligned} & E[\exp_{ist}|s = ECCAS, t \geq 1994] - E[\exp_{ist}|s = ECCAS, t < 1994] \\ &= (\gamma_{ECCAS} + \lambda_{\geq 1994}) - (\gamma_{ECCAS} + \lambda_{< 1994}) = \lambda_{\geq 1994} - \lambda_{< 1994} \end{aligned}$$

And the CEMAC time-difference is written as follows:

$$\begin{aligned} &= E[\exp_{ist}|s = CEMAC, t \geq 1994] - E[\exp_{ist}|s = CEMAC, t < 1994] \\ &= (\gamma_{CEMAC} + \lambda_{\geq 1994} + \delta) - (\gamma_{CEMAC} + \lambda_{< 1994}) = \lambda_{\geq 1994} - \lambda_{< 1994} + \delta \end{aligned}$$

Combining the above two equations to give the population diff-in-diff, we get

$$\begin{aligned} & \{E[\exp_{ist}|s = CEMAC, t \geq 1994] - E[\exp_{ist}|s = CEMAC, t < 1994]\} \\ & - \{E[\exp_{ist}|s = ECCAS, t \geq 1994] - E[\exp_{ist}|s = ECCAS, t < 1994]\} \end{aligned}$$

²⁷ $D_{st} = 1$ in CEMAC from 1994, and 0 otherwise

$$=(\lambda_{\geq 1994} - \lambda_{< 1994} + \delta) - (\lambda_{\geq 1994} - \lambda_{< 1994}) = \delta \quad (3.16)$$

This is estimated using the sample analogue of the population mean

Assume a fixed effects model for $\exp_{it}$, a typical regression model estimated is given as:

$$\ln \exp_{it} = \alpha_0 \text{cemdummy}_{it} + X'\delta + a_i + a_t + \mu_{it} \quad (3.17)$$

Where $\ln \exp$ is the log of exports, cemdummy is a dummy variable that is equal to 1 after the region adopted the common currency and 0 otherwise. X is a vector of control variables and these variables include labour force, GDP, trade openness and foreign direct investment. a_i is a set of country fixed effects and it controls for factors that are persistent in the region such as social norms, political and economic factors that affect intra-regional trade flow (Conti, 2014). While a_t is a set of time dummies that captures and takes into consideration the common macroeconomic shocks. μ_{it} is the error term.

The above econometric specification is an example of panel regression using within-country variation. The control group is a set of non CEMAC member states that are also members of the Economic Community of Central African States. These countries include Angola, Burundi, Democratic Republic of Congo and Sao Tome and Principe. We decided to include these countries based on their similarities with CEMAC member states and the fact that these countries are members of ECCAS with countries of CEMAC customs union.

The inclusion of country time trends in a diff-in-diff model is important as it accounts for the different level of growth between member states of the control and treatment groups.

3.5.2 Data sources

A panel of the ten countries (Angola, Burundi, Cameroon, Central African Republic, Chad, Republic of Congo, Democratic Republic of Congo, Equatorial Guinea, Gabon and Sao Tome and Principe) is considered over the period of 36 years, from 1981 to 2017 due to availability of data. Data on some of the key variables such as inflation and foreign direct investment were not available for some of the member states. The control variables used in our trade analysis include the following:

1. Total merchandise trade (X_{ij}): The merchandise trade is composed of imports and exports over the given period of time. The value of merchandise trade flow is normally expressed in nominal dollar prices. Main source of data for exports and imports flows are derived from the United Nations Conference for Trade and Industry trade (UNCTAD) and WTO Statistics databases.
2. Gross Domestic Products (Y_i). The real GDP or GDP per capita of both the exporter and importer are used as a proxy to determine the level of economic growth. In this section, the growth rate in GDP and GDP per capita are used in the analysis. The dataset is from UNCTAD and WTO Statistics databases.
3. Size of a country (pop_i) and labour force (lp): According to Frankel (1997:57), the size of a country can be measured in two main ways- the total output of a country (GNP) and the size of the population. The coefficient for population tends to be negative assuming that small countries tend to trade more with others since they find it difficult to enjoy economies of scale comparable to countries with large populations. Although these large countries trade more in absolute terms, they tend to find more markets within the border of their country. As a result, total cross border trade is less in percentage of total GDP. The total labour force include agriculture labour force is measured in millions and collected annually. The data on population and labour force are derived from UNCTAD Statistics database.
4. Foreign direct investment (FDI): This is considered as the net flow of the transfer of skilled personnel, marketing skills, financial and intangible assets such as technologies and the net inflow of fixed assets. The data is derived from the World Bank Development Indicators.
5. Trade openness ($trade_open$): This corresponds to the share of trade to total gross domestic product. The share of trade is the summation of the value of total exports plus total imports. We expect a positive relationship between trade openness and net exports.
6. Dummy variables for common currency. It takes the value of one if trading partners adopted the common currency and zero otherwise.

3.6 Empirical Results

3.6.1 Sample split results

The model is design for a balanced panel and consider all six member states of CEMAC which are observed for the periods 1981 to 2017. The value of export is used as the threshold variable. There are additional independent variables (GDP, GDP per capita, CEMAC labour force, inflow of FDI, population and the level of trade openness) in the regression.

Table 3.1 shows the summary statistics of the key variables of interest used in the analysis. The variables include value of bilateral exports (exp), bilateral imports (imps), GDP (gdp_cu) and GDP per capita (gdppc_c) growth rates, the rate of foreign direct investment (dfi_rate), population growth rate (pop_rate) and a dummy variable for common currency (cemdummy). The table also shows the minimum and maximum values with the 25, 50 and 75 percentiles.

Table 3.1 Summary statistics

variable	Min	p25	p50	p75	max
year	1981	1990	1999	2008	2017
exp	11.287	188	2000.18	4900	44623.59
imp	17.521	317	1103.14	3106.941	29242.85
gdppc_gr	-36.8299	-2.58447	0.769209	3.2522	87.86341
gdp_gr	-36.7	0.630473	3.577964	6.12079	95.26215
fdi	-793.872	5.12073	73.2851	469.506	6215.291
pop	270.063	1536.411	4275.8	13133.59	52166.38
lf	85.503	622.9271	1877.616	5232.367	2.12E+07
trade_open	-2408.81	-52.177	404.237	2001.948	25281.74
cem	0	0	1	1	1

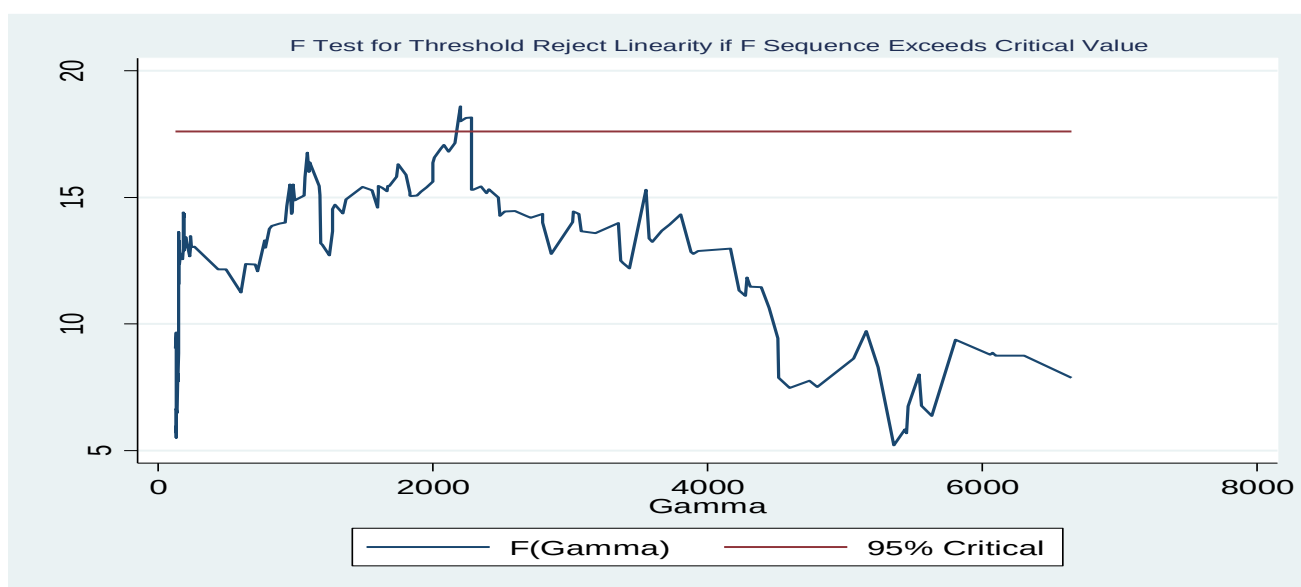
Source: Author's computation

3.6.1.1 Test of threshold for bilateral exports and imports

It is important to carry a test to determine the number of thresholds in the regression. That is, the threshold γ under the null hypothesis of no threshold effect. The estimation is done by least square, allowing one, two or three thresholds. A bootstrap is used to compute the p -value. Using 300 bootstrap replication since the sample size is small, the p -value for the threshold model using the value of intra-regional exports is highly significant at 1% statistical level. This

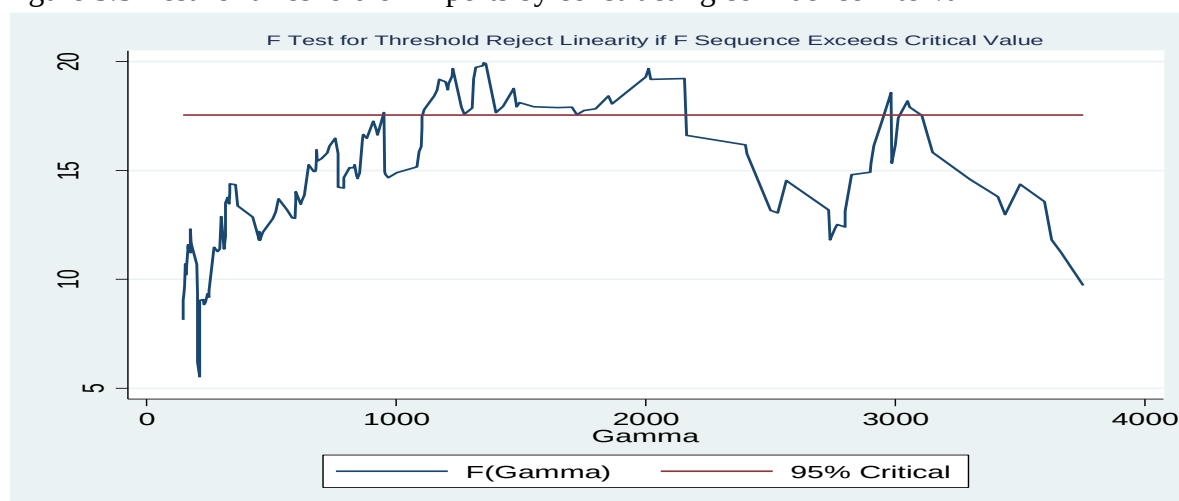
suggests a sample split indicating the presence of a threshold²⁸. This is shown in figure 3.2 where the asymptotic 95 percent critical value from the graph given the LR (γ) crosses the red horizontal line can be read off. The red line denoted the critical value at the 95% confidence level.

Figure 3.2 Test for threshold by constructing confidence interval²⁹



Source: Author's computation

Figure 3.3 Test for threshold of imports by constructing confidence interval



Source: Author's computation

²⁸ Threshold variable: Exports value

²⁹Hansen (2000) Stata command of threshold test was used to test for the threshold in export value

Figure 3.3 shows a situation where the graph of the likelihood ratio as a function of the threshold in output. The graph shows evidence multiple thresholds but because of the considerable uncertainty about the value of the threshold. The attention is now placed on figure 3.2 where it provides more information with regard to the certainty of the threshold value.

Table 3.2 Threshold estimator (level = 95)

Model	Threshold	Lower	Upper
Th-1	28.5714	22.8264	29.2089
Th-2	3.2787	1.455	3.3638
Th-3	31.6043	28.5515	32.1008

Threshold estimator (level = 95):

Source: Author's computation

In table 3.2, Th-1 denotes the estimator in a single-threshold model, while Th-2 denotes the estimator in a double threshold model and Th-3 indicates a three threshold model. The threshold of bilateral exports values is estimated at 28.5714 which lies within a confidence interval of approximately 23 and 29 percent.

Table 3.3 Threshold effect test (bootstrap = 300 300 300)

Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	9.45E+07	4.26E+05	47.42	0.0000	30.9374	36.7425	42.1412
Double	7.98E+07	3.60E+05	40.81	0.1600	58.9876	88.7437	141.892
Triple	7.01E+07	3.16E+05	30.87	0.5133	78.5954	97.2059	147.1451

Source: Author's computation

The test statistics for single, double and triple thresholds as well as their bootstrap p-values, are shown in table 3.3. The p-values are bootstrapped in order to examine the relevance of the sample split. The test for a single threshold is statistically significant at 1% with bootstrap p-values of 0.0000 while that of double and triple thresholds are not statistically significant with bootstrap p-values of 0.1600 and 0.5133.

Given the above information, we can conclude that there is strong evidence of a single sample split in the regression relationship. Next, the focus is shifted to the single threshold. The value of bilateral exports (exp) is trimmed off at five percent at both sides of the threshold to search for the threshold estimator. A grid of (400) is used to reduce the problem of computation error (Qunyong Wang, 2015).

Table 3.4: Fixed effect panel data and threshold regression estimates

Dependent Variable: Bilateral exports (exp)	Single threshold	Fixed effects panel regression (within estimates)	Single threshold SE adjusted for 7 clusters in ctry_pair
cem	-670*** (234)	-605** (238)	-670** (258)
gdp_gr	62.8 (110)	-236 (116)	62.8 (97.4)
gdppc_gr	-67.6 (113)	231 (172)	-67.6 (97.3)
fdi	.791*** (0.104)	1.09*** (0.163)	.791*** (0.136)
pop	.2*** (0.0294)	.379*** (0.0378)	.2*** (6.81)
lf	.00015*** (3.70)	.00025*** (5.40)	.00015*** (3.40)
trade_open	.862*** (0.0412)	1.43*** (0.0387)	.862*** (0.0483)
_cat#c.year			
0	46.3*** (14.1)		46.3* (20.4)
1	47.1*** (14)		47.1* (20.3)
2	49.2*** (14)		49.2* (20.4)
3	54.8*** (14)		54.8** (20.4)
_cons	-92753*** (28000)	-1050* (602)	-92753* (40000)
r2	0.977	0.938	0.977
r2_a	0.976	0.935	0.976
N	259	259	259

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: * significant at 10%; ** significant at 5%; ***significant at 1%

The coefficient of interest is the common currency variable. Table 3.4 shows that the effect of a common currency (cem) is statistically significant and negative at 5%, indicating a negative and non-linear relationship with CEMAC intra-regional trade in exports for the fixed effects panel regression (third column). In other words, the fact that the CEMAC customs union has been in existence since 1994, the CFA franc has not been able to lay the foundation necessary to increase intra-regional trade flows. Bilateral exports within the CEMAC region has been negatively affected as shown by the single threshold estimates and the fixed effects panel regression.

The coefficients of growth rates in GDP (gdp_gr) and GDP per capita (gdppc_gr) of CEMAC member states are not statistically significant and have not impacted the flow of bilateral trade in the region. The results from table 3.4 shows that bilateral trade has actually reduced as a percentage of GDP since 1994 as indicated by the negative coefficients of common currency for both the single threshold and fixed effects regressions. When the standard error is adjusted for the seven clusters³⁰, there is no change in the threshold results as shown in the fourth column of table 3.4. Also, the results show that the level of inward foreign direct investment (fdi) is positive and slightly significant, meaning FDI into the CEMAC region has contributed in promoting the region's exports. As shown in table 3.4, the coefficients of FDI from column 2, 3 and 4 are significant at 1%. Specifically, increase in FDI by one percentage point will increase bilateral exports by approximately 0.08% from the threshold estimates and by one percentage point from the fixed effects panel regression. When the standard error is adjusted for the six member states and CEMAC region as a whole as shown in column 4 from table 3.4, there is no effects in the regression. The trade openness (trade_open) variable is positive and highly significant as confirmed with previous studies. A large number of empirical studies are in favour of the positive contribution of trade openness to international trade. CEMAC population (pop) and labour force (lf) are both statistically significant, implying that member states' populations and those in the labour force have contributed to the region's intra-regional trade flow. On average, individual countries in the CEMAC customs union has not benefited from other member states through increased in bilateral trade since the creation of the common currency. When the whole region is considered, the outcome is still negative indicating the poor performance of the franc CFA to the region as a whole and individual CEMAC countries.

³⁰ The seven clusters include the six CEMAC countries and the region as a whole

3.6.2 Sensitivity analysis: results using difference-in-difference framework

The difference-in-difference results in table 3.5 and table 3.6 shows the different empirical estimations as in equation (3.17). Table 3.5 shows a panel of regression estimates where country fixed effects and year are controlled. The results in column 1 show that the common currency (cem_CFA) is also negative and significant at one percent. In other words, the correlation between the franc CFA and intra-regional trade in the CEMAC region is negative. When the robust clustered standard error is considered, the coefficients are still significant at 10 percent. This is shown in column 2. But when the natural logarithm of export in column 3 is applied, there is a fall in the standard error coefficients. The coefficients are still statistically significant and negative at one percent.

As a form of robust check, one lag and two leads of the common currency dummies are introduced. Introducing one lag and two leads takes into consideration the possibility of pre-trend in the data (Conti, 2014). This includes any anticipatory effects before the introduction of the common currency or economic shocks when the currency was instituted such as the devaluation of the franc CFA in 1994. This is shown in column 4 of table 3.5 where the effects are negligible although statistically significant. The lagged value is statistically significant at one percent level with negligible positive effects. When the normal standard error with no time trend effects is considered, the lagged effects become more statistically significant but the effects of the common currency coefficient (cem_CFA) becomes statistically insignificant as shown in column 5. This shows that using the standard robust cluster variance estimator makes the estimation more robust and reduces the level of misspecification and within-cluster correlation in the model.

Next, other covariates such as the level of gross domestic products (GDP), regional and member states labour force (lf), the net inflow of foreign direct investment (fdi) and level of trade openness (trade_open) are included in the regression. The results shown in column 6 in table 3.5 are statistically significant at one percent level. The GDP coefficient is positive while that of GDP per capita is negative but significant at five percent. The labour force, FDI and trade openness coefficients are all positive and significant at one percent. This implies there is a positive relationship between the CEMAC bilateral trade and labour force, FDI and trade openness. Adding more covariates and applying the robust clustered standard error shows that, there is no significant change in the magnitude for labour force as it becomes less significant.

In table 3.6, the difference-in-difference approach is applied. The coefficient ‘diff-in-diff’ is the differences-in-differences estimator. This is shown in column 1 in table 3.6 where the effect is significant at one percent with the treatment having a negative effect on CEMAC intra-regional trade flow. Column 1 of table 3.6 also shows the year’s effects and their significance. From 1994, the coefficients are negative and statistically significant at one percent. When other covariates are introduced as shown in column 2, the treatment is still negative but insignificant. Column 3 in table 3.6 shows a situation where the kernel propensity score matching difference-in-difference is applied but the magnitude of the results does not change much compared to that of column 1. The effect is still negative and highly significant at five percent.

So far the possibility that some or all of our variables are non-stationary has not been considered. Since the countries are heterogeneous in nature, and the datasets are assumed to be balanced, the Im, Pesaran and Shin (2003) test is ideal in estimating the panel unit root test. The test for non-stationarity of the dependent variable exports and other independent variables such as GDP, GDP per capita, FDI, labour force and trade openness are carried out. In this case, the variables contain unit roots and are all non-stationarity at level. This implies the null hypothesis of non-stationarity is accepted. When one lag and first difference is considered, the variables become stationary.

The test for cointegration is carried out using Westerlund (2007) panel cointegration test. The idea is to test for the presence of long run relationships among the integrated variables including the dummy variable for common currency with both a time series and cross sectional dimension (Persyn & Westerlund, 2008). The results in table 3.7 suggest we reject the hypothesis that the series are not cointegrated³¹.

³¹ We use xtwest command to test for cointegration as it takes into consideration optimal lag and lead lengths using the AIC.

Table 3.5 Panel regression results with year and country fixed effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	exp	Exp	lnexp	lnexp	lnexp	exp	exp
cem_CFA	-8,424*** (2,244)	-8,424* (3,885)	-0.528*** (0.123)	-0.484*** (0.119)	0.105 (0.158)	-360.5*** (138.4)	
gdp						0.386*** (0.0195)	
gdppc_c						-0.0783** (0.0359)	
lf						0.0869*** (0.0307)	
fdi						0.622*** (0.0787)	
trade_open						1.129*** (0.0236)	
t	994.8*** (119.4)	994.8* (453.0)	0.103*** (0.0221)	0.0926*** (0.0204)			
cem_lag1				0.0139*** (0.00340)	0.0472*** (0.00726)		
cem_lead1				0.00268** (0.00102)	0.0382*** (0.0102)		
cem_lead2				-0.00881** (0.00289)	-0.0152* (0.00869)		
1o.treated							-
1.time							12,028*** (1,965)
diff							-7,775*** (2,573)
Constant	-5,119*** (1,234)	-5,119 (5,170)	5.393*** (0.364)	-9.961 (11.31)	-133.5*** (19.07)	-4,046*** (285.0)	1,844* (977.5)
Observations	384	384	384	381	381	384	384
R-squared	0.229	0.229	0.477	0.478	0.390	0.992	0.106
Number of ctry_pair	12	12	12	12	12	12	12

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: * significant at 10%; ** significant at 5%; ***significant at 1%

Table 3.6: The difference-in-difference regression results

VARIABLES	(1) exp	(2) __exp	(3) __exp
.treated	-	60.06 (285.2)	9,837*** (1,745)
Time	26,919*** (4,709)	414.4 (272.2)	-14.73 (1,892)
diff-in-diff	-7,775*** (2,328)	-49.43 (354.0)	-5,584** (2,461)
Gdp		0.0973*** (0.0122)	
gdppc_c		-0.121*** (0.0314)	
Lf		-0.0285 (0.0200)	
Fdi		1.222*** (0.0871)	
trade_open		1.457***	
	(4,509)		
1990.year	766.5 (4,509)		
1991.year	549.8 (4,509)		
1992.year	531.2 (4,509)		
1993.year	539.4 (4,509)		
1994.year	-22,037*** (4,509)		
1995.year	-21,659*** (4,509)		
1996.year	-21,257*** (4,509)		
1997.year	-21,150*** (4,509)		
1998.year	-21,769*** (4,509)		
1999.year	-21,392*** (4,509)		
2000.year	-20,506*** (4,509)		
2001.year	-20,718*** (4,509)		
2002.year	-20,242*** (4,509)		
2003.year	-19,350***		

	(4,509)		
2004.year	-17,345***		
	(4,509)		
2005.year	-13,894***		
	(4,509)		
2006.year	-11,582**		
	(4,509)		
2007.year	-8,575*		
	(4,509)		
2008.year	-1,995		
	(4,509)		
2009.year	-9,902**		
	(4,509)		
2010.year	-5,799		
	(4,509)		
2011.year	-562.7		
	(4,509)		
2012o.year	-		
Constant	1,675	4.254***	5.241***
	(3,188)	(0.210)	(0.289)
Observations	384	384	384
R-squared	0.328	0.650	0.124
Number of ctry_pair	12		

Table 3.7a: Co- integration test

Statistic	Value	Z-value	P-value
Gt	-3.437	-4.663	0.000
Ga	-34.864	-11.960	0.000
Pt	-5.561	2.047	0.980
Pa	-14.172	-3.026	0.001

Source: Author's computation

Table 3.7b: Bootstrapping critical value under null hypothesis

Statistic	Value	Z-value	P-value	Robust P-value
Gt	-1.996	1.577	0.943	0.760
Ga	-7.525	2.285	0.989	0.810
Pt	-6.625	0.792	0.786	0.580
Pa	-7.119	1.025	0.847	0.580

Source: Author's computation

3.7 Conclusion

This chapter has applied both the sample split model and the difference-in-difference methods for panel data to analyse the effects of common currency on intra-regional trade flow in the CEMAC region taking into account the individual fixed effects. The diff-in-diff method was used as a test of sensitivity of the results. All six member states that make up the CEMAC customs union were considered and the time frame was from 1981 to 2017. Testing for the presence of thresholds, overwhelming evidence was found of a single threshold effect which separated the period into two: before and after the year 1994; when the region instituted the common currency. The diff-in-diff result is also negative and highly significant.

According to the test used to estimate the number of thresholds, we find that the model with one threshold (fig 3.2 and table 3.3) or single regime adequately captures the relationship between the policy change and intra-regional trade flows. Estimated results provide strong evidence that the relationship between common currency and intra-regional trade is non-linear. The estimated common currency (cem) for CEMAC countries is -605 for the fixed effects panel and -670 points down for the single threshold. The results are also statistically significant at the 5%, 1% and 10% level for the fixed effects, single threshold standard error adjusted for the seven clusters estimations. The negative values may be due to the fact CEMAC economies have low and volatile economic growth and trade for a sustained period after the 1994 policy change. Macroeconomic policies have been, on balance, more inconsistent in its application by member states and often, its policies tend to favour its external trading partners. Besides, the estimated coefficients associated with the control variables used in the model are consistent with the empirical literature.

In summary, the results suggest that the regional central bank and policy makers could improve the level of intra-regional trade significantly by reducing the asymptotic 95 percent critical value from the graph (fig 3.2) by approximately 2.5% points. To improve intra-regional trade and growth performance, governments in the region should enhance and coordinate their individual fiscal and supply side policies accordingly.

However, focusing on the increase in exports will hardly promote intra-regional trade flow since most of the exports from the CEMAC region are similar and the demand is negligible within the region. Although the Euro which is considered a strong currency, it would prevent CEMAC countries from offering competitive prices to their products if the CFA franc continue to be peg to the Euro.

By leveraging new infrastructure projects, such as the deep-sea port and hydroelectric dams in Cameroon, the boundaries of the Community could expand well beyond its national limits. The possibility of a regional carrier can be tapped be it airports or the highway corridors, providing a significant impetus for labour and capital mobility, private sector development and economic diversification to the region and Africa in general. One reason is that CEMAC is very significant because it shares its borders with other regions on the continent: in the West by ECOWAS in the East by EAC and COMESA, in the South by SADC; and in the North by the Arab countries.

Some might argue that, the fact that France guarantees convertibility of the CFA franc, the region has somehow maintained certainty in exchange rates to both exporters and importers. Also, the region has for long enjoyed lower cost as inflation has been kept low and pegged at a rate considerably lower than the African average. This was more beneficial to the European economies as the CEMAC member states used to trade more with the EU. As mentioned earlier, the pattern of trade between CEMAC member states and the EU is changing. The EU is no longer CEMAC's number one trading partner and therefore, the conclusion can be reached that the fate of the CFA franc is inherently no longer tied to the euro.

According to the above perspective, the CFA franc has not contributed to create an environment necessary to stimulate trade integration between member states. One of the main channels of the currency union on trade being the elimination of the bilateral nominal exchange rate volatility. The elimination of any nominal exchange rate volatility between CFA zone and Eurozone has not boosted trade between countries involves (Martínez-Zarzoso, 2017), which

is in line with the results from table 3.4 and table 3.5. Forming a currency union and linking the currency with a fixed peg both imply the elimination of any volatility in the nominal bilateral exchange rate which is the case of the CFA franc pegged to the Euro. Unfortunately, the common currency has not managed to create the mechanism to which stable exchange can boost intra-regional trade flow.

The previous sections have shown how high level of intra-regional area trade is a major determinant for an Optimum Currency Area. One of the major benefits of a common currency is that it facilitates trade and investment among the countries of the union. The benefit is through the reduction of transaction costs in cross-border trade, and removing volatility in exchange rates across the union. The question one might ask is “what happen if cross border trade among the countries in the currency union is negligible?” Definitely, the advantage of lower transaction cost will not be felt. This is the case with CEMAC member states where the countries in the customs union trade more with non-member states and very little among themselves.

For example, Cameroon who is a member of the Commonwealth, the CEMAC customs union and ECCAS ratio of trade to GDP is around 40% (World Bank, 2016). Cameroon signed a free trade agreement with the European Union in August 2016 and for some years now, Eastern Asian countries (especially China, Japan, India and Thailand) have also been reinforcing their trade ties with Cameroon. Cameroon’s main export partners are the European Union, India, China and Chad. While Central African Republic’s main trading partners for its exports are France, Burundi, China, Cameroon and Germany. For Chad, United States account for 58.5% of its exports and India 13.3%, Japan account for 11.3% and China 4.1% in 2015. Gabon’s main trading partners are United States with 15.1% of its exports, China 13.7% and Hong Kong 11.3% of its exports in 2013. Equatorial Guinea’s top export destinations are India, China, South Korea and the EU (World Bank, 2016).

That is why the results from the analyses in table 3.4 and table 3.5 shows a negative relationship between intra-regional trade in the CEMAC region and common currency. Currency union on its own is not enough to increase the level of intra-regional trade among member states. Although Lagarde (2016) considers CEMAC customs union the heart of Africa and one of the most important regional groupings in Africa with a huge potential for trade and investment, the trade bloc is still far from achieving its objective of realizing a significant increase in intra-

regional trade flow. Limited production structure and lack of complementarity and diversity in the production of goods and services is limiting its potential of being a major regional trade bloc in Africa.

Common currency would not necessary solve the problem of narrow product specialization and lack of trade complementarities that member states in the CEMAC customs union suffer from. For intra-regional trade to take place, what is been supplied by one country must be demanded by the trading partner country. This means that the pattern of demand and supply must be examined to determine if there is complementarity of exports and imports. Alva and Behar (2009) shows that weak infrastructure, weak productivity and weak trade facilitation characterizes lack of product complementarity in the region.

This chapter reveals how common currency on its own does not actually benefit the CEMAC regional bloc. Some preconditions need to be fulfilled before the positive effects of a common currency can be felt. For example, the EU had a well-established financial integration, intra-regional trade was quite significant and there was high level of factor mobility even before the Euro was instituted. This is not the case with the CEMAC region as seen in section 3.3. The region is heavily dependent on revenue from extractive industry and the high level of non-tariff barriers is also playing a significant role in reducing the level of intra-regional trade. Most of the non-tariff barriers are informal barriers that are difficult to document as they also depend on the discretion of customs officers who often demand more than the required documentation. There are also inconsistencies in the application of CEMAC rules by member states.

3.8 Policy Implications

The future of the Euro will determine the strength of the CFA franc. Any significant appreciation of the Euro will likely have a negative impact on the real effective exchange rate of the CFA countries. The impact will be worse if the Euro depreciates significantly against the dollar. Despite the fact that depreciation of the Euro can improve the terms of trade of the CFA member states, as it makes member states export cheaper and more competitive in the international market, the level of uncertainty is still very high given the change in trade pattern over time. An important consideration to reflect on whether exports from the region are priced in dollars and how depreciation for the Euro affects the value of exports in the CEMAC customs union. Further thought and reflection by the BEAC central bank on the question will throw

more light onto the future of the CFA franc. The central bank and policy makers in the CEMAC region need to study carefully the future impact of pegging the CFA franc to the Euro. As the pattern of trade shifts from the EU countries to countries in Asia, the question that arises is whether a pegged exchange rate to the Euro is the most ideal for the region.

Political constraints have contributed to the CEMAC region's poor economic performance. Most of the countries in the region have witnessed or are going through some tough political crises. Security threat posed by Boko Haram on the north-western of CEMAC region, piracy along the Gulf of Guinea, instability in the Central African Republic between the Anti-Balaka and Séléka militias continue to threaten the region's security. Furthermore, unresolved issues revolve around the failed coup attempt in Equatorial Guinea in 2004 and 2017, and the internal political crisis in Cameroon. Industries will not be able to work to full capacity and intra-regional trade will be hindered. Political instability has a strong negative effect on a country's economic performance. The idea is that having politically unstable geographical neighbours influences a country's pattern of trade and investment, lower mobility of factors of production including labour, thus leading to lower economic development. Policies geared at enhancing trade at the individual and regional level will be hampered if the security issues are not addressed. One way is for member states to initiate inclusive dialog with the different stake holders that are contributing to the crises in the countries concerned.

The CEMAC customs union is also known for having some of the oldest and longest serving leaders in Africa. Regimes in the CEMAC region are known to have stayed in power for too long. For example, the youngest regime is in Chad where the president has held power for 28 years. In Gabon, the Bongo family have been in power since 1967. In Equatorial Guinea, Cameroon and the Republic of Congo, the same presidents have ruled for more than three decades. Senility in leadership presents many challenges to the effective functioning of the economy. They are less receptive to change and have less stake in creating a strong future. Designing policies that will enhance intra-regional trade in the CEMAC region will require the need for a dramatic change in which the system of government is being run. For the CEMAC customs union to grow and stand out in Africa as a successful customs union, there is need to include young people in government and in policy making. Young people are more flexible to change and are poised to advocate for the needs of the majority in crafting and implementing policies and programs that enhance economic development.

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Chapter Four

Impact analysis of CEMAC's monetary union on intra-industry trade flow

4.1 Introduction

Intra-industry trade has grown rapidly over the last three decades and it has also become the subject of both theoretical and empirical analyses. It is gaining prominence and has risen rapidly in the past three decades and now accounts for more than half of all trade manufactures among the industrial countries. It is defined as the exchange of similar goods between trading partners. As industries grow, the level of similarity in production is also increasing. Intra-industry trade arises from the facts that products are differentiated. This has attracted the attention of many trade experts since the phenomenon forms an important component of the theories of international trade. As trade experts continue to develop and refine theories to explain the nature and determinants of intra-industry trade, there is insufficient theoretical and empirical literature to explain the development of the effect of common currency on intra-industry trade especially in developing countries. This may be attributed to lack of data on the different sectors in the economy and the estimation of disaggregate data is not as straightforward as the aggregation of data.

There is no generally accepted definition of a monetary union and common currency. On one hand, monetary union and monetary integration have for long been used interchangeably and this involves the unification of exchange rates. This happens when member states in a particular RTA fix their exchange rate at a fixed rate giving no room for exchange rate fluctuation (Tavlas, 1993). On the other hand, common currency refers to a situation where countries in a particular RTA use a single currency in trade (Gulde, Jafarov & Prokopenko, 2004).

According to Amador and Cabral (2009), intra-industry trade (IIT) is defined as the two way flow or simultaneous exports and imports within industries. These simultaneous trade flows can be broken down into two categories called vertical intra-industry trade, which is associated with a specialization along quality ranges, and horizontal intra-industry trade that is trade associated with a specialization in differentiated product varieties. Some of the factors to be looked at when measuring the level of IIT over the years is the development level of countries involved, whether the countries involved are close to each other or whether the participating countries are members of a trade bloc.

According to Lapinska (2014), factors that determine the level of intra-industry trade (IIT) are generally divided into two broad categories: country-specific and industry-specific determinants. Country-specific determinants include factors that characterise trading partners' economies and industry-specific factors include those that determine which products have been traded among member states. Intra-industry trade is more prevalent in developed countries than developing countries since they present higher indices of intra-industry trade than less developed countries. IIT trade has generally been concentrated in Australia, Europe, East Asia and North America. Africa exhibited an IIT of approximately five percent with the exception of trade with advanced economies in 2006 (Brulhart, 2008). This is common in sectors where firms are particularly concerned with sophisticated manufacturing than specialising in primary goods (Swart, 2013). There is a positive correlation between IIT and level of income of the country and its trading partners. According to Brulhart (2008), IIT among high income countries far more outweighs IIT among poorer countries and regions. Although the convergence on IIT across the globe has been significant, the share of IIT among trade blocs in Africa has not been encouraging and still remains relatively low.

Intra-industry trade is significantly low in Africa and many trade blocs on the continent still struggle to promote IIT among themselves. According to UNECA (2015)³², the low level of IIT is attributed to weak industrialization which typically constrains the scope for IIT. Using the merchandise trade complementarity index from UNCTAD statistics database, Africa is one of the regions with the lowest index after Oceania. The index assesses how a country or region's exports from potential trading partner's matches that of its imports from these trading partners.

When we take a closer look at IIT and regional integration in Africa, CEMAC has performed poorly in relation to other trade blocs such as West African Economic and Monetary Union (WAEMU), East African Community (EAC) and Southern African Customs Union (SACU). Lack of export diversification and product concentration are contributing to this poor performance (Ofa et al., 2012). To make matters worse, is the presence of numerous roadblocks and cumbersome border crossing procedures along the main transit corridors in the CEMAC region. According to Brulhart (2008), IIT in these regions differs substantially over time and institutional depth. In 2006, none of these region's IIT exceeded two percent of total trade and none contributed significantly to regional trade nor structural convergence.

³² United Nations Economic Commission for Africa, 2015

As mentioned above, the scope of Africa's IIT in manufacturing is relatively lower compared to that of Asia and Latin America. Absence of regional value chains, a narrow range of manufacturing base across the region, lack of economic diversification and the absence of large corporations trading in various parts of the continent are some of the reasons for the low level of IIT in the manufacturing sector in Africa (UNCTAD, 2013). This same UNCTAD (2013) report shows that approximately 25 percent of African total trade, traded regionally with only one percent accounting for product category in 2011, which was in sharp contrast to that traded in Asia where approximately 40 percent of its total trade was intra-industry trade in the nine Standard International Trade Classification (SITC) product categories and 25 percent for the Americas in six of nine product categories. This is an indication that there is still ample opportunity in terms of product diversification in Africa as Africa remains unexploited in many product categories. Another reason for the low level of intra-industry trade is the mismatch in production versus consumption rates and trends in African countries. What adds to this mismatch are the high levels of locally manufactured products that are exported for consumption in other markets and regions of the world (Brulhart, 2008).

A closer look at the share of IIT by product category in some of the trade blocs in Africa indicates that the EAC intra-industry trade accounted for more than 25 percent of its total trade in five out of nine product categories between 2007 and 2011. This was followed by the Economic Community of Central African States (ECCAS) and the Economic Community of West African States (ECOWAS), where intra-industry trade was approximately 25 percent of their total trade in three product categories. In the Common Market for Eastern and Southern Africa (COMESA) and the Southern African Development Community (SADC), intra-industry trade was significant only in two product categories (UNCTAD, 2013).

4.1.1 Justification

This chapter discusses and analyses the flow of intra-industry trade in three main sectors: agriculture, fuel and manufacturing, and the nine product categories according to the Standard International Trade Classification (SITC) in the CEMAC region. The aim is to contribute to the debate on the economic effects of common currency on intra-regional trade by estimating the effect of the CFA franc adoption on intra-industry trade with yearly data for countries in the CEMAC region over the period 1995–2015 using descriptive statistics and the gravity model. Although this approach could be considered an “unsophisticated” way to assess

the impact of the CFA franc on CEMAC IIT, nevertheless the belief is that it might provide a useful starting point for future research on intra-industry trade in the CEMAC trade bloc.

While the analysis presented in chapter three shows that the common currency in the CEMAC customs union has not managed to create a favourable environment for increased intra-regional trade, it is reasonable to question whether this relationship holds for both sectors level and the different product categories. Breaking down total exports into the different product categories and sectors in the CEMAC region will underscore the importance of the sectoral trade in the region. The effects of monetary union and intra-regional trade flow are usually assessed at the aggregate level, where trade models aggregate all products of a country or trade bloc as a single homogenous good. There is less attention in the literature to the impact of monetary union on trade by sector, and this might be due to the fact that such estimation is less straight forward and bares more complications than an estimation of aggregate trade. Many developing countries are heavily dependent on primary products as their main source of export income. The questions that arises are “how has the CFA franc contributed to the growth of IIT? Or does common currency in the CEMAC customs union promote intra-industry trade?” In attempting to answer these questions, we decompose the growth in total trade into the sectoral and the different products categories according to SITC classification.

Since countries in the CEMAC region are known to be exporters of primary products in the global markets, it is worth the effort to take a deeper look at trade among CEMAC countries in the different products categories. Though it is common knowledge that intra-regional trade is negligible, knowledge on sectoral trade flow in the region will throw more light on which sectors or product categories are contributing to bilateral trade flow in the region or which sectors or products are shaping the pattern of trade flows among member states in the region.

Although the elimination of nominal exchange rate volatility between CEMAC countries and the Eurozone has not boosted total bilateral trade between countries of both zones to a similar level as for trade of the former sole anchor currency (France) with the CEMAC countries. An analysis of trade at the disaggregate level will give more information with regard to whether the elimination of nominal exchange rate volatility has any significant positive effect on sectoral trade at the different digit level. The study of monetary union and intra-industry trade is important as the intra-regional trade at the aggregate level may suffer from aggregation bias. Also, intra-industry trade helps identify the sectors that benefit the individual economies or

trade bloc in terms of export revenue especially in situations where the countries are seeking diversification of their economies.

Given the fact that a high proportion of trade today is through intra-industry trade in developed economies, looking back at the theory of comparative advantage which suggests that each economy should specialize to a degree in certain products, and then exchange those products. It is important to estimate the level of intra-industry trade in the developing countries—that is, trade of goods within the same industry from one country to another. The study of intra-industry trade in the CEMAC customs union will provide valuable information about the composition of the flow of traded goods since the establishment of the union in the mid-1990s.

This chapter is important as it will give an indication of which sectors have benefited most since the common currency was established in 1994 and also which sectors might have been more sensitive to changes in trade policy. Common currency and intra-regional trade will identify the different patterns of trade flow in the different sectors and enable policy makers to identify which sectors need the greatest supports and which sectors brings the highest exports revenue. This can also serve as a guideline for export policies that would promote intra-industry trade in the CEMAC region in particular and developing regions in general.

The rest of this chapter is organized as follows:

Section 4.2 provides an overview of the nature of CEMAC intra-industry trade. In this section, the percentages of flow of IIT exports and imports to and from the member states of CEMAC customs union are analysed. The reason is to give an indication of the current trend of CEMAC IIT, so comparison can easily be carried out with other trade blocs. Section 4.3 examines the determinants and types of intra-industry trade. In section 4.4, a brief explanation of the literature review and the theoretical framework is given. Section 4.5 looks at the methodology and the process of data collection. In this section, the empirical model is also explained. Section 4.6 presents the empirical results and their interpretations. Section 4.7 concludes the study while section 4.8 provides policy implications and recommendations to policy makers.

4.1.2 Limitations

The analysis in this chapter is not free of shortcomings, as the results may be affected by the fact that there is only four years of data before the CEMAC customs union was formed. The

choice of the period of study is limited due to availability of data. Unfortunately, there are no disaggregate or sectoral data for the countries in the CEMAC trade bloc prior to 1990.

Availability of data before 1995 is not available. Therefore, the study is not able to provide readers with a comprehensive understanding of the pattern of IIT prior to the introduction of the policy change. Also, readers will not be able to carry out a comparison of the pattern of IIT before and after policy change in 1994.

The data used in the study is on sectorial variations and product categories. However, due to data limitations, the priority is shifted to the analysis of the nature and trend of CEMAC intra-industry trade at the first digit level of aggregation of the Standard International Trade Classification Revision³³ section. Analysis of CEMAC IIT in more than one product nomenclature should have been the better option and should have produced more significant results. However, data on the different products and services are not readily available for the CEMAC region. Focus is then placed on trade in goods only. Although theoretical and empirical works on IIT have proven that the determinants of horizontal and vertical IIT differ (Greenaway, Hine & Milner, 1995a), this chapter follows the approach of previous studies to look at total IIT rather than breaking it into horizontal and vertical IIT.

Since the CEMAC customs union is an example of a monetary area using a single currency, the analysis is limited to the channels through which sharing a common currency affect intra-industry trade. The analysis did not include other channels such as eliminating the volatility in nominal exchange rates and increasing the transparency of markets which can also have a profound effect on the pattern and flow of intra-industry trade. Our analysis points out that the formation of a currency union affects the patterns of trade of both member and non-member countries by reducing trade costs between members, through the elimination of individual member state currencies. Taking into account these effects, we show that the formation of a currency union will not necessarily increase the volume of bilateral trade between members and it is still possible for the volume of bilateral trade between member and non-member countries to increase.

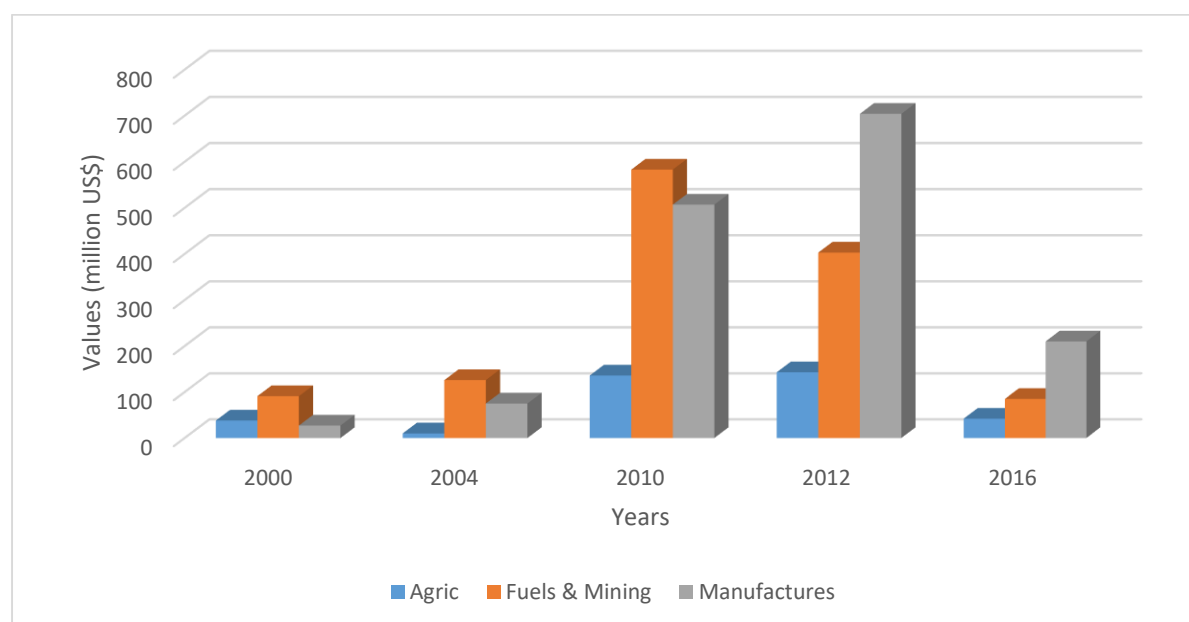
³³ According to the different nomenclature giving the availability of data

4.2 Nature of CEMAC intra-industry trade

4.2.1 CEMAC sectoral trade patterns

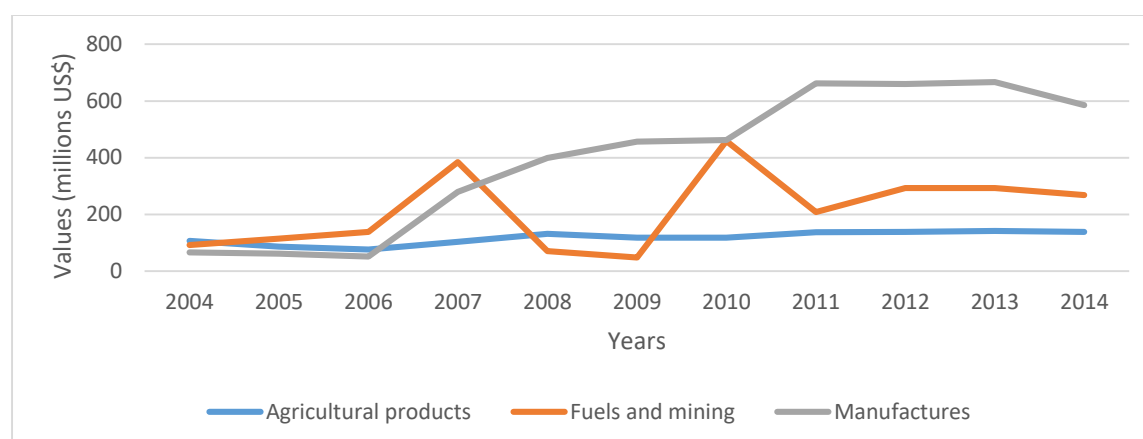
Intra-industry trade in the CEMAC region by commodity and product has followed different trends since 2000. In figure 4.1a and figure 4.1b, the flow of agricultural exports within the CEMAC region has relatively been low from 2000 to 2016. Exports of fuel and mining products have witnessed the highest level of fluctuation. Trade in manufacturing goods has dominated intra-industry since 2012. The growth in manufacture goods has been insignificant compared to its regional counterparts.

Figure 4.1a: CEMAC intra- industry trade in three key sectors (Exports, Million US\$)



Source: constructed by author using WTO Statistic Database 2017

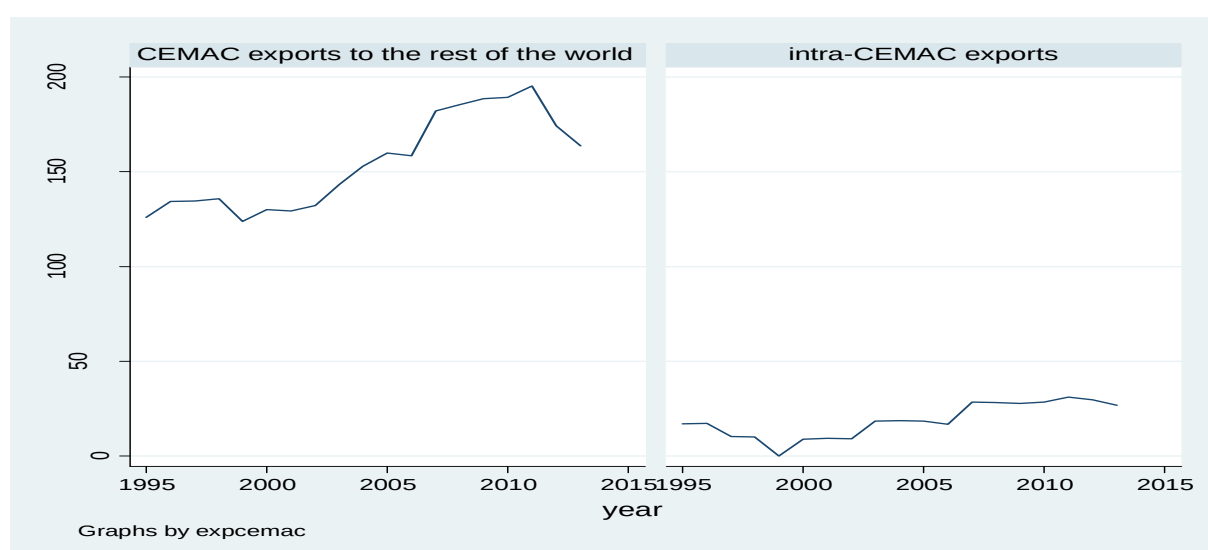
Figure 4.1b: Line graph showing CEMAC IIT in three key sectors, (Exports, Millions US\$)



Source: Constructed by Author using WTO Statistic Database 2017

When total merchandise trade is broken down by main commodity group in 2015, agricultural exports to the rest of the world account for 46.2 percent, followed by fuel and mining products that accounted for 46 percent, and manufacturing just eight percent (WTO, 2017). Manufacturing imports were quite significant accounting for 50.7 percent of total imports, while the import of fuel and mining products was 20.4 percent, and that of agriculture was 19.4 percent. In figure 4.2, it is clear that the total value of IIT in the CEMAC region is lower relative to its total trade with the rest of the world.

Figure 4.2: Comparing CEMAC total exports to the rest of the world and CEMAC intra-industry trade (million US Dollars)



Source: Author's computation using data from UNCTAD Database

CEMAC total IIT has been relatively low since 1995, whereas, its trade to the rest of the world during the same time frame witnessed an upward trend until 2012, when it started to decline.

4.2.2 CEMAC intra-industry trade patterns

In this section, CEMAC trade by sectors is analysed according to the SITC system of classification. We use a list of 10 sectors shown in appendix A³⁴ (food and live animals, beverages and tobacco, crude materials, mineral fuels, animal and vegetable, chemicals and related products, manufactured goods, machinery and transport equipment, miscellaneous manufactured articles and commodities and transactions) to analyse the pattern of IIT in the CEMAC region.

In table 1A, mineral fuels, lubricants and related materials accounted for the highest value of gross exports between 1995 and 1999 and increased more than eight fold between 1995 and 2015. It is also clear from table 2A that fuel products accounted for more than 50 percent of CEMAC total exports to the rest of the world. Manufacturing increased by approximately 0.3 billion US Dollars between 1995 and 1999 and then rose slightly to 2.4 billion US Dollars between 2010 and 2015. Given the value of CEMAC IIT by products, intra-industry exports were more significant in manufactured goods than mineral fuels and crude materials as seen in table 3A. This is because the demand for mineral and crude oil was more significant from outside the CEMAC region.

In terms of the value of CEMAC IIT by main sectors as shown in table 4A, manufactured goods were more significant between 1995 to 2015 than food items and fuels. Between 1995 to 1999, total value of manufactured goods was approximately 55.5 million US dollars and increased to 356.7 million US dollars between 2011 to 2016. Between 1995 and 1999, food items were more than fuel products in CEMAC IIT, but between 2011 and 2015, fuel products dominated foods items and it stood at approximately 219.9 million US dollars' while foods was only 64.8 million US dollars.

In terms of product shares of CEMAC trade as a percentage of total trade, fuel products accounted for close to 60 percent of total trade between 1995 and 2000. By 2015, at SICT 5, it was approximately 81 percent of total CEMAC trade as shown in table 5A. The contribution

³⁴ In appendix A, table 1A-7A comprises of breakdown of trade by sector for CEMAC countries

from agriculture was less and stood at 21 percent between 1995 and 2000, but it dropped significantly to approximately six percent between 2011 and 2015.

A close look at the different product categories in table 4A at revision one (Rev 1) of the SITC, only exports of mineral fuels, lubricants and related materials contributed significantly to CEMAC total trade and stood at 60 percent between 1995 and 2000. This was followed by crude materials with 23 percent, while the other eight product categories accounted for less than 10 percent each between the same periods. The trend is similar between 2011 and 2015 for most product categories apart from mineral fuels that increase to 81 percent. Crude materials is seen to decline and is approximately eight percent from 23 percent between 1995 and 2015.

The ratio of CEMAC intra-industry trade followed a completely different pattern as shown in table 6A. On average, manufactured goods accounted for the highest percentage from 1995 to 2015. This was followed by food items. Intra-industry trade in fuel was negligible and accounted for less than one percent between 1995 and 1999 and increased to one percent between 2006 and 2010 and again it dropped between 2011 and 2015. As mentioned earlier, the low level of intra-industry trade in fuel and mining products was due to high domestic production in the entire CEMAC region and buyers for these products were outside the region.

When the products are grouped into different categories as shown in table 7A, IIT accounted for two percent on average of total production in the CEMAC region from 1995 to 2015. IIT for food and live animals accounted for approximately three percent between 1995 and 1999 and it increased to five percent on average between 2011 and 2015. Crude materials and mineral fuels were quite low with an average of 0.2 percent and 0.7 percent respectively from 1995 to 1999 while crude materials dropped to 0.1 percent on average from 2011 to 2015.

Intra-industry trade is relatively weak and witnessed a decline from 1995 to 2015 as evident from table 7A. For example, manufactured goods were on average eight percent between 1995 and 1999 and dropped to 7.6 between 2011 and 2015. Also, chemicals and related products on average stood at 32 percent of total sector 5 trade between 1995 and 1999 and dropped to approximately nine percent between 2011 and 2015. On the other hand, only animal and vegetable oil, fats and waxes (sector 4) trade seem to have an upward trend since 1995.

4.2.3 Contribution of individual CEMAC countries to CEMAC's Intra-industry trade

Intra-industry trade among CEMAC member states has followed different patterns of growth since 1995³⁵. The individual CEMAC member states contribution to intra-industry trade is unevenly distributed as shown in appendix B (tables 1B – 9B) for the 1995-1999, 2000-2005, 2006-2010 and 2011-2015 periods.

4.2.3.1 Food and live animals (sector 0)

Cameroon recorded the highest percentage of exports to the other CEMAC countries by origin and destination in food and live animals (sector 0) between 1995 and 2015 as shown in table 1B. Between 1995 and 2015³⁶, the highest percentage of Cameroon sector 0 exports was destined to Chad. Chad accounted for approximately 30 percent of Cameroon sector 0 exports between 1995 and 1999 (table 1B.1) and marginally increased to 32 percent between 2011 and 2015 (table 1B.4). Central African Republic (CAR) and Gabon exports of sector 0 were also significant to Cameroon. In this sector, Chad and Equatorial Guinea exports to other member states were negligible in most instances and in other cases, data were not available to determine the value of these countries' exports to other CEMAC member states. Most of Congo's export of sector 0 products were destined to Chad between 1995 and 1999. Between the period 2000 and 2006, Congo exported more of its products to Cameroon and since then, Cameroon has been the preferred destination for its sector 0 products.

4.2.3.2 Beverages and tobacco (sector 1)

Despite the negligible level of CEMAC intra-industry trade, Cameroon exported mostly sector 1 products to other CEMAC member states (table 2B). This was followed by Gabon, where her export of sector 1 products to CEMAC was also significant apart from the period 1995 – 1999 (table 2B.1) where her exports were non-existent. Congo came third in number and her exports were geared to the Republic of Central Africa and Gabon between 1995 and 1999. Between 2006 and 2010 (table 2B.3), Congo exported approximately 15.9% of sector 1 products to Cameroon, 29.9% to CAR and 54.2% to Gabon. Gabon accounted for the highest percentage (54 percent) of Congo intra-CEMAC exports in this product category. Her export to Chad between 2011 and 2015 (table 2B.4) was negligible.

³⁵ See appendix B where the contribution of IIT by the different product categories from member states are shown. The data source in this section is from UNCTAD Statistical Database

³⁶ Tables 1B.1 to table 1B.4

4.2.3.3 Crude materials, inedible, except fuels (Sector 2)

From table 3B, Cameroon and Congo were the main export destinations for Gabon sector 2 products. Between 1995 and 2006 (table 3B.1 and table 3B.2), Cameroon imported more in terms of percentages while approximately three-quarters of Gabon CEMAC intra-sector 2 products were destined to Congo between 2011 and 2015 (table 3B.4). Most of CAR intra-CEMAC sector 2 products were exported to Cameroon and some to Congo and Chad. Between 1995 and 2005, Chad was not an important destination for Cameroon sector 2 intra-CEMAC exports. However, between 2006 and 2015, export to Chad was significant in terms of percentage and Chad accounted for approximately 31 percent between 2006 and 2010 and grew to 61 percent between 2011 and 2015.

4.2.3.4 Mineral fuels, lubricants and related materials (Sector 3)

During the 1995-1999 and 2000-2005 periods as shown in table 4B.1 and table 4B.2, Cameroon exported most of its sector 3 products to Chad, while Congo attracted most of the sector 3 products from CAR. Between 2006-2010 and 2011-2015 (table 4B.3 and Table 4B.4), there were no intra-sector 2 CEMAC exports from CAR. During these same periods, Chad was still the number one destination for Cameroon sector 2 intra-CEMAC trade. While Equatorial Guinea attracted most of Gabon's intra-CEMAC export.

4.2.3.5 Animal and vegetable oils, fats and waxes (sector 4)

CEMAC trade was negligible in the region between 1995 and 2015 in sector 4, table 5B. Only Cameroon exported more of its sector 4 products to other CEMAC states especially Congo, Equatorial Guinea and Gabon. During the 1995-1999 and 2000-2005 periods, Chad was not formally exporting or importing until the year 2006, where her imports from Cameroon rose significantly.

4.2.3.6 Chemicals and related products (sector 5)

During the period of 1995 to 2015 as shown in table 6B, Gabon and Congo were the main importers of Cameroon's intra-CEMAC sector 5 products. This was followed by Gabon who exported her sector 5 products to Cameroon, Congo and Equatorial Guinea. Chad and CAR did not attract Gabon's sector 2 products probably because of the problem of distance proximity and the fact that these countries do not share a common boundary with Gabon. CAR exported

to Cameroon, Chad and Congo, but her sector 2 exports became negligible as from the year 2000.

4.2.3.7 Manufactured goods (sector 6) and machinery and transport equipment (sector 7)

From table 7B, Cameroon and Gabon exports of intra-sector 6 products were quite significant to the other member states in the CEMAC customs union. CAR exported mostly to Cameroon, Chad and Congo with Chad attracting the highest percentage of CAR's sector 6 intra-CEMAC exports. Overall, the export trend in sector 7 (table 8B) was similar to that of sector 6 with intra-CEMAC trade more from Cameroon, CAR and Gabon. Congo exports were mostly destined to CAR with a total export value of 89.9% between 1995 to 1999 as shown in table 8B.1. Between 2000 and 2010 (table 8B.2 and table 8B.3), Congo exports were destined mostly to Cameroon and Gabon.

4.2.3.8 Miscellaneous manufactured articles (sector 8)

Analysing the individual member states' contributions from table 9B, Equatorial Guinea imported close to 50 percent of total CEMAC sector 8 products from Cameroon, while CAR exported mostly to Cameroon and Congo between the periods 1995-1999 (table 9B.1). The rest of the periods saw Cameroon exports to Equatorial Guinea dropping and that of Gabon increasing between 2000 and 2015 (table 9B.2, 9B.3 and 9B.4). CAR exports to Congo increased in terms of percentage, although the periods 2006-2010 saw a significant drop.

To conclude this section, there is no clear pattern of CEMAC intra-industry trade since 1995 after the institution of the common currency. In most instances, intra-industry trade for Chad and Equatorial Guinea was zero. Despite the fact that Cameroon dominated CEMAC intra-industry trade, the percentage of IIT to total trade is still very small compared to other trade blocs on the African continent. Given this haphazard trend, the conclusion that can be reached is that, there is no evidence whether the institution of CEMAC in 1994, actually contributed to the growth of IIT in the CEMAC region.

4.3 Determinants and main types of intra-industry trade

4.3.1 Determinants of intra-industry trade

For decades, it was a general belief that IIT takes place only between the more industrialised countries. On one hand, IIT was shown to have a direct relationship with the level of average income and trade orientation which was believed to be common with developed economies (Balassa & Bauwens, 1987). IIT is more pronounced with developed countries as these countries are assumed to have a high capital-labour ratios with similarity in factor endowments. High demand and greater variety of products associated with high GDP per capita were also believed to have contributed to increase in IIT. On the other hand, IIT was negatively related with income inequality which was assumed to be a characteristic of developing economies (Balassa & Bauwens, 1987). Inter-industry trade was more common among less developed countries. Developing countries were lagging behind in IIT due to their high labour-intensive mode of production and these countries were engaged mostly in the extractive industries and primary products exchanging them for finished goods (Sawyer, Sprinkle & Tochkov, 2010).

Balassa (1986) analyses the determinants of IIT specialisation in the United States of America with thirty seven partners trading in manufactured goods covering 167 industries. The results show that a high level of IIT is associated with high levels of product differentiations, costs of marketing, high variability of profit rates and offshore procurement. In other words, the level of IIT is positively related to the above mentioned factors. While factors such as economies of scale, industry concentration, FDI and cost of transportation are all negatively related to IIT. Clark (2005) identifies some unobservable factors that influence IIT. These factors include industrial policies, managerial competence, industry-specific border barriers, unmeasurable product quality and factors that facilitate the fragmentation of production processes.

Geographic cost in terms of distance also has an important role in determining the level of IIT. The distance between trading partners determines the level of IIT between them. For years, trade experts believed that the greater the distance between the trading partners the lesser the degree of trade between them. The work of Clark (2005) shows that the share of IIT between the United States of America and that of her trading partners decreases with distance. In another study, Hummels and Levinsohn (1995) examine the behaviour of IIT and concluded that IIT is highly explained by country-pair-specific effects and not by time varying factors. After separating the country-specific effects into both land and distance effects, their results show that the distance effect plays a more significant role in IIT than the land effect.

Trade orientation in terms of barriers to trade influence the share of IIT. Falvey (1981) developed a model of trade to show how IIT occur as a natural outcome in a multi-product industry and to show how the share of IIT is inversely proportional to the level of trade restriction. Clark (2005) supported the view that the share of IIT is positively related with trade orientation.

4.3.2 Types of intra-industry trade

Intra-industry trade is broken down into two main categories: horizontal and vertical intra-industry trade. According to Kandogan (2004), horizontal intra-industry trade (HIIT) takes place when trading partners export and import similar products that are differentiated. Vertical intra-industry trade occurs when countries export and import goods of different varieties of different qualities from the same industry (Greenaway, Hine & Milner, 1995b).

4.3.2.1 Horizontal intra-industry trade

Economists distinguish between horizontal and vertical IIT. Horizontal IIT (HIIT) is the two-way trade of goods with closed substitutes having different attributes or characteristics. Greenaway, Hine and Milner (1995) identify two ways to model HIIT namely: the Lancasterian and Chamberlinian approaches. The Lancasterian approach assumes a combination of tastes and attributes that drives consumers to buy certain goods and services while the Chamberlinian approach has to do with the fact that consumers do not limit their consumption to a particular variety of goods but consume as many varieties of goods as possible. The fact that producers can have more access to intermediate goods allows more goods to be produced and be available to consumers. Structural convergence of economies in mostly developed regions is enabling the growing share of different varieties of a product of similar quality. According to Kawecka-Wyrzykowska et al., (2017), higher Horizontal IIT indicate more similarity among trading partners.

Horizontal IIT is best explained using modern trade theories and for long, some economists believed that HIIT is highly affected by economies of scale, tastes and preference diversity (Lancaster, 1980). These theories explain the two-way trade of varieties of goods with similar qualities and other features that attract consumers to a particular good like taste or colour. The limitations of the traditional theory of comparative advantages to explain HIIT led to the emergence of modern theories that used the framework of monopolistic competition and

product differentiation to explain HIIT. These theories include neo-Chamberlinian and the neo-Hotelling models. The Krugman model, on the one hand, is an example of the neo-Chamberlinian model which considers the assumption that all varieties enter the utility function symmetrically. In this model, the consumers are assumed to have a very high marginal propensity to consume as many different varieties of a given product as possible. On the other hand, an example of the neo-Hotelling model is the Lancaster model which assumes product asymmetry. In this model, different consumers have different preferences for alternative varieties of a given commodity and each consumer prefers one variety to all others (Kawecka-Wyrzykowska et al., 2017).

4.3.2.2 Vertical intra-industry trade

Vertical intra-industry trade (VIIT) on the other hand is the two way trade involving goods of close substitutes with different qualities between two or more countries (Sharma, 2004). According to Fukao, Ishido and Ito (2003), one driver of vertical IIT is differences in factor endowment. VIIT is more common between less developed and advanced economies and is best explained using theories of comparative advantage (Greenaway, Hine & Milner, 1995). In another study, Dautovic, Orszaghova and Schudel (2014) show how vertical IIT involves both the exports and imports of differentiated goods from trading partners. The goods are heterogeneous in nature due to differences in factors of production, including differences in technology and the distribution of capital and income. A key determinant of VIIT is the differences in human and physical capital in the respective member states. Foreign direct investment is a major determinant of VIIT. This is true in the sense that multinational companies tend to provide developing countries with the technology and equipment needed to exploit their factor endowment effectively (Fukao, Ishido & Ito, 2003).

The early monopolistic competition model of IIT was generally assumed to be horizontal in nature and did not include trade in services since its attention was on differentiated goods. Vertical intra-industry trade embodies exchange of net factor services and it is considered to be the dominant form of IIT in most developed economies (Cabral, Falvey & Milner, 2013). Vertical IIT is also affected by distance. The greater the distance between two countries, the lower the level of vertical IIT as a measure of trade costs.

On one hand, vertical IIT has a direct relationship with both the number of firms and vertical product differentiation in an industry. On the other hand, empirical evidence has shown no

clear relationship exists between horizontal IIT and product differentiation common to industry with very few firms (Greenaway, Hine & Milner, 1995).

4.4 Literature Review and Theoretical Framework

4.4.1 Literature review

Literature in the field of international trade, generally acknowledges the fast growing pace of trade among the industrial countries and within industrial categories. This process has attracted the attention of economists to the phenomenon of IIT.

It is important to note that the choice of partners directly affects the composition of trade flow. The literature on IIT shows that it accounts for a greater share of a developed country's trade. In developing countries, IIT accounts only for a small percentage of total trade flow. Several empirical studies use the gravity model to explain the pattern of IIT. For example Song (2011), Funk et al., (2006), Co (2010) and Dautovic, Orszaghova and Schudel (2014) use economic sizes and distance between two countries (gravity model) to analyse different aspects of IIT.

The general notion is that higher level of intra-industry trade is common with more developed countries. Therefore, intra-industry trade can be seen as an indicator of development within an RTA. IIT can also be used as a guide to estimate the similarity of a country's factor endowment (Isemonger, 2000). An analysis on IIT and trade cost was done by Bergstrand and Egger (2006) using a cross section of countries that make up the OECD. The authors use the Grubel-Lloyd indexes to show that trade costs must be taken seriously when analysing IIT as it can readily have a negative impact on the flow of IIT.

The recent trade agreement between Africa and the European Union, as well as other current negotiations, is creating the need to study which of the industries or sectors will be affected the most. Given this backdrop, it is crucial to carry out an empirical study on current intra-industry trade structure in Africa. Regional trade agreements in Africa differ greatly from one another in terms of age and complexity. Brühlhart (2009) shows how IIT is similar across the African continent in terms of negligible trade effects and low level of growth³⁷. He concludes that IIT in Africa is not stimulating trade and is not promoting any regional structural convergence. The gravity equation has provided a strong theoretical framework and evidence in international

³⁷ Brühlhart (2009) analysis of IIT shows that African IIT barely exceed two percent of total trade compare to that of EU which was 46% in 2006

trade as to why there is an inverse relationship between distance and trade volume in the past. According to Bergstrand and Egger (2006), this should not be the case with intra-industry trade, especially for countries sharing common borders.

Studies on Intra-industry trade relevant to the CEMAC region are non-existent. Relevant literature on IIT is mostly on South Africa and its major trading partners. In the CEMAC region, there is a high level of complementarity in the production structure. Intra-industry trade can allow countries to gain exports over and above that gained through comparative advantage (Krugman & Obstfeld, 2006). A regional currency can have a huge impact on member states' trade flow, but it is also important to identify which sector is profoundly affected. Empirical studies of intra-industry trade will shed more light as to how a common currency affects the different industries in the CEMAC trade bloc.

Ishchukova et al., (2014) conducted a study on Russian intra-industry trade in the agricultural sector and they breakdown Russian foreign trade in agricultural products into three trade types covering the periods 1996-2012. The analysis is to compare trade in agriculture between Russia and the European Union, Russia and the Common Wealth of Independent States (CIS), Russia and Asia and finally Russia and South America. Their results show that Russia intra-industry trade in agriculture with the above trading regions depend highly on the proximity of the region in question. The lowest level of IIT with regards to agriculture is with South America and the highest is with the CIS countries. Also, Russian IIT with the CIS countries is benefiting from trade liberalisation.

Using two different variations of the Grubel-Lloyd indices of IIT, Isemonger (2000) examines the level of South African IIT for the period of 1993 to 1996. His analysis show that South Africa's pattern of IIT in the primary product exports is relative and the manufactured product in the imports categories are certainly low. A few light manufacturing categories like textiles witness a similar increase. This also applies to IIT in manufactured imported products. According to the author, one reason for this low level of SA IIT is that South African major trading partners are becoming increasingly diversified and moving away from resource-dependent base production.

Gebreselasie and Jordaan (2009) show how IIT in manufacturing is high between South Africa and countries similar to South Africa in terms of economic size. IIT is less between South Africa and its trading partners especially countries that are not proportional in size. The authors

conclude that IIT plays an important role in promoting South Africa's bilateral trade. The fact that SA's manufacturing sector responded positively between 1994 and 2004 to similarity of trading partner factor endowments implies that SA's manufacturing sector shares characteristics similar to those of the developed world. Damoense and Jordaan (2007) analysed the determinant of SA IIT in the automobile industry using the HS 6-digit disaggregate data and to test whether SA IIT with its main trading partners is vertical or horizontal. Their results show that SA IIT in the automobile industry is mostly horizontal while IIT in automotive parts is highly vertical IIT.

In investigating the determinants of Intra-industry between Zambia and SADC member states, Mulenga (2012) applies the gravity model in a panel data framework with data from 1998 to 2006. The results show that IIT between Zambia and its trading partners in SADC increases over the specific period and that the larger the size of the economy in terms of GDP, the larger the intra-industry trade. The author also concluded that similarities in per capita income is a very important aspect in increasing IIT between Zambia and its trading partners in the SADC. Historical ties have been found to have a very important role to play in expanding IIT between Zambia and its trading partners in SADC.

In terms of similarity in the levels of demand and how it can affect intra-industry trade, Shahbaz and Leitão (2011) test the determinants of IIT between Pakistan and its main trading partners using an unbalance panel for the period of 1980 to 2006. The results from the study show that the sizes of the markets are an important determinant of IIT and that countries with similar level of demand tend to promote IIT more than those without similar demand pattern. In analysing the pattern of IIT in the East African Community (EAC), Rutaihwa and Rutatina (2012) study the effects of EAC regional integration on intra industry trade. The study shows that the pattern of IIT flows in the period between 1990-2000 were very low compared to the period between 2004 and 2010. Regional macroeconomic policies and the establishment of the East African Customs in January 2005 played an important role in the improvement in the trade patterns of IIT among the EAC partner states

Faruquee (2004) argues that countries with more flexibility in shifting their resources to sectoral level enjoy comparative advantage and can realize larger trade gains. Accordingly, share of intra-industry trade seem to play a role and member states in the trade bloc that have higher

share of IIT prior to adopting the single currency would seem to benefit the most from their decision.

To conclude this section, the above analysis has shown clearly that very little empirical work on IIT has been carried out in Africa. Most of the studies on IIT in Africa are carried out by authors studying different sectors of South African trade with its trading partners (Dias, 1998, Isemonger, 2000, Matthee & Naudé, 2007, Sichei, Harmse & Kanfer, 2007). These studies show that SA IIT is mostly with countries that are proportional in size and that no African economy fits in this category. Although these studies have greatly contributed to existing knowledge on IIT, none have been carried out in the CEMAC area. This study focusses on the CEMAC customs union by presenting a comprehensive analysis of the main sectors and different product categories according to the SITC level of classification using descriptive statistics and econometric model.

4.4.2 Theoretical framework

The standard trade theory was introduced by David Ricardo in 1817 when he formulated what we now call the theory of comparative advantage. One of the main take aways from the theory is that goods are more mobile across international boundaries than are factors of production. Differences in resources and factor endowment enable countries to trade with each other. This assumption still characterizes the theory of intra-industry trade.

Recent studies have used models of monopolistic competition and increasing returns to scale to predict IIT since traditional theories³⁸ failed to predict intra-industry trade satisfactorily. Under careful consideration, these modern theories can actually predict a mix of both intra-industry and inter-industry trade, making it a good predictor of bilateral trade flows. The theories include but are not limited to the Robinson (1933) and Chamberlin (1936) models of increasing returns to scale and of monopolistic competition. Lancaster (1980); Spence (1976), and Dixit and Stieglitz (1977) came up with some mathematical formulations to explain the theoretical foundation of intra-industry trade. These models permeated some of the weakness of the traditional models and it takes into account critique that has weakened the predictive strength of the traditional models.

³⁸ Ricardian trade theory and the Heckscher-Ohlin-Samuelsson models

It is assumed that under conditions of imperfect competition and with the presence of high level of product differentiation in the market, both intra-industry and inter-industry trade processes become intensified. This makes it easier and more conducive for IIT to take place as more barriers to trade have been removed. The reason is that goods subject to intra-industry trade are mostly substitutes and therefore, these goods are more price elastic (Lapinska, 2014).

The theoretical work on IIT trade started to gain recognition after Grubel and Lloyd published their book on intra-industry trade in 1975. Grubel and Lloyd (1975) analysed the trade pattern of member states of the Organisation for Economic Cooperation and Development (OECD) and realized there was a steady increase in IIT. This was somehow contrary to existing trade theories at that time, such as the Heckscher-Ohlin-Samuelson comparative advantage and specialisation theories.

Grubel and Lloyd (1975) came up with an index to measure IIT. The Intra-industry index is given as follows:

$$IIT_{ij} = \left[1 - \frac{|X_{ij} - M_{ij}|}{(X_{ij} + M_{ij})} \right] (100) \quad (4.1)$$

Where, X_{ij} = exports from industry i goods to country j , M_{ij} = imports of industry i from country j and $i = 1 \dots n$.

The values of IIT_{ij} normally lie between 0 and 100. The level and intensity of IIT between trading partners is greatest when the computed value of IIT_{ij} is closer to 100 (Sharma, 2004).

In order to measure the IIT in all product categories, Equation (4.1) can be modified as a weighted measure of the IIT_{ij} . According to Ekayanake, Veeramacheneni and Moslares (2009), this can be written as follows:

$$IIT_{ij} = \sum_{i=1}^n w_{ij} \left[1 - \frac{|X_{ij} - M_{ij}|}{(X_{ij} + M_{ij})} \right], \text{ where } w_{ij} = \left[\frac{(X_{ij} + M_{ij})}{\sum_{i=1}^n (X_{ij} + M_{ij})} \right]$$

$$\text{Therefore, } IIT_j = \frac{\sum_{i=1}^n (X_{ij} + M_{ij}) - \sum_{i=1}^n |X_{ij} - M_{ij}|}{\sum (X_{ij} + M_{ij})} \quad (4.2)$$

In the above equation, n represents the number of industries at a given level of aggregation.

According to Davis (1995), traditional theories of trade based on perfect competition and constant return to scale such as theories of comparative advantage for long were regarded as insufficient to explain IIT. Focus was on scale economies as they lead to specialisation within the industry. Davis (1995) developed a model that explains the conditions for IIT from constant return to scale based on comparative advantage. His model took into consideration Ricardian and the Heckscher-Ohlin effects and he placed greater focus on scale economies and specialisation. Davis' model showed that since increasing return is associated with imperfect competition, it therefore attracts the attention of government acting to intervene in the market. On the other hand, constant returns have limited government intervention and promote a policy of free trade as free trade is more associated with perfect competition.

The Heckscher–Ohlin (HO) theorem and the imperfection competition model of trade have played an important role in describing IIT among developed countries at the time when IIT was more pronounced in the industrialised regions. Other theories like the Helpman (1987) theorem which gained enormous support from developed countries especially the OECD countries explained how the size of a group of countries and the similarities of these countries will determine the level of IIT. Unfortunately, these theories lacked the necessary empirical support to explain IIT between developing countries. The main problem with the Helpman Theorem is that it falls short of distinguishing OECD trade dominated by differentiated products from non OECD trade where differentiated products are not that prevalent (Debaere, 2005).

Lancaster (1980) applied the theory of a perfectly competitive monopolistic market to show how IIT does not only occur between economies having different comparative advantage but also with countries that are similar in size and structure. Trade in this market was mostly common with manufactured goods. Differences in comparative advantage could be attributed to differences in technology or factor endowment. The occurrence of IIT due to these differences can be less than that of IIT between countries with greater similarities.

Modern theories on IIT consider the existence of product differentiation; the presence of imperfect market structure and the existence of economies of scale (Al-Mawali, 2005). According to Bhagwati and Davis (1999), this can be explained by the close substitute in consumption and the factor-intensity in production. Close substitute, in this regard, refers to goods that are similar in consumption but differentiated in tastes and designs. Firms enjoying economies of scale within an industry tend to specialize in the production of a limited number of goods in order to achieve greater efficiency. For this reason, it is assumed that there is a positive relationship between the share of IIT and the degree of economies of scale in production (Clark, 2005). Monopolistic competition of trade became prominent in IIT because some economists found perfect competition to be inconsistent with the internal economies of scale (Clark, 2005).

Differences in tastes and differences in elasticity could also explain the existence of IIT. The differences in tastes could also be a reflection of the uniqueness of the different environments promoting IIT. Higher stages of economic integration such as a monetary and economic unions are assumed to witness a higher level of IIT. Higher level of IIT could lead to harmonisation of the business cycle among member states which can reduced the level of symmetric shocks (Dautovic, Orszaghova & Schudel, 2014).

Cukrowski and Aksen (2003) showed how it is also possible for IIT trade to take place in a perfectly competitive (PC) market characterised by the international exchange of identical products. This is made possible where risk-averse firms in a PC market prefer to diversify their products due to price uncertainty. Some trade theorists in the 1980s looked at IIT trade from the production side and analysed it using the factor intensity theory. The Heckscher-Ohlin-Samuelson factor proportion model was the driving force and dominant theory during that period.

4.4.2.1 The gravity equation of intra-industry trade

In a traditional gravity equation, bilateral trade is a positive function for the combined GDP and population between the two countries involved and negative of the distance separating the two countries (Martínez-Zarzoso & Nowak-Lehmann, 2003). The model is based on the assumption that trade between any two countries is linked to the supply conditions of the exporter and the importer's demand conditions. According to Anderson and van Wincoop

(2004), the traditional linear gravity model is commonly expressed in log form and estimated as follows:

$$\ln x_{ij} = k + \ln y_i + \ln y_j + (1 - \sigma)\rho \ln d_{ij} + (1 - \sigma) \ln b_{ij} - (1 - \sigma) \ln p_i - (1 - \sigma) \ln p_j \quad (4.3)$$

Where:

k is a constant

X_{ij} is the value of trade between country i to j ,

y_i and y_j are the GDP of the two countries involved in trade, one being the exporter's and the other the importer's GDP.

d_{ij} measures the distance between country i and country j and is a proxy for transport costs.

b_{ij} is a dummy variable for sharing a common border. It takes the value of 1 if both countries share a border and 0 otherwise.

σ represents the elasticity of substitution between all goods traded,

p_{ij} is for price of country i goods for country j consumers. The variables p_i and p_j signify the multilateral resistance terms. Prices of exports and imports differ between trading partners, and the price index is an indication of increased trade flow between trading partners. Accordingly, the more trade barriers are removed, the more member states in a particular trade bloc trade with each other.

e_{ij} is the error term (assumed to have a standard normal distribution).

In estimating the gravity equation, several methods have been used by researchers. There is no single method that is ideal as all of them have their advantages and disadvantages. The fixed effect panel data has been used by many authors. Though it is simple and controls for unobserved heterogeneity (Gómez-Herrera, 2013:1092), it is not as robust as the nonlinear least squares (NLS) estimator in identifying specification error (Anderson & Wincoop, 2003: 180) and the fixed effect also suffers from sample selection bias (Egger, 2000:26). But the NLS is also not robust to heteroskedasticity and it is also not free from sample selection bias.

Rose and van Wincoop (2001) use country-fixed effects to estimate the effect of a currency union on a set of countries, while Feenstra (2002:492) shows how a simple fixed effects method can be used to estimate consistencies in the border effect of trade across countries. This method enables unobserved price indices to be captured in the model. Another advantage of this method

is that, it takes into consideration differences in prices across countries and the fixed effects also capture omitted trade resistance variables (Péridy, 2005).

One of the latest techniques of estimation is that of Helpman, Melitz and Robinson. Helpman, Melitz and Rubinstein's (2008) theoretical and empirical model is robust to heteroskedasticity and also provides an explanation for the presence of zero trade flows between countries. According to Gómez-herrera (2013:1095), this method of estimation uses mostly cross sectional data and it is difficult to use panel data in such as estimation technique. Gomez-herrera goes further to show the extent to which other estimation techniques such as Poisson Pseudo and Gamma Pseudo maximum likelihoods proposed by other researchers seem to be unstable when using disaggregate data especially in the presence of heterogeneity.

Carrère (2004) applies an augmented gravity model to estimate the effects of RTA in Africa. Her technique uses a panel data set with the introduction of population and income per capita of the importer to take into consideration the Engel effects. It also takes cognisance of the differences in factor endowment. Carrere's (2004) estimation technique uses the fixed effect approach. This approach takes into consideration the unobserved price indices (Feenstra, 2002:502). The fixed effect explains differences in the price which are not captured in the price index across member states.

The equation is stated as follows:

$$\ln M_{ijt} = \gamma_0 + \gamma_1 \ln Y_{it} + \gamma_2 \ln Y_{jt} + \gamma_3 \ln N_{it} + \gamma_4 \ln N_{jt} + \gamma_5 \ln \theta_{ijt} + \gamma_6 \ln \bar{D}_i + \gamma_7 \ln E_{ijt} + \eta_{ijt} \quad (4.4)$$

M_{ijt} = quantity of imports from country i to country j at time t

$Y_{i(j)}$ = GDP of country i and j

$N_{i(j)t}$ = population of country $i(j)$

θ_{ijt} = transport cost between i and j . The coefficient γ_5 is expected to be negative

$\bar{D}_i$ = distance that separates the importer i from its trading partner j

E_{ijt} = bilateral real effective exchange rate, γ_7 is expected to be negative

Carrère (2006) estimates the barrier to trade cost function as a multilateral resistance between country i and j . This takes the following form:

$$\theta_{ij} = (D_{ij})^{\delta_1} (IN_i)^{\delta_2} (IN_j)^{\delta_3} [e^{\delta_4 L_{ij} + \delta_5 E_i + \delta_6 E_j}] \quad (4.5)$$

Where the expected signs are in the bracket.

D_{ij} is the distance between the two countries i and j ($\delta_1 > 0$)

L_{ij} is dummy variable for common border, that is 1 if i and j share common border, otherwise 0 and ($\delta_4 < 0$)

$E_{i(j)}$ is dummy variable for landlocked and 1 if the country $i(j)$ is landlocked; otherwise 0 ($\delta_5 > 0, \delta_6 > 0$)

$IN_{i(j)}$ = level of development in terms of infrastructure of country $i(j)$.

To avoid potential bias caused by differences in infrastructure and differences in costs of transportation between country i and country j , Carrere decided to model θ_{ij} as follows:

$$\ln \theta_{ijt} = \alpha_0 + [\alpha_1 \ln D_{ij} + \alpha_2 B_{ij}] + [\alpha_3 L_i + \alpha_4 \ln I_{it}] + [\alpha_5 L_j + \alpha_6 \ln I_{jt}] + \omega_{ijt} \quad (4.6)$$

D_{ij} = distance between i and j , the coefficient $\alpha_1 > 0$

B_{ij} = 1 if i and j share common border, otherwise 0, the coefficient $\alpha_2 < 0$

$L_{i(j)} = 1$ if country $i(j)$ is landlocked, otherwise 0, the coefficient $\alpha_{3(5)} > 0$

$I_{i(j)t} = \ln IN_{i(j)}$ above, $\alpha_{4(6)} < 0$

Substituting equation (4.6) in equation (4.4) yield the gravity equation as follows:

$$\begin{aligned} \ln M_{ijt} = & \beta_0 + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt} + \beta_3 \ln N_{it} + \beta_4 \ln N_{jt} + \beta_5 \ln D_{ij} + \beta_6 \ln \bar{D}_i + \\ & \beta_7 B_{ij} + \beta_8 L_i + \beta_9 \ln I_{it} + \beta_{10} L_j + \beta_{11} \ln I_{jt} + \beta_{12} \ln E_{ijt} + \eta_{ijt} \end{aligned} \quad (4.7)$$

The expected signs of the coefficients are as follows:

$$\begin{aligned} \beta_1 > 0, \beta_2 > 0, \beta_3 < 0, \beta_4 < 0, \beta_5 = \gamma_5 \cdot \alpha_1 < 0, \beta_6 > 0, \beta_7 = \gamma_5 \cdot \alpha_2 > 0, \beta_8 = \gamma_5 \cdot \alpha_3 < 0, \\ \beta_9 = \gamma_5 \cdot \alpha_4 > 0, \beta_{10} = \gamma_5 \cdot \alpha_5 < 0, \beta_{11} = \gamma_5 \cdot \alpha_6 > 0, \beta_{12} < 0 \end{aligned}$$

To conclude this section, a common currency has the ability to promote intra-industry trade as producers are forced to become more efficient in order to compete through differentiated products. Producers in the currency union compete with each other as the products are very similar. Prices are easily comparable which makes shopping easier for consumers to purchase

goods according to their preferences and tastes. The elimination of individual currencies in favour of a regional one increases transparency in cross border transactions, both for the individual consumers and producers. It also mitigates risks of exchange rates fluctuation and reduces transaction costs through the exchange of one currency to another.

Ideally, the above can be applicable to more developed regions like the EU, but not in the CEMAC region where production base is low and the transmission mechanism necessary for IIT to benefit from the common currency is missing. Members of the CEMAC customs union differ in both institutional and structural ways, making the benefits from a common currency to be negligible. For example, most of the region's most pressing challenges revolve around implementing structural reforms to promote sustainable and inclusive growth. Also, the central bank (BEAC) finds it challenging to accelerate the implementation of the 2011 decision of the Monetary Policy Committee to freeze and gradually eliminate the stock of central bank advances to governments (IMF, 2014). The extent and the speed in which the policy is implemented vary from one country to another in the region. Member states differ in their production orientation because of heavy reliance on natural resources making common regional policy challenging for the countries to experience a positive outcome.

4.4.2.2 Optimum Currency Area and intra-industry trade

From the point of view of the conventional Optimum Currency Area (OCA) theory, many researchers on bilateral trade have used the theory of optimum currency areas (OCA) developed by Mundell (1961), McKinnon (1963), and Kenen (1969) to analyse the costs and benefits of monetary union and IIT. These studies have mostly analysed the case of IIT of the European Monetary Union (EMU).

For member states to gain from the OCA criteria, the degree of openness within the member states must be high enough and the similarity of shocks and business cycles among member states must be aligned. Moreover, Mundell (1961) points at the importance of international factor mobility. Labour mobility must be high enough to facilitate adjustment to the adverse effects of asymmetric shocks and thus reduce the pressure for exchange rate adjustments. Product diversification is now included in the OCA theory when analysing intra-industry trade. Kennen (1969) notes that a country exporting highly diversified products is less vulnerable to sector-

specific shocks and that countries will less likely use their exchange rate as an adjustment tool when there is a large product spectrum.

The traditional approach to OCA also tries to single out certain economic characteristics that include similarity in rates of inflation and the degree of political and economic integration among countries in the monetary union. Fidrmuc (2004) shows how differences between rates of inflation among member states can cause a loss of competitiveness in high-inflation countries, which calls for external adjustments. Accordingly, a high degree of economic and policy integration before the formation of the monetary is likely to result in lower costs for the participating countries. The author concluded that the stronger the above-mentioned linkages between countries participating in a currency area, the greater the expected gains in the participating countries in trading in the different products categories.

A country's suitability for entry into a currency union depends on the extent to which domestic business cycles are correlated with those of the other countries in the union. Entry into a currency union may raise international trade linkages which can affect the nature of national business cycles. According to Frankel and Rose (1998), closer trade ties could result in countries becoming more specialised in the goods in which they have comparative advantage. The countries might then be more sensitive to industry-specific shocks, resulting in more idiosyncratic business cycles. However, if intra-industry trade accounts for most trade, then business cycles may become more similar across countries when countries trade more. Increased integration may result in more highly correlated business cycles because of intra-industry trade.

4.5 Research Methodology

This section explains the estimation technique and the process of data collection. The first part explains the econometric technique used in analysing the data. We apply an augmented gravity model to analyse the pattern of CEMAC IIT at the individual sectors during the 1995-2015 time frame. The model is applied for a total of ten product categories³⁹ and the model is estimated using the ordinary least square (OLS). We use a panel data model with fixed effects techniques to estimate the gravity equation. The second part describes the data used in estimation and also explains the sources of the data.

³⁹ That is sector 0 to sector 10 of the SICT method of classification

4.5.1 Model specifications

As a complement to the descriptive statistics in section 4.2, we analyse further our data in this section using regression analysis to quantify the sensitivity of CEMAC intra-industry trade as well as its relationship to common currency integration. We convert the model introduced in section 4.4.2.1 into our empirical model below which is then used to get our results presented in section 4.6.

In analysing the pattern of IIT, the Kandogan (2003) method of estimation is used to derive the dependent variable. This model is derived directly from the definition of IIT. The values of exports and imports play an important role in the estimation technique. Export and import values are aggregated at two different levels. Higher level of aggregation signifies industries while lower level of aggregation signifies the products produced in each industry. The values of export and import are given as follows:

$$X_i = \sum_p X_{ip} , \quad M_i = \sum_p M_{ip} \quad (4.8)$$

Where X_{ip} and M_{ip} are the values of export and import of good p in industry i .

Accordingly, for goods P in industry i , total trade (TT) and intra-industry trade (IIT) is given as:

$$TT_i = \sum_p X_{ip} + M_{ip} = X_i + M_i \quad (4.9)$$

$$IIT_i = TT_i - |X_i - M_i| \quad (4.10)$$

The expression $|X_i - M_i|$ means absolute value of the trade balance.

Where:

M_j = imports of the j th industry

X_j = exports of the j th industry.

We estimate CEMAC IIT at one digit industry level, applying different equations for each sector. In doing this, we are able to see how over time, the flow of IIT in the CEMAC customs union has been affected since its formation in 1994.

In estimating the gravity equation for IIT, Anderson and van Wincoop (2004) came up with the following equation:

$$X_{ij}^k = \sum_i \left(\frac{t_{ij}^k}{P_j^k \Pi_i^k} \right)^{1-\sigma^k} \frac{E_j^k Y_i^k}{Y^k} \quad (4.11)$$

$$(\Pi_{ij}^k)^{1-\sigma^k} = \sum_j \left(\frac{t_{ij}^k}{P_j^k} \right)^{1-\sigma^k} \frac{E_j^k}{Y^k} \quad (4.12)$$

$$t_{ij}^k = D_{ij} r_{ij}^k e^{Lang} e^{Border} \quad (4.13)$$

From equation (4.13):

D_{ij} = distance between country i and country j

r_{ij}^k = tariff and non-tariff barriers for exports of sector k from country i to country j

ℓ = dummy variables for common border or common language.

From equation (4.12)

$$(P_j^k)^{1-\sigma^k} = \sum_i \left(\frac{t_{ij}^k}{\Pi_i^k} \right)^{1-\sigma^k} \frac{Y_i^k}{Y^k} \quad (4.14)$$

We divide equation (4.11) by $E_j^k Y_i^k$ and take the logarithms, we have the following equation.

$$\ln \left(\frac{X_{ij}^k}{E_j^k Y_j^k} \right) = -\ln Y^k + \ln N_{ij} + (1-\sigma^k) \ln t_{ij}^k - (1-\sigma^k) \ln P_j^k - (1-\sigma^k) \ln \Pi_i^k \quad (4.15)$$

Where X_{ij}^k = value of sector k ($k = 0, 1, 2, \dots, n$) exports from country i to country j

Y^k is world output in sector k commodities.

E_j^k = value of country j exports from sector k

Y_i^k = Total expenditure on sector k commodities by country i

t_{ij}^k = trade costs⁴⁰ for sector k between country i and j

$(1 - \sigma^k)$ = elasticity of substitution between all goods traded in sector k

According to Anderson and van Wincoop (2004), trade barriers determine the level of bilateral trade. The two indices P_j^k and Π_i^k indicate the outward and inward multilateral resistance and can be solved as a function of trade costs with t_{ij}^k and $E_j^k Y_i^k$.

$\ln\left(\frac{X_{ij}^k}{E_j^k Y_j^k}\right)$ in equation (4.15) is then normalised to $\ln(X_{ij})$.

Equation (4.15) then becomes:

$$\ln(\ln X_{ij}) = -\ln Y^k + \ln N_{ij} + (1 - \sigma^k) \ln t_{ij}^k - (1 - \sigma^k) \ln P_j^k - (1 - \sigma^k) \ln \Pi_i^k \quad (4.16)$$

N_{ij} represents the supply and demand capacity and is often proxied by both the exporter and importer GDP.

P_j^k = inward resistance term and it takes into consideration the rise of sector k imports from country j .

Π_i^k = outward resistance term. This takes into consideration the impact of trade costs for sector k imports from country i

The regression uses a fixed effects panel data model. In this model, a time fixed effect variable is included to control for any sudden increase in trade due to oil price (Rose & van Wincoop, 2001). According to Alturki (2007), a panel data estimator should include within estimator in order to capture heterogeneity of the sample over time.

⁴⁰ These costs include but are not limited to transport, tariffs, differences in language and other non-tariff barriers between country i and country j

When we include t_{ij}^k (trade costs for sector k between country i and j), the different fixed effects and other controlled variables, the regression equation (4.16) then becomes:

$$\ln X_{ijt}^k = \alpha_0^k + \alpha_1^k \ln GDP_{it} + \alpha_2^k \ln GDP_{jt} + \alpha_3^k \ln D_{ij} + \alpha_4^k Pop_{ij} + \alpha_5^k CMAC_{ijt} + \alpha_6^k Border_{ij} + \alpha_7^k Lang_{ij} + \alpha_8^k Locked_{ij} + \alpha_9^k Ccol_{ij} + \lambda_t + \pi_i + \sigma_j + \varepsilon_{ijt} \quad (4.17)$$

Where:

X_{ijt}^k is the nominal value of exports in sector k from i to j in current US dollars, GDP denotes gross domestic product for country i and country j , D_{ij} is the distance between the exporter i and importer j , Pop_{ij} is the population of both country i and country j , $CMAC_{ijt}$ is a binary variable that takes the value of one if both the exporter and importer are members of CEMAC union, $Border_{ij}$ is another binary variable that takes the value of one if both countries share a common border or zero otherwise, $Lang_{ij}$ is a dummy variable that takes a value of one if country i and j speak the same official language and zero otherwise, $Locked_{ij}$ is a dummy variable if either or both countries are landlocked and zero otherwise, $Ccol_{ij}$ is a dummy variable if either one or both countries were previously colonised by the same coloniser and zero otherwise, λ_t is time effect, π_i is exporter fixed effect variable that takes the value of one if country i is the exporter and zero otherwise, σ_j is the importer fixed effect and takes the value of one if country j is the importer and zero otherwise and ε_{ijt} is the error term.

We regressed the explanatory variables against each trade sector of the SITC 1 classification. These methods tell us how each trade sector in the CEMAC region is affected by the explanatory variables. We expect the coefficients α_1 and α_2 to be positive since a higher level of production increases the quantity of goods available for exports and high income importing countries will likely import more goods. Although, we expect the coefficient α_3 to be negative in most instances. The theory assumes that the longer the distance between the trading partners,

the lower the volume of trade between them which is an indication of transport costs. The coefficient α_4 , can either be negative or positive. This depends on whether the country enjoys economies of scale by exporting more when it is large in size or exporting less as a result of high level of domestic goods being consumed locally (Martínez-Zarzoso & Nowak-Lehmann, 2003).

The coefficient α_5 is expected to be greater than 0 as any form of trade agreement increases trade as it eliminates tariffs among member states. The coefficients α_6 and α_7 are expected to be greater than zero. Common borders reduce trade costs as exporters do not need to go through numerous borders and a common language tends to facilitate communication when trade takes place. This is also true for $\alpha_9 > 0$ if the two trading partners were colonised by the same colonial master. Lastly, α_8 is expected to be negative as landlocked countries tend to trade less. This is because they do not have access to the sea directly and have to go through another country to export most of their produce.

4.5.2 Data Sources

In order to estimate the disaggregated data, that is, trade data broken down in component parts, data for the different sectors and product categories in the economy must be available. Due to the limitation posed by non-availability of relevant information and data, the study uses average trade data for the periods 1995-1999, 2000-2005, 2006-2010 and 2011-2015⁴¹. The advantage of using average data is that the total value is spread across all observations and the separate areas are reconfigured into one big area. This is supplemented with data from the World Bank, the World Trade Organisation (WTO), the *Centre "d'Etudes Prospectives et d'Informations Internationales"* (CEPII) data, and the Penn World table. We use panel data for the six member states of the CEMAC customs union (Cameroon, Chad, Central African Republic, Republic of Congo, Equatorial Guinea and Gabon) and the region's main trading partners over the period 1995– 2013. The choice of the time frame is due to the availability of data. The data for exports, imports and GDP are in thousands of current price (US Dollars). Our four-year average

⁴¹ Data is derived from the United Nations Conference for Trade and Industry (UNCTAD) statistic database

smooths out any problem that might arise due to unreported or misallocated data (Alawadhi, 2014).

The variables used in this chapter are:

Exports per sector (X_{ij}): Annual data from 1995-2013 and this represents the value of exports for the six member states in the CEMAC region. The value of export is normally expressed in nominal dollar prices. We considered exports for ten trade sectors at the first-digit level of aggregation of the Standard International Trade Classification. The sectors are food and live animals (sector 0), beverages and tobacco (sector 1), crude material, except fuels (sector 2), mineral fuels, lubricants and related materials (sector 3), animal and vegetable oils and fat (sector 4), chemicals (sector 5), manufactured goods (sector 6), machinery and transport equipment (sector 7) and miscellaneous manufactured articles (sector 8) and commodities and transactions (sector 9). Main source of export values are derived from the UNCTAD and WTO Statistics databases.

Gross Domestic Products (Y_i): The GDP of both the exporter and importer are used as a proxy to determine the level of growth. The datasets are derived from the World Bank Statistics database.

Size of a country (Pop_i): The coefficient for population tends to be negative assuming that small countries tend to trade more with other countries since they find it difficult to enjoy economies of scale comparable to countries with large populations. Although these large countries trade more with trading partners in absolute terms, they tend to find more markets within the border of their country. As a result, total cross border trade is less in percentage of total GDP. The data on population is derived from the Penn World table (PWT) version 7.1.

Distance ($Dist_{ij}$): Distance between trading partners is frequently used as a proxy for transaction costs. According to Frankel (1997), distance is usually the capital city of the countries, but in a case where the capital city is not the main business hub or economic capital, the city having the most economic activities and where the main airport and seaport are located will be considered. The great circle distance formula is used to measure the distance between the two cities as it uses both the latitudes and longitudes (Minondo & Requena, 2013: 12). The further away two countries are, the lesser the bilateral trade between the two countries. Data

on distance is derived from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII) Geo-distance database.

Dummy variable ($CEMAC_{ij}$): if the exporter and importer are members of the CEMAC customs union. It takes the value of one if trading partners are members of the customs union and zero otherwise.

Dummy variable ($contiguity$) for common border: According to Frankel (1997:71), since the gravity equation is normally expressed in logarithm form, the best way to express a dummy variable is to take its exponent. The variable takes the value of one if the two countries included in the model share a common border and zero otherwise.

For common language ($Lang_{ij}$): In the case of CEMAC, we allowed for French and Spanish. Five of the member states were colonized by France and only one country in the region, that is Equatorial Guinea, was colonised by Spain. There is need to allow countries that speak more than one official language. This is the example of Cameroon that was colonized both by the French and British and therefore has a linguistic connection with both France and England. The variable takes the value of one if country i and country j share a common official language and zero otherwise.

For landlocked countries ($LLock_{ij}$): Two of the countries in question; Chad and Central African Republic are landlocked while the other four countries share a marine coastline. The variable takes the value of one if either one or both countries in the equation are landlocked otherwise zero for countries with a marine coastline.

γ_i is the multilateral resistance variable and takes the value one if country i is the exporter and zero otherwise.

ϕ_j is the multilateral resistance and takes the value one if country j is the importer and zero otherwise.

4.6 Empirical Results

The summary statistics of variables used in the analyses is shown in table 4.1. The descriptive statistics are employed to present quantitative descriptions of the data, showing the mean, standard deviation and the maximum and minimum values and ratios of the variables used in the regression.

Table 4.1 Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
lTotal_prds	477	8.704884	3.357056	-.0294288	16.49225
lgdp_exp	627	8.792984	1.0289	6.216218	11.05567
lgdp_imp	627	9.256971	2.245306	6.216218	16.76627
ldist	627	7.009181	.7623842	5.861656	9.35078
landlocked	627	.3030303	.4599351	0	1
border	627	.5454545	.4983271	0	1
comlang	627	.5151515	.5001694	0	1
CEMAC	627	.9090909	.2877093	0	1

4.6.1 Baseline results

The regression results of total intra-industry CEMAC exports at the aggregate level are presented in table 4.2. The benchmark results in table 4.2 shows the consequences of omitting the multilateral resistance term. We solve this problem by introducing the fixed effects model. On one hand, the fixed effects models are sometimes considered the gold standard in empirical research as they have the capability to identify a causal effect and allow for correlation of traditionally unobserved factors (Schurer & Yong, 2012). On the other hand, the random effects model tends to suffer under heterogeneity bias as the assumption of the independence of the covariates and residuals is not satisfied (Prehn, Brümmer & Glauben, 2016).

Three dummies are introduced to represent the different fixed effects. The first two are the countries fixed effect dummies, one for the exporter and the other for the importer. The third is the time dummy which represents the year fixed effects. Country dummies remove cross-

section bias between the unobservable term and the included variables (Cipollina & Salvatici, 2012).

Table 4.2: Baseline results of total IIT exports

	Main Results(benchmark)				
Dependent variable: Log of Export volume	Without Fixed Effects (1)	Fixed Effects (2)	Fixed Effects (3)	Fixed Effects (4)	Fixed Effects (5)
lgdp_exp	1.17***	0.76***	0.94***	0.25	0.37
	(0.16)	(0.17)	(0.33)	(0.45)	(0.42)
lgdp_imp	0.46***	0.25***	1.46***	0.92***	0.88***
	(0.09)	(0.09)	(0.26)	(0.32)	(0.28)
ldist	-0.59***	-0.62***	-3.89***	-3.89***	-0.48
	(0.23)	(0.24)	(0.80)	(0.77)	(0.90)
Border	2.66***	2.84***	0.22	0.26	1.48***
	(0.24)	(0.22)	(0.58)	(0.55)	(0.56)
comlang	-0.58***	-0.62***	-0.95	-1.04	-4.77***
	(0.19)	(0.18)	(0.58)	(0.64)	(0.79)
CEMAC	-4.46***	-6.85***	0.00	0.00	0.00
	(0.92)	(0.95)	(.)	(.)	(.)
Constant	0.91	8.53**	17.99**	33.80***	1.15
	(3.63)	(3.70)	(8.79)	(10.36)	(4.82)
Country Specific Dummy	No	No	Yes	Yes	No
Year Dummy	No	Yes	No	Yes	Yes
Country Pair Dummy	No	No	No	No	Yes

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: *Significant at 10%; ** significant at 5%; and *** significant at 1%

In table 4.2, all the coefficients have expected signs except for common language (comlang) that is negative. The reason for the negative result is because of the differences in official languages spoken in the region. The official language in Equatorial Guinea is Spanish and English is also widely spoken in Cameroon. Another reason for the negativity is that each country in the CEMAC region has many native languages that are unique and different from each other and these are the main languages used in the market place and sometimes in border

trade. In column 3, 4 and 5 in table 4.2, CEMAC dummy coefficients equal to zero when we include country and year fixed effects (columns 3, 4 and 5). This shows that some pairs of countries do not trade with each other. According to Silva and Tenreyro (2006), the zero observations pose no problem in the equation especially in their multiplicative form. Without fixed effects, the CEMAC dummy has a negative relationship with intra-industry trade. This implies that since the establishment of CEMAC in 1994, the policy change that took place has not managed to create a favourable environment where member states can benefit from increased flow of IIT.

Table 4.3 shows the fixed effect regression results of CEMAC total gross exports and the exports from the three major sectors in the region. From table 4.3, the GDPs of CEMAC member states are insignificant in determining the trade flow of agricultural raw materials and fuels (A02 and A04). Instead, the GDPs of the importers are significant at one percent for all products and fuels and five percent significant for manufacture. As the GDPs of importers increase, so too is the increase in exports of fuels and manufactured goods. There is a positive relationship between the GDPs of importers and the exports of fuels and manufactured goods. The coefficients for agricultural products are mostly insignificant except the variable landlocked which is significant and negative. The coefficient for common border (contig)⁴² is significant and positive. The distance coefficients are negative and statistically significant for total products, fuel and manufactured foods and insignificant for agriculture. This suggests that the greater the distance between trading partners, the lesser the degree of trade between these countries. Surprisingly, the landlocked coefficients are positive except for agriculture which tells us that landlocked states in the CEMAC region tend to trade less in agriculture.

⁴² contig appears in the regression table representing common border

Table 4.3: Total products and major sectors (fixed effects)

	Total	A02	A04	A12
	All Products	Agriculture	Fuels	Manufacture
lgdp_exp	0.58** (0.23)	0.22 (0.26)	0.72 (0.47)	0.53** (0.23)
lgdp_imp	1.44*** (0.31)	0.57 (0.37)	1.23*** (0.37)	0.77** (0.31)
ldist	-1.61*** (0.32)	0.57 (0.51)	-0.15 (1.00)	-0.76** (0.33)
landlocked	2.42*** (0.47)	-2.17* (1.20)	1.41* (0.81)	1.01* (0.61)
contig	1.32*** (0.25)	1.63*** (0.53)	2.33*** (0.76)	2.17*** (0.27)
comlang	-0.80*** (0.20)	-0.37 (0.26)	-0.72 (0.49)	-1.41*** (0.22)
Constant	1.23 (4.38)	-7.64 (5.45)	-12.74 (12.32)	-2.87 (4.17)
Observations	1155	821	638	1092
Adjusted R ²	0.750	0.743	0.655	0.658

Standard errors in parentheses

* p < 0.10, ** p < 0.05, *** p < 0.01

Note: *Significant at 10%; ** significant at 5%; and *** significant at 1%

From table 4.3 above, total products, fuels and manufactured goods have positive signs. The two landlocked countries in the CEMAC region (Chad and CAR) trade more with member states. The common border coefficients are positive and significant at five percent indicating that countries sharing common borders do not have to go through many borders and this reduces trade costs. Despite the fact that the official language of most member states is French, the coefficients are all negative and that of agricultural raw materials and fuels are insignificant. As mentioned earlier, the market language (medium of communication) in the CEMAC region differs from one country to another. The fact that member states use mostly the local languages and in some cases local dialects to communicate in the market place makes trade less successful between the trading partners.

More attention is paid to the specific product sectors in table 4.4. This table shows the regression results of the disaggregated data at one digit SITC level of the different product categories.

Table 4.4: Regression results by product category

	0	1	2	3	4
	Food & Live	Beverages & tobacco	Crude Materials	Mineral fuels	Animal & Vegetable
lgdp_exp	-0.75** (0.34)	-2.15*** (0.56)	0.25 (0.26)	0.72 (0.47)	0.35 (1.16)
lgdp_imp	1.19*** (0.35)	0.61 (0.50)	0.81** (0.40)	1.23*** (0.37)	-0.54 (0.48)
ldist	3.29*** (0.63)	-4.67*** (0.93)	-0.45 (0.42)	-0.15 (1.00)	-4.32*** (1.65)
landlocked	0.49 (0.86)	-1.10 (1.26)	-0.85* (0.50)	-1.41* (0.81)	-4.01* (2.40)
contig	2.47*** (0.47)	-1.44** (0.70)	1.49*** (0.38)	2.33*** (0.76)	-3.07* (1.63)
comlang	-1.15** (0.46)	0.49 (0.73)	-0.41* (0.23)	-0.72 (0.49)	-1.88 (1.20)
Constant	-28.30*** (8.56)	52.09*** (8.93)	-4.66 (7.15)	-12.74 (12.32)	56.42*** (20.49)
Observations	716	476	897	638	287
Adjusted R^2	0.594	0.328	0.755	0.655	0.408

Standard errors in
parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: *Significant at 10%; ** significant at 5% and *** significant at 1%

Figure 4. 4: Regression results by product category (continuation)

	5	6	7	8	9
	Chemicals	Manu goods	Machine & Trans	Misc.	Commo dities
lgdp_exp	2.19*** (0.38)	0.46* (0.25)	-0.04 (0.30)	0.03 (0.31)	1.18** (0.49)
lgdp_imp	-0.19 (0.29)	0.03 (0.27)	0.34 (0.24)	0.89*** (0.30)	-1.08 (0.95)
ldist	-1.03** (0.52)	-0.92** (0.43)	-1.69*** (0.41)	-0.74* (0.42)	1.75** (0.84)
landlocked	-0.92 (0.77)	0.25 (0.56)	-1.78*** (0.67)	0.88 (0.65)	0.43 (1.37)
contig	3.30*** (0.48)	2.31*** (0.33)	0.83** (0.33)	1.60*** (0.32)	1.18* (0.68)
comlang	-2.26*** (0.37)	-0.86*** (0.25)	-1.15*** (0.26)	0.32 (0.28)	-1.87*** (0.61)
Constant	2.53 (7.89)	14.79** (6.24)	10.36** (4.57)	0.51 (5.07)	1.64 (16.52)
Observations	729	965	967	877	469
Adjusted R^2	0.528	0.614	0.629	0.570	0.468

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: *Significant at 10%; ** significant at 5% and *** significant at 1%

From table 4.4, the exporter GDP is negative and significant at five and one percent level for SICT 0 (food and live animals) and SITC 1 (beverages and tobacco). This suggests that as CEMAC member states GDPs increase, IIT of SITC 0 and SITC 1 does not increase as

expected. One reason is that as the GDP of these states increases, they tend to import more goods from non-member states. For SITC 2 (crude materials, except fuels), SITC 3 (mineral fuels, lubricants and related materials) and SITC 4 (animal and vegetable oils, fats and waxes), the coefficients are all insignificant. Most importer coefficients are positive except SITC 1 and SITC 4. This implies that as the GDP of CEMAC trading partner's increases, it positively affects their demand for SITC 0 and SITC 1 products.

The distance coefficients in table 4.4 is negative and significant for SITC 1 and SITC 4 as supported by the Anderson and van Wincoop (2003) model. Surprisingly, the coefficient for distance in SITC 0 deviates from what the gravity model stipulates; geographical distance as an indicator of trade costs is inversely proportional between two countries. To explain this unusual phenomenon, other factors that determine the type of primary goods and in our case the amount of food and live animals (SITC 0) traded must be considered. The most important of these factors is differences in climate which govern the type of goods produced. According to Wu (2015), when trading partners are neighbours and if they have similar climatic conditions, farmers in these two countries will likely grow similar crops that are suitable to this particular climate and there will be no comparative advantage of one country over the other in growing and trading of that particular crop. For these reasons, incentives to trade with each other are minimal, notwithstanding the fact that these countries share the same border and are very close to each other. Food and live animal (SITC 0) products fall into this category and the argument put forward is that the distance coefficient is positive as countries further away from CEMAC will likely buy more of their products given the fact that importer GDP is positive.

The dummy coefficients for landlocked countries is insignificant for sectors 0, 1, 5, 6, 8 and 9, while it is significant and negative for sectors 2, 3, 4 and 7 in table 4.4. This implies that CEMAC member states that are landlocked tend to trade less in sector 2, 3, 4 and 7 products. For common border (contig), the coefficients are significant and positive for the nine out of ten sectors. Only sector 1 (beverages and tobacco) coefficient is significant and negative at five percent. This denotes that common borders have no positive effects on sector 1 products. The common language dummy coefficients are significant and negative for most of the product categories except sectors 1, 3, 4 and 8 that are insignificant. This implies common language has no effect on trade in beverages and tobacco (sector 1), mineral fuels (sector 3), animals and vegetables (sector 4) and miscellaneous manufactured articles (sector 8). For sectors 0, 2, 5, 6,

7 and 9, the coefficients for common language (comlang) are significant and negative suggesting that having a common language has not benefited trade in these sectors since 1995. The negative impact is as a result of the fact that CEMAC countries export a high percentage of these products to other countries and trade very little among themselves in sector 0, 2, 5, 6, 7 and 9 products. Low industrialisation in the CEMAC regions, makes trade in these sectors less attractive.

4.6.2 Sensitivity analysis

The discussion in this section showcases the results of how individual member states of the CEMAC customs union have contributed to the CEMAC IIT. The results are shown in table 1C and table 2C in appendix C. Table 1C shows the individual country sensitivity to total products and the three major sectors in the CEMAC region (agricultural raw materials, fuels and manufactured goods). The exporters' coefficients for total products are all positive and significant except for Chad (TCD), where we see that the exporter's coefficient is insignificant. One reason for the insignificant coefficients for Chad is that during the time frame, Chad exports of these products to member states were mostly zero. This is also true for the agriculture sector and manufactured goods. The fuels coefficient for Chad is positive and significant at one percent indicating the boom in fuel exports that started in the late 1990s due to the discovery of oil in the country and political stability that Chad started to enjoy during the time frame.

The exporters' coefficients for fuels and manufactured goods are positive and significant except for the agricultural materials coefficient, which is negative and significant. This demonstrates that exports in agricultural material from the CEMAC region are negligible. The negative effect is highly significant for Equatorial Guinea (GNQ) and least for Cameroon (CRM).

The second half of table 1C shows the importer's effects. The importers are CEMAC member states, trade blocs in Africa and their main trading partners. For total products, the coefficients for CEMAC member states as importers are all negative and highly significant at one percent. This indicates that CEMAC IIT for total products has been on average negative. Non-CEMAC countries and regions such as China (CHN), India and the European Union (EU) are the main importers of products from the CEMAC region and their imports from the region are statistically significant. This is in line with the descriptive statistic in section 4.2 which highlights China, the EU and India as CEMAC's main trading partners. CEMAC trade with

other regional trade blocs in Africa is either negative or insignificant. For example, individual countries in the CEMAC region trading activities with COMESA and ECOWAS is insignificant. It is statistically significant and negative with the EAC for total products.

A closer look at agricultural materials, fuels and manufactured goods indicates a similar pattern. China, EU and India are still the main importers of goods from these sectors. In Africa, the coefficients for COMESA and ECOWAS are positive for agricultural products. It is also significant at 10 percent for Chad. This implies that Chad imports of agricultural produce from other CEMAC member states are statistically significant. This is also true for COMESA and ECOWAS. For trade in fuels, none of the CEMAC member states or trade blocs in Africa is contributing positively to the region's exports. For manufactured goods, only ECOWAS and EU imports from CEMAC are significant and positive with the EU accounting for the highest increase. The Economic Partnership Agreements (EPA) between the CEMAC countries and the European Union is one of the reasons why the coefficients are positive and significant. The goods exported to the EU are mostly light manufacturing that relate to wood and cotton products. But there is very little diversification, especially in manufacturing in the region. Of the six members only Cameroon has a significant industrial base.

The distance coefficients from table 1C (ldist) are negative and statistically significant for total products and manufactured goods. Agricultural raw materials are insignificant and positive while the distance coefficient for fuels is negative and insignificant. The distance coefficient tends to be more sensitive for total products and manufactured goods when we include individual member states. The sensitivity of the distance coefficient follows Anderson and van Wincoop's (2004) model, which states that trade between member states are inversely proportional with distance. The landlocked coefficient is positive and significant for total products and manufactured goods but negative for agricultural raw materials. This suggests that CEMAC landlocked countries trade less in agricultural raw materials with member states on average, but that trade in total products and manufactured goods are positive. Border coefficients are positive and highly significant at one percent. The results suggest that when we include individual countries, border effects become more sensitive indicating increases in trade among countries that share a common border. The language coefficients are negative and significant at one percent for total products and manufactured goods. This demonstrates that member states in the CEMAC region do not take advantage of the common language in cross

border trade in manufactured goods. For agricultural materials and fuels, the effects of a common language are mostly insignificant.

To extend our test of sensitivity, we ran another set of regressions to see how the individual countries respond to the different product categories (sectors 0-9). This is shown in table 2C in appendix C. For the exporters' effects in the different sectors, the coefficients for sector 0 products are positive and significant for Central African Republic (CAR) and Cameroon (CRM). For Equatorial Guinea (GNQ) and Chad (TCD), the coefficients are negative and statistically significant. The coefficient for Gabon is insignificant and positive. This suggests that Central African Republic and Cameroon exports of sector 0 products are significant while Equatorial Guinea and Chad exports of sector 0 after 1994 are negative.

Trade in sector 4 products (Animal and vegetable oils, fats and waxes) is statistically significant and negative for Congo (COG), Gabon (GAB) and Equatorial Guinea (GNQ) or statistically insignificant for Central African Republic (CAR), Cameroon (CRM) and Chad (TCD). The coefficients are positive and significant for most of the sectors for CAR except for sector 2, 4 and 9 that are insignificant. These findings indicate that since 1995, exports from CAR have been significant in some of the sectors, while few have been insignificant. In the Republic of Congo, exports from most of the sectors (sectors 0, 1, 2 and 9) are insignificant while the coefficient for sector 4 is negative and statistically significant. This is an indication that on average, Congo is not performing well in animal and vegetable oils, fats and waxes exports. Cameroon is performing relatively well in terms of exports to its CEMAC counterparts except for sector 4 products that are negative. The coefficient for mineral fuels is highly significant for Gabon. Though sectors 5, 6, 7 and 8 are also positive and significant for Gabon as seen in table 2C. Gabon's sector 3 exports outweighs the other sectors, indicating that mineral fuels exports are a major contributor to Gabon's export revenue. It is also clear from table 2C that Chad and Equatorial Guinea also depend solely on a single sector (Mineral fuels).

The second part of table 2C shows the results of the importer's effects. The coefficients for most CEMAC member states are negative for most of the sectors. This is an indication that CEMAC countries do not import from fellow member states and this phenomenon explains why IIT in the region is exceptionally low compared to CEMAC's African counterparts. The few exceptions are sector 0 (Food and live animals) and sector 9 (Commodities and transactions) where imports by member states in the CEMAC region have been statistically

significant and positive. From table 2C, the main importers of goods from the different sectors are China, India and the EU. Sector 0, 2 and 9 coefficients are significant and positive for COMESA and negative for sector 1. This suggests that, to an extent, COMESA imports sector 0, 2 and 9 products from the CEMAC region but her contribution to sector 1 products are negligible. EAC on average contribute positively only to sector 0 but negatively to sector 1, 3 and 6 products. This implies that over time, EAC imports from CEMAC region has been decreasing. ECOWAS imports from CEMAC is positive and significant only in two product categories (sector 0 and 9). The other eight sectors are statistically insignificant.

Lastly, the coefficients of the dummy variables in table 2C do not have the expected signs as assumed by the gravity model. For example, the distance (*ldist*) coefficients have both the positive and negative signs for the different sectors. Based on the different sectors specification, the distance coefficients for sector 0 and 9 are positive and statistically significant but negative for sector 1, 4, 5, 6, 7 and 8. The coefficients for landlocked countries are mostly statistically insignificant except for sector 4, 7 and 8. Surprisingly, the coefficients for sector 7 and sector 8 are positive indicating that CEMAC countries along the coastline do not trade more in these sectors and that some of the landlocked countries trade more in sector 7 and 8. The border coefficients are mostly positive but negative for sector 1 and sector 4 implying that in some instances, member states sharing a common border trade less in sector 1 and 4 products compared with the rest of the world. Common language coefficients on average are negative and statistically significant for most of the sectors except sectors 1, 3 and 8 that are insignificant but have a negative sign. This is in line with tables 1C and 2C where the common official language, French, is not contributing positively to intra-industry trade in the CEMAC region.

4.7 Conclusions

This chapter provides empirical evidence and insights into how poorly CEMAC has performed over time in terms of intra-industry trade (IIT). The objective of this chapter is three fold: (i) analyse IIT flow in the CEMAC region between 1995 and 2015; (ii) examine how each sector responded to IIT flows; and (iii) evaluate how individual member states have contributed to the region's growth in IIT. Different applications of an augmented gravity model by Anderson and van Wincoop (2004) are used to analyse CEMAC IIT at the first digit level of aggregation of the SITC revision 1 classification system. A panel fixed effect model is adopted to analyse the bilateral trade of the six member states of CEMAC customs union and its main trading

partners for the period 1995 to 2013. The chapter used both descriptive statistics and regression equations; the results are showed in table 1C and 2C. The results reveal how the GDPs of both exporters and importers are important in determining the flow of IIT in most sectors. The model seeks to explain why the distance coefficient is positive in some instances. Similar climatic condition in the production of food and live animal give no single country in the CEMAC region a comparative advantage to trade with each other.

Another interesting finding is the common language coefficients that have a negative impact on CEMAC IIT. The gravity model basically assumed that trading partners that share a common language tend to trade more with each other. But this is not always the case for CEMAC member states according to the findings. Despite the fact that five out of six countries in the CEMAC region use French as official language, the analysis points out that, common language has not benefited the flow of the region's IIT. Though, language is an important tool in intra-industry trade as it can act as a vehicle to transmit cultural values, the CEMAC case is different as there are hundreds of languages spoken in the region and they differ from one country to another.

CEMAC IIT in most of the sectors has been negative with very few exceptions. On average, the CEMAC region has not done a good job in promoting IIT. The sensitivity analysis shows how member states' imports from the region have been negative in most sectors and negligible in others. Cameroon is the only country in the region that trades more with other member states and has shown significant results in sector 0 in particular. The results also show that only sector 3 (mineral fuels) exports is significant and positive for Chad and Equatorial Guinea. This is true as these two countries depend mainly on the exports for fuel and petroleum products (UNECA, 2015).

4.8 Policy Implications and Recommendations

The CEMAC region has not benefited from IIT and the level of IIT is negligible and insignificant in most cases. The region is still to address and institutionalise sustainable solutions to numerous challenges ranging from poor transportation networks to haphazard policies in member states. The results in section 4.6 show that since 1995, intra-industry trade has not reaped the expected benefits of increased sectoral trade flow.

The sensitivity results also show that the contribution of the individual sectors to the flow of IIT differs from one country to another. In table 2C, for example, the CEMAC region is not doing well in terms of trade in sector 1 products (beverages and tobacco). The coefficients for both the exporters and importers are either negative or insignificant. Only Central African Republic's (CAR) exports from this sector are significant. Also, the export of mineral fuels, lubricants and related materials (sector 3) is statistically significant across member states. This implies that sector 3 is one of the most important sectors in the region. Policy makers in the CEMAC region should continue to invest in this sector so as to boost export revenue. The revenue from this sector should be used to diversify the economy and promote other sectors such as transport and other infrastructural projects of economic importance in the medium to long term.

The results also show how intra-industry trade is low in the CEMAC region because exports from the different sectors are not demanded by member states in the region. On average, the EU, China and India are the most important CEMAC trading partners. Table 2C shows that only sector 0 products are significant in promoting CEMAC IIT. Cameroon is a major player in the region in terms of its economic performance and high population. Therefore, Cameroon policy makers should play a leading role in working with the other CEMAC governments to initiate projects that will boost trade in the region.

As a main policy implication, our work suggests that the gains in intra-industry trade from the specific sectors would follow that the CEMAC customs union could be enhanced by adding value to the extractive industry. By so doing, member states can demand the finished products from other member states. This will further reduce their economic dissimilarities with respect to the existing common currency. Though literature in IIT shows that higher range of IIT should ultimately raise the benefits and reduce the costs of economies in the monetary union. In this paper, The analysis shows that despite similarities in trade structures of the CEMAC economies, IIT trade remains low. Experience elsewhere shows that growth in IIT cannot be sustained without a structural transformation to uplift the industrial base of the countries involved. This includes policies geared at uplifting workers from low-productivity agriculture and the informal sector to higher-productivity activities. This is important in the CEMAC region since a large proportion of cross border trade also takes place in the informal sectors. The larger the size of the informal sectors, the larger the proportion of trade that goes unrecorded. This transformation is yet to take place in the CEMAC region. Therefore, a

deliberate attempt by policy makers to boost light manufacturing in the region is of necessity for the region to reap some of the benefits of common currency.

Revenue from the sale of the member states' natural resources could be used to diversify production. This will go a long way to fuel economic growth in the CEMAC region and revive the waning manufacturing sector common in the region. Instead of using proceeds from the sale of fuel and mining products on non-productive expenditures, for example the continuous increase in imports of consumer goods and salary increase of state officials, it can be used for long term investment through investing in infrastructure and the telecommunication network. Poor road network and lack of electricity supply are some of the key challenges the region is facing. Dilapidated infrastructures, poor road network, shortage of electricity supply and political instability are some of the key constraints preventing the growth of firms in the CEMAC region (Buys, Deichmann & Wheeler, 2006). Policy makers should have self-confidence to develop alternative policies and keep in mind that they are not bound to hold on to any theoretical policy.

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Appendix⁴³

Appendix A:

Table 1A: Value of CEMAC gross exports by product categories (Millions of US Dollars)

	1995-1999	2000-2005	2006-2010	2010-2015
Food and live animals	454.3	459.7	825.6	1074.1
Beverages and tobacco	22.0	27.8	51.0	28.8
Crude materials, inedible, except fuels	1521.6	1656.4	2844.3	2995.1
Mineral fuels, lubricants and related materials	3922.3	9859.6	27037.6	31688.2
Animal and vegetable oils, fats and waxes	11.8	10.4	22.9	13.6
Chemicals and related products	34.8	148.1	343.6	543.5
Manufactured goods	461.5	442.5	751.1	1351.3
Machinery and transport equipment	69.9	97.5	680.5	1073.9
Miscellaneous manufactured articles	27.8	31.7	83.1	144.9
Commodities and transactions	21.4	112.6	188.9	124.2

Table 2A: CEMAC gross exports by main sectors (Billions of US Dollars)

	1995-1999	2000-2005	2006-2010	2011-2015
Total all products	6.5	12.8	32.8	39.0
Agricultural raw materials	1.4	1.4	2.0	2.3
Fuels	3.9	9.9	27.0	31.7
Manufactured goods	0.3	0.5	1.5	2.4

⁴³ All source data for appendix A- D are derived from UNCTAD statistical database

Table3A: Value of CEMAC IIT by product categories (Millions of US Dollars)

	1995-1999	2000-2005	2006-2010	2011-2015
Food and live animals	14.1	24.0	55.8	53.9
Beverages and tobacco	18.1	14.5	33.3	15.9
Crude materials, inedible, except fuels	2.7	4.4	3.9	4.1
Mineral fuels, lubricants and related materials	30.5	77.2	251.4	258.3
Animal and vegetable oils, fats and waxes	4.8	7.1	18.1	10.9
Chemicals and related products	10.8	12.5	35.3	48.4
Manufactured goods	34.3	43.3	89.7	98.0
Machinery and transport equipment	13.1	9.9	233.7	262.3
Miscellaneous manufactured articles	5.8	7.4	14.5	17.1
Commodities and transactions.	0.4	1.5	2.4	

Table 4A: Value of CEMAC IIT by main sectors (Millions of US Dollars)

	1995-1999	2000-2005	2006-2010	2011-2015
Total all products	134.3	200.7	737.3	653.2
All food items	37.6	46.5	107.7	64.8
Fuels	30.5	77.2	251.4	219.9
Manufactured goods by degree of manufacturing	55.5	65.8	362.6	356.7
Agricultural raw materials (SITC 2 less 22, 27 and 28)	0.8	3.1	2.2	2.1

Table 5A: Main sectors and product shares of CEMAC trade (percentage of total trade)

	1995-1999	2000-2005	2006-2010	2011-2015
Agricultural raw materials (SITC 2 less 22, 27 and 28)	21.0	11.0	6.0	6.0
Fuels (SITC 3)	59.9	76.8	82.4	81.2
Manufactured goods (SITC 5 to 8 less 667 and 68)	4.1	3.8	4.6	6.1
Food and live animals	6.9	3.6	2.5	2.8
Beverages and tobacco	0.3	0.2	0.2	0.1
Crude materials, inedible, except fuels	23.2	12.9	8.7	7.7
Mineral fuels, lubricants and related materials	59.9	76.8	82.4	81.2
Animal and vegetable oils, fats and waxes	0.2	0.1	0.1	0.0
Chemicals and related products, n.e.s.	0.5	1.2	1.0	1.4
Manufactured goods	7.0	3.4	2.3	3.5
Machinery and transport equipment	1.1	0.8	2.1	2.8
Miscellaneous manufactured articles	0.4	0.2	0.3	0.4
Commodities and transactions, n.e.s.	0.3	0.9	0.6	0.3

Table 6A: CEMAC IIT by main sectors (percentage of total trade)

	1995-1999	2000-20005	2006-2010	2011-2015
Agricultural raw materials	0.8	3.1	2.2	2.4
Manufactured goods	21.1	13.8	22.4	17.8
Fuels	0.7	0.8	1.0	0.8
All food items	77	9.1	12.2	7.2
Primary commodities	1.3	1.1	1.2	1.0

Table 7A: CEMAC IIT by product categories (percentage of total IIT)

Products/year	1995-1999	2000-2005	2006-2010	2011-2015
Total (all products)	2.0	1.6	2.3	2.0
Food and live animals	3.1	5.1	6.7	5.0
Beverages and tobacco	82.6	57.5	67.1	52.2
Crude materials, inedible, except fuels	0.2	0.2	0.1	0.1
Mineral fuels, lubricants and related materials	0.7	0.8	1.0	0.8
Animal and vegetable oils, fats and waxes	42.9	65.8	81.8	79.7
Chemicals and related products	32.2	10.6	10.9	9.2
Manufactured goods	8.0	9.8	12.1	7.6
Machinery and transport equipment	20.9	10.5	32.3	23.8
Miscellaneous manufactured articles	20.9	22.4	18.6	12.4
Commodities and transactions	0	0.3	1.1	1.8

Appendix B

Table 1B: Share of CEMAC IIT by origin and destination in food and live animals (%)

I. Table 1B.1: Food and live animals (Sector 0, 1995-1999)

Exports	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cameroon		11.1	30.4	21.3	7.4	29.7
CAR	32.0		1.7	66.3	0.0	0.0
Chad	0.0	0.0		0.0	0.0	0.0
Congo	0.0	100.0	0.0		0.0	0.0

Equa_Guinea	0.0	0.0	0.0	0.0		0.0
Gabon	51.4	0.0	0.0	48.6	0.0	

Table 1B.2 Food and live animals (Sector 0, 2000-2005)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam		14.4	20.7	27.0	5.9	32.1
CAR	20.3		68.5	11.2		
Chad						
Congo	94.7	5.3				0.0
Equa_Guinea						
Gabon	46.6	38.6	9.9	2.0	2.9	

Table1B.3: Food and live animals (Sector 0, 2006-2010)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam		16.4	27.1	14.4	10.1	32.0
CAR	12.6		48.2	39.2	0.0	0.0
Chad	0.0	0.0		0.0	0.0	0.0
Congo	99.0	0.0	0.0		0.0	1.0
Equa_Guinea	0.0	0.0	0.0	0.0		0.0
Gabon	88.8	0.0	0.0	6.1	5.1	

Table 1B.4: Food and live animals (Sector 0, 2011-2015)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam	0.0	13.5	32.0	11.2	21.7	21.7
CAR	0.0		0.0	100.0		
Chad						
Congo	54.4	39.0				6.5
Equa_Guinea						
Gabon	89.3	0.0	0.0	4.1	6.5	

Table 2B: Share of CEMAC Intra-industry trade by origin and destination in Beverages and tobacco (Sector 1)

Table 2B.1: Beverages and tobacco (Sector 1, 1995-1999)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam	0.0	6.4	9.8	20.5	61.8	1.5
CAR	3.0		95.2	1.8		
Chad						
Congo	0.0	72.2				27.8
Equa_Guinea						
Gabon	0.0	0.0	0.0	100.0	0.0	

Table 2B.2: Beverages and tobacco (Sector 1, 2000-2005)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam	0.0	5.3	18.6	30.8	39.0	6.4
CAR	0.0		0.0	100.0		
Chad						
Congo	100.0	0.0				0.0
Equa_Guinea						

Gabon	5.3	3.6	69.3	21.8	0.0	
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Table 2B.3: Beverages and tobacco (Sector 1, 2006-2010)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam		4.3	23.8	4.9	64.1	2.8
CAR	0.0		0.0	0.0		
Chad	0	0		0	0	0
Congo	15.9	29.9	0		0	54.2
Equa_Guinea		0	0	0		0
Gabon	39.0	13.9	0.0	47.1	0.0	

Table 2B.4: Beverages and tobacco (Sector 1, 2011-2015)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam	0.0	11.7	41.2	3.4	41.7	2.0
CAR	100.0		0.0	0.0		
Chad						
Congo	41.1	0.0				58.9
Equa_Guinea						
Gabon	47.1	15.0	0.0	37.9	0.0	

Table 3B: Share of CEMAC Intra-industry trade by origin and destination in Crude materials, inedible, except fuels (sector 2)

Table 3B.1: Crude materials, inedible, except fuels (sector 2, 1995-1999)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam	0.0	23.4	0.0	6.3	33.4	36.9
CAR	42.4		25.0	32.5		
Chad						
Congo	11.3	88.7				0.0
Equa_Guinea						
Gabon	100.0	0.0	0.0	0.0	0.0	

Table 3B.2: Crude materials, inedible, except fuels (Sector 2, 2000-2005)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam	0.0	35.4	0.0	18.8	13.4	32.3
CAR	92.3		5.7	1.9		
Chad						
Congo	4.3	95.7				0.0
Equa_Guinea						
Gabon	62.6	0.0	0,0	15.9	21.6	

Table 3B.3: Crude materials, inedible, except fuels (Sector 2, 2006-2010)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam	0.0	34.8	31.1	4.0	7.9	22.1
CAR	79.5		0.0	20.5		
Chad						
Congo	90.5	0.0				9.5

Equa_Guinea						
Gabon	4.7	0.0	0.0	78.6	16.7	

Table 3B.4: Crude materials, inedible, except fuels (Sector 2, 2011-2015)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam	0.0	5.0	63.2	5.1	19.3	7.4
CAR	59.1		29.9	11.0		
Chad						
Congo	33.8	0.0				66.2
Equa_Guinea						
Gabon	3.2	0.0	0.0	72.6	24.2	

Table 4B: Share of CEMAC IIT by origin and destination in Mineral fuels and lubricants

Table 4B.1: Mineral fuels, lubricants and related materials (Sector 3, 1995-1999)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam	0.0	16.9	42.7	15.3	12.7	12.5
CAR	20.4		19.2	60.4		
Chad						
Congo	0.0	0.0				100.0
Equa_Guinea						
Gabon	13.7	0.0	0.0	86.3	0.0	

Table 4B.2: Mineral fuels, lubricants and related materials (Sector 3, 2000-2005)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam	0.0	2.9	72.8	3.2	13.8	7.3
CAR	17.8		0.0	82.2		
Chad						
Congo	40.6	0.3				59.0
Equa_Guinea						
Gabon	29.4	1.0	1.0	19.1	49.5	

Table 4B.3: Mineral fuels, lubricants and related materials (Sector 3, 2006-2010)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam	0.0	3.1	83.5	4.5	3.3	5.6
CAR	0.0		0.0	0.0		
Chad						
Congo	54.0	0.0				46.0
Equa_Guinea						
Gabon	18.4	0.0	0.0	13.7	67.9	

Table 4B.4: Mineral fuels, lubricants and related materials (Sector 3, 2011-2015)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam	0.0	0.7	77.1	2.4	18.4	1.4
CAR	0.0		0.0	0.0		
Chad						
Congo	89.4	0.0				10.6
Equa_Guinea						

Gabon	18.8	0.2	0.0	8.2	72.8	
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Table 5B: Share of CEMAC IIT by origin and destination in animal and vegetable oils, fats and waxes (Sector 4)

Table 5B.1: Animal and vegetable oils, fats and waxes (Sector 4, 1995-1999)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam	0.0	2.1	0.0	4.8	4.4	88.7
CAR	100.0		0.0	0.0		
Chad						
Congo	0.0	0.0				0.0
Equa_Guinea						
Gabon	100.0	0.0	0.0	0.0	0.0	

Table 5B.2: Animal and vegetable oils, fats and waxes (Sector 4, 2000-2005)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam	0.0	1.9	0.0	2.4	2.9	92.8
CAR	100.0		0.0	0.0		
Chad						
Congo	0.0	0.0				0.0
Equa_Guinea						
Gabon	100.0	0.0	0.0	0.0	0.0	

Table 5B.3: Animal and vegetable oils, fats and waxes (Sector 4, 2006-2010)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam	0.0	2.0	21.4	0.3	0.2	76.1
CAR	100.0		0.0	0.0		

Chad						
Congo	0.0	0.0				100.0
Equa_Guinea						
Gabon	100.0	0.0	0.0	0.0	0.0	

Table 5B.4: Animal and vegetable oils, fats and waxes (Sector 4, 2011-2015)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam	0.0	6.9	35.1	0.0	0.0	58.0
CAR	0.0		0.0	0.0		
Chad						
Congo						
Equa_Guinea						
Gabon	100.0	0.0	0.0	0.0	0.0	

Table 6B: Share of CEMAC IIT by origin and destination in Chemicals and related products (Sector 5)

Table 6B.1: Chemicals and related products (Sector 5, 1995-1999)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam	0.0	17.0	9.3	14.9	22.4	36.4
CAR	16.5		14.1	69.4		
Chad						
Congo	76.9	0.0				23.1
Equa_Guinea						
Gabon	27.0	0.0	0.0	73.0	0.0	

Table 6B.2: Chemicals and related products (Sector 5, 2000-2005)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam	0.0	12.2	45.1	12.9	6.8	23.0
CAR	100.0		0.0	0.0		
Chad						
Congo	5.8	0.0				94.2
Equa_Guinea						
Gabon	24.9	0.0	0.0	49.1	26.0	

Table 6B.3: Chemicals and related products (Sector 5, 2006-2010)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam	0.0	2.5	54.5	5.6	14.2	23.2
CAR	0.0		0.0	0.0		
Chad						
Congo	12.3	0.0				87.7
Equa_Guinea						
Gabon	19.8	0.0	0.0	61.0	19.2	

Table 6B.4: Chemicals and related products (Sector 5, 2011-2015)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam	0.0	3.6	52.4	17.9	12.9	13.2
CAR	3.8		62.2	34.0		
Chad						
Congo	17.9	0.0				82.1
Equa_Guinea						

Gabon	25.2	0.0	0.0	44.4	30.4	
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Table 7B: Share of CEMAC IIT by origin and destination in manufactured goods (Sector 6)

Table 7B.1: Manufactured goods (Sector 6, 1995-1999)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam		16.3	12.7	12.0	27.9	31.1
CAR	31.4		55.5	13.1		
Chad						
Congo	8.1	82.8				9.1
Equa_Guinea						
Gabon	57.2	2.8	0.0	40.0	0.0	

Table 7B.2: Manufactured goods (Sector 6, 2000-2005)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam	0.0	8.9	44.1	13.4	8.8	24.9
CAR	26.1		58.7	15.2		
Chad						
Congo	1.1	3.5				95.4
Equa_Guinea						
Gabon	10.2	0.2	0.6	14.0	75.0	

Table 7B.3: Manufactured goods (Sector 6, 2006-2010)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam		8.1	46.4	7.4	12.3	25.8
CAR	9.9		47.8	42.3		
Chad						

Congo	2.0	4.4				93.6
Equa_Guinea						
Gabon	24.1	0.8	0.9	50.5	23.6	

Table 7B.4: Manufactured goods (Sector 6, 2011-2015)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam	0.0	5.5	52.4	10.4	14.5	17.1
CAR	29.8		41.0	29.2		
Chad						
Congo	10.6	6.8				82.6
Equa_Guinea						
Gabon	36.3	0.8	0.0	39.8	23.2	

Table 8B: Share of CEMAC IIT by origin and destination in Machinery and transport equipment (Sector 7)

Table 8B.1: Machinery and transport equipment (Sector 7, 1995-1999)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam		17.9	32.1	8.8	26.0	15.2
CAR	61.7		11.8	26.5		
Chad						
Congo	0.0	89.9				10.1
Equa_Guinea						
Gabon	18.5	0.0	0.0	81.5	0.0	

Table 8B.2: Machinery and transport equipment (Sector 7, 2000-2005)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam	0.0	19.3	29.7	13.5	14.9	22.7
CAR	26.4		46.0	27.6		
Chad						
Congo	5.2	0.0				94,8
Equa_Guinea						
Gabon	15.4	0.3	6.5	38.9	38.8	

Table 8B.3: Machinery and transport equipment (Sector 7, 2006-2010)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam	0.0	3.2	9.2	16.8	36.5	34.3
CAR	14.8		75.0	10.2		
Chad						
Congo	12.8	0.3				87.0
Equa_Guinea						
Gabon	0.7	0.0	1.1	96.9	1.3	

Table 8B.4: Machinery and transport equipment (Sector 7, 2011-2015)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam	0.0	2.2	7.8	57.7	18.7	13.6
CAR	17.7		73.8	8.5		
Chad						
Congo	21.1	0.1				78.9
Equa_Guinea						

Gabon	1.2	0.0	0.0	96.5	2.3	
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Table 9B: Share of CEMAC IIT by origin and destination in Miscellaneous manufactured articles (Sector 8)

Table 9B.1: Miscellaneous manufactured articles (Sector 8, 1995-1999)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam		9.2	13.4	12.7	48.7	16.0
CAR	54.0		0.0	46.0		
Chad						
Congo	55.2	23.5				21.3
Equa_Guinea						
Gabon	27.4	3.3	0.0	69.3	0.0	

Table 9B.2: Miscellaneous manufactured articles (Sector 8, 2000-2005)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam		22.5	30.6	10.1	14.9	21.9
CAR	50.3		0.0	49.7		
Chad						
Congo	28.8	26.0				45.1
Equa_Guinea						
Gabon	7.8	0.4	0.8	21.6	69.3	

Table 9B.3: Miscellaneous manufactured articles (Sector 8, 2006-2010)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam		15.3	30.4	4.4	12.2	37.7
CAR	90.3		0.0	9.7		
Chad						
Congo	7.9	0.0				92.1
Equa_Guinea						
Gabon	5.4	1.4	0.8	67.3	25.2	

Table 9B.4: Miscellaneous manufactured articles (Sector 8, 2011-2015)

	Cam	CAR	Chad	Congo	Equa_Guinea	Gabon
Cam		9.7	30.2	16.9	17.9	25.2
CAR	17.7		1.7	80.6		
Chad						
Congo	42.4	0.0				57.6
Equa_Guinea						
Gabon	6.5	1.2	0.0	50.3	42.0	

Appendix C: Sensitivity Analysis

Table 1C: Country sensitivity (total and main sectors)

VARIABLES	-1 lTotal_prds	-2 lA02_Agric	-3 lA04_Fuels	-4 lA12_Manu
Exporters				
CAR	7.469*** (0.559)	-1.990** (0.958)	7.733*** (0.899)	5.771*** (0.561)
COG	5.734*** (0.494)	-1.605* (0.887)	6.787*** (0.847)	3.728*** (0.497)
CRM	5.915*** (0.532)	-0.153 (0.907)	6.613*** (0.914)	4.661*** (0.534)
GAB	5.493*** (0.522)	-1.031 (0.901)	6.648*** (0.897)	3.190*** (0.525)
GNQ	3.113*** (0.450)	-2.134** (0.848)	7.591*** (0.794)	1.182*** (0.449)
TCD	0.266 (0.248)	0.388 (0.317)	3.185*** (0.600)	0.0326 (0.255)
Importers				
CAR	-3.176*** (0.967)	0.702 (1.385)	-6.697*** (1.915)	-1.291 (0.968)
CHN	5.759*** (0.290)	7.189*** (0.371)	2.668*** (0.652)	0.294 (0.299)
CRM	-2.558*** (0.958)	0.0366 (1.342)	-4.864*** (1.864)	-1.320 (0.960)
COG	-2.480*** (0.897)	0.0450 (1.316)	-5.274*** (1.817)	0.325 (0.901)
COMESA	0.0877 (0.692)	3.758*** (0.903)	-2.054 (1.366)	1.363** (0.694)
EAC	-3.493*** (0.750)	0.241 (0.975)	-9.685*** (1.509)	-0.840 (0.752)
ECOWAS	-0.471 (0.932)	3.407*** (1.227)	-1.642 (1.807)	1.244 (0.930)
EU	6.766*** (0.479)	8.812*** (0.612)	2.788*** (0.956)	6.076*** (0.482)
GAB	-3.544*** (1.026)	0.555 (1.513)	-6.264*** (2.093)	-0.416 (1.030)
GNQ	-4.415*** (1.209)	-0.510 (1.704)	-5.809** (2.378)	-0.941 (1.206)
IND	2.778*** (0.363)	5.147*** (0.464)	0.280 (0.781)	0.735* (0.379)
TCD	-3.339*** (0.934)	2.496* (1.392)	-4.315** (1.933)	-1.955** (0.931)
Ldist	-1.603*** (0.378)	0.539 (0.486)	-0.513 (0.713)	-0.717* (0.377)
Landlocked	2.557*** (0.480)	-2.150** (0.867)	1.112 (0.776)	1.174** (0.482)
Border	1.188*** (0.294)	1.525*** (0.455)	1.920*** (0.611)	2.041*** (0.295)
comlang	-0.810*** (0.230)	-0.373 (0.295)	-0.620 (0.442)	-1.421*** (0.232)
Constant	16.35*** (3.841)	-0.499 (4.924)	7.738 (7.205)	8.482** (3.826)
Observations	1,155	821	638	1,092
R-squared	0.680	0.741	0.634	0.585

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: * significant at 10%; ** significant at 5%; ***significant at 1%

Table 2C: Country sensitivity (individual product categories)

VARIABLES	lFood_live (0)	lBevtoba (1)	lCrude_mat (2)	lMinfuels (3)	lAniveg (4)
Exporters					
CAR	4.312*** (0.889)	2.144* (1.258)	0.879 (0.617)	7.733*** (0.899)	-1.262 (2.208)
COG	1.096 (0.823)	1.533 (1.202)	0.193 (0.551)	6.787*** (0.847)	-6.473*** (2.159)
CRM	3.523*** (0.927)	1.530 (1.390)	1.495** (0.586)	6.613*** (0.914)	-3.409 (2.382)
GAB	1.083 (0.883)	0.555 (1.323)	0.928 (0.571)	6.648*** (0.897)	-4.144* (2.231)
GNQ	-1.344* (0.724)	-2.538*** (0.950)	-0.882* (0.506)	7.591*** (0.794)	-8.625*** (1.504)
TCD	-2.083*** (0.436)	0.876 (0.824)	0.535** (0.268)	3.185*** (0.600)	0.0181 (1.204)
Importers					
CAR	9.322*** (1.577)	-8.596*** (2.442)	-0.946 (1.142)	-6.697*** (1.915)	
CHN	1.199** (0.557)	-0.169 (1.492)	7.254*** (0.318)	2.668*** (0.652)	
CRM	9.796*** (1.556)	-10.91*** (2.412)	-1.126 (1.111)	-4.864*** (1.864)	0.0354 (0.790)
COG	7.717*** (1.482)	-8.002*** (2.358)	-1.663 (1.067)	-5.274*** (1.817)	-0.772 (0.811)
COMESA	6.399*** (1.098)	-6.806*** (1.905)	2.416*** (0.760)	-2.054 (1.366)	0.0429 (1.932)
EAC	4.339*** (1.195)	-8.270*** (2.066)	-1.306 (0.813)	-9.685*** (1.509)	-0.943 (1.867)
ECOWAS	8.494*** (1.434)	-9.679*** (2.281)	1.365 (1.023)	-1.642 (1.807)	-1.506 (1.015)
EU	9.439*** (0.794)	-2.431 (1.596)	8.140*** (0.515)	2.788*** (0.956)	6.433** (2.674)
GAB	9.401*** (1.743)	-12.33*** (2.639)	-1.126 (1.253)	-6.264*** (2.093)	1.483* (0.773)
GNQ	10.19*** (1.996)	-11.30*** (2.968)	-2.096 (1.417)	-5.809** (2.378)	-4.602*** (1.311)
IND	1.713*** (0.649)		4.913*** (0.392)	0.280 (0.781)	10.19** (4.467)
TCD	8.760*** (1.474)	-7.581*** (2.315)	-0.707 (1.162)	-4.315** (1.933)	-1.120 (1.278)
ldist	3.291*** (0.577)	-4.831*** (0.848)	-0.485 (0.406)	-0.513 (0.713)	-3.901** (1.548)
landlocked	0.164 (0.816)	-0.785 (1.178)	-0.627 (0.531)	1.112 (0.776)	-4.442** (2.155)
border	2.504*** (0.433)	-1.654** (0.707)	1.336*** (0.362)	1.920*** (0.611)	-2.782* (1.413)
comlang	-1.083*** (0.377)	0.751 (0.676)	-0.404* (0.241)	-0.620 (0.442)	-1.730* (1.045)
Constant	-28.74*** (5.906)	47.30*** (8.671)	7.474* (4.104)	7.738 (7.205)	37.83*** (11.77)
Observations	716	476	897	638	287
R-squared	0.600	0.346	0.751	0.634	0.444

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: * significant at 10%; ** significant at 5%; ***significant at 1%

Table 2C: Country sensitivity of individual product categories (continuation)

VARIABLES	lChem (5)	lMan_goods (6)	lMachinetrans (7)	lMiscmanu (8)	lCommo (9)
Exporters					
CAR	5.143*** (0.787)	5.107*** (0.632)	6.272*** (0.694)	5.104*** (0.621)	1.591 (1.393)
COG	1.809** (0.707)	2.294*** (0.567)	4.009*** (0.626)	3.559*** (0.550)	0.783 (1.173)
CRM	2.662*** (0.766)	3.215*** (0.608)	4.475*** (0.673)	3.054*** (0.582)	4.062*** (1.336)
GAB	1.634** (0.742)	1.757*** (0.599)	3.860*** (0.661)	2.760*** (0.576)	0.828 (1.236)
GNQ	-0.0122 (0.624)	0.111 (0.509)	1.504*** (0.559)	1.083** (0.486)	-0.199 (1.077)
TCD	-2.043*** (0.428)	-0.635** (0.310)	-0.153 (0.321)	0.770*** (0.295)	-1.416*** (0.676)
Importers					
CAR	-3.561** (1.388)	-2.620** (1.125)	-2.594** (1.205)	-2.295** (1.031)	6.168** (2.455)
CHN	0.146 (0.581)	0.747** (0.349)	-0.193 (0.392)	-1.193*** (0.375)	2.460*** (0.947)
CRM	-3.249** (1.349)	-3.806*** (1.119)	-1.884 (1.189)	-2.706*** (1.018)	7.582*** (2.324)
COG	-1.916 (1.306)	-2.693** (1.061)	0.0978 (1.119)	-1.785* (0.966)	7.262*** (2.261)
COMESA	0.840 (1.011)	-0.291 (0.803)	0.818 (0.865)	0.550 (0.750)	5.214*** (1.509)
EAC	-0.679 (1.071)	-3.077*** (0.865)	-0.958 (0.931)	-0.943 (0.810)	2.544 (1.696)
ECOWAS	-0.0311 (1.294)	-0.693 (1.069)	0.522 (1.142)	0.0253 (0.985)	7.818*** (2.032)
EU	4.484*** (0.708)	5.693*** (0.555)	5.740*** (0.597)	3.944*** (0.517)	9.538*** (1.061)
GAB	-2.228 (1.489)	-2.793** (1.229)	-1.053 (1.287)	-1.754 (1.100)	7.840*** (2.461)
GNQ	-3.149* (1.687)	-3.201** (1.410)	-1.155 (1.504)	-2.717** (1.277)	7.741*** (2.918)
IND	1.494** (0.586)	0.668 (0.433)	0.672 (0.487)	-0.302 (0.448)	1.111 (0.833)
TCD	-4.617*** (1.378)	-3.514*** (1.094)	-2.448** (1.159)	-1.741* (1.004)	7.717*** (2.326)
Ldist	-0.999* (0.517)	-0.961** (0.434)	-1.546*** (0.467)	-0.749* (0.401)	1.798** (0.804)
landlocked	0.0612 (0.669)	0.434 (0.543)	2.029*** (0.607)	0.942* (0.520)	0.473 (1.178)
Border	2.928*** (0.431)	2.059*** (0.341)	0.539 (0.365)	1.535*** (0.319)	1.225* (0.637)
comlang	-2.312*** (0.346)	-0.896*** (0.266)	-1.273*** (0.289)	0.260 (0.253)	-1.822*** (0.564)
Constant	11.28** (5.190)	11.82*** (4.390)	13.87*** (4.730)	7.082* (4.042)	-17.39** (8.160)
Observations	729	965	967	877	469
R-squared	0.474	0.580	0.514	0.542	0.494

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Chapter Five

Conclusions and Policy Recommendations

5.1 Introduction

This thesis assesses the relationship between common currency, economic growth and intra-regional trade flow in the CEMAC customs union using diverse theories and models of regional integration from received literature. In chapter two and chapter three that answer the stated research objectives and research questions, and reliable econometric techniques are used to analyse the impact of common currency on economic growth and intra-regional trade flows in the CEMAC region during the period before and after 1994 when the common currency was instituted. Due to data limitation, the fourth chapter on intra-industry trade contributes to the debate on intra-regional trade by estimating the sectoral trade flow in the region which gives an indication of which sectors or product categories are contributing to bilateral trade flow in the CEMAC region and which sectors or products are shaping the pattern of trade flows among member states using yearly data from 1995 to 2015.

5.2 Summary of Findings

The monetary union that includes member states of the CEMAC customs union are part of and was borne from an outgrowth of economic and financial arrangements under French colonial administration dating back to 1945. The common currency used by both the CEMAC and UEMOA trade blocs are two separate currencies with their respective central banks. Individual member states in the monetary union used to have their own separate CFA franc until 1994 when all member states decided to institute a common regional currency. The stability and convertibility of the CFA franc was first guaranteed by the French franc and are now guaranteed by the Euro. One of the objectives of the creation of a common currency was to facilitate commercial exchange and reduce transaction costs for member states. Given the objective of the creation of CEMAC⁴⁴, none of the recent empirical studies have carried out an investigation to determine the extent to which the common currency has influenced intra-regional trade flow and economic growth since 1994. Most of the recent empirical literature on the CFA zone has focused on the capacity of member states satisfying optimum-currency area (OCA) criteria.

⁴⁴ The objective was to boost economic growth and increase intra-regional trade and mobility of factors of production,

Chapter one analyses the conceptual framework showing the relationship between the antecedent, mediating, independent and dependent variables used in the study. In this section, the history and the different types of monetary unions in Africa are also analysed. The objectives and research questions that guide the study are also stated. This is followed with the justification of the study that briefly outlined some of the gaps in the existing literature and how these gaps are going to be addressed.

Chapter two provides empirical evidence to answer the question pertaining to the extent of which the growth experiences in CEMAC, pre-and-post adoption of the common currency could be attributed to the franc CFA. The analysis of the literature review shows that not much work has been done with regard to CEMAC monetary union and economic growth. The theoretical framework also discusses the neoclassical and endogenous growth models and how these models have contributed the literature on economic growth. The work of Mundell and other theorists on the optimum currency area are discussed and the discussion highlights the findings of other researchers and how the CEMAC monetary union has not fulfilled many of the requirements of the OCA.

The empirical analysis of chapter two entails a counterfactual analysis, the sharp regression discontinuity design econometric technique to find an answer to the question. Both parametric and non-parametric approaches with different bandwidths are used to strike the balance between precision and bias in the model. The Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) are used to check the robustness of the regression results. Both the AIC and BIC ensure confidence in the robustness of the model. The AIC indicates whether the data used in the analysis fits the model better than another, while a smaller BIC indicates that the data fits the model. Other covariates are controlled to make sure that they are not responsible for the jump around the point of discontinuity in the RDD and thus affect the treatment around the point of discontinuity.

We find evidence of a negative relationship between common currency and economic growth in the CEMAC customs union as a whole and the individual member states that make up CEMAC customs union. Since we are interested in the regression function at a single point which is the boundary point, standard nonparametric kernel regression does not work well in this situation. At boundary points, such estimators have a slower rate of convergence than they do at interior points (Imben, 2010). The study first of all makes use of the parametric approach

using local linear regression to overcome the problem. Applying both rectangular and triangular kernels reduces the problem of too much sensitivity to the choice of bandwidth. Changing the bandwidth enables us to verify the robustness of the results.

Chapter three examines the relationship between common currency and intra-regional trade at the aggregate level. The chapter pays particular attention to the nonlinear relation between intra-regional trade flows and common currency (CFA franc) in the CEMAC customs union using data from 1980 to 2017. The desk research and review of earlier literature—empirical and theoretical—reveal that many of the early studies on interregional trade failed to consider geography and distance as important factors in determining the pattern of bilateral trade flow. Chapter three also discusses the transmission mechanism through which common currency can affect bilateral trade flows.

Since time series data on macroeconomic variables often largely exhibit nonlinearity properties, the sample split threshold technique is used to model the dynamics in time series data. A 300 bootstrap replication is applied given the fact that the sample size is small. The test for thresholds indicate a sample split, implying the presence of a single threshold.

The difference-in-difference (diff-in-diff) estimation technique in chapter three is primarily used as a test of sensitivity to analyse the change in policy called the treatment. As a form of robust check, one lag and two leads of the common currency dummies are introduced. When the normal standard error with no time trend effects is considered, the lagged effects become more statistically significant. A standard robust cluster variance estimator is applied to reduce the level of misspecification and within-cluster correlation in the model. The test for non-stationarity of the dependent variable and independent variables shows that the variables of interest contain unit roots and are all non-stationarity at level. When one lag and first difference are considered, the variables become stationary. The test for co-integration is carried out using Westerlund's (2007) panel co-integration test and there are reasons to reject the hypothesis that the series are not co-integration. The results from the diff-in-diff approach suggest a negative relationship between the common currency and CEMAC intra-regional trade flow. We therefore establish the fact that the franc CFA has not contributed positively to the growth of CEMAC intra-regional trade flow.

According to the results, the common currency has not managed to create an environment necessary to stimulate intra-regional trade in the CEMAC customs union. The elimination of

any nominal exchange rate volatility between CFA zone and Eurozone has not boosted trade between countries involved which is in line with the results from table 3.4 and table 3.5. Forming a currency union and linking the currency with a fixed peg both imply the elimination of any volatility in the nominal bilateral exchange rate which is the case of the CFA franc that is pegged to the Euro.

Chapter four gives an in-depth analysis of intra-industry trade in the CEMAC region. The investigation is done to analyse intra-regional trade at the disaggregated level. This chapter investigates how the different sectors or product categories according to SITC revision one have been affected since the CEMAC customs union was established in 1994. Different specifications of an augmented gravity equation are applied using a panel fixed effect model. The gravity equations are used to analyse the bilateral trade of the six member states of the CEMAC customs union and its main trading partners. The period covered in our analysis is from 1995 to 2013. Our findings show that individual CEMAC countries have responded poorly to the different sectors in terms of IIT. Only sector three (mineral fuels) exports are statistically significant. One reason for this is that, the CEMAC region is endowed with an abundance of sector three products which are highly demanded by the non-member states of the union. Similarity in factor endowments can be attributed for low demand by member states. The implication is that the sector where the CEMAC customs union is more effective has one of the lowest shares in CEMAC Intra-industry trade.

5.3 Implications of Findings

The findings allow us to draw some policy implications for the CEMAC policy makers, and other regional trade arrangements who have showed interest in establishing a common currency. The CFA franc's stability is a source of concern as the past four years have seen the CFA region witnessing serious macroeconomic concerns and volatility of the oil price. There are concerns of a possible devaluation of the currency in the near future to accommodate some of the macroeconomic fundamental disequilibria. To sustain the currency peg with the Euro, several major challenges lie ahead, not only for the CEMAC customs union, which is now facing serious challenges for depending heavily on oil, but also for WAEMU, whose robust growth over the past decades have managed to fuel macroeconomic imbalances in the region.

The CEMAC custom union has not fulfilled all its objectives particularly in terms of regional integration. Figure 3.1 shows the extent to which intra-regional trade is negligible and among

the lowest in Africa. The common currency has not managed to increase the level of trade and trade relations among member states. Export diversification is low and limited to few extractive industries. Five of the six CEMAC member states depend heavily on oil as their main export. Only Cameroon is more diverse producing and exporting primary products that include but not limited to oil, hydrocarbon and several agricultural produce⁴⁵. As the international oil price dropped, as was seen in the second half of 2014 to 2016, so too is the CEMAC lost in oil related budget revenues and exports value. Fall in export value, implies foreign investors will find the region unattractive despite stability in the CFA franc as a result of the absence of exchange rate fluctuation.

Political instability has also put the CEMAC region in a very difficult position to further its agenda of enhancing regional growth and intra-regional trade. Political constraints have contributed to the CEMAC region's poor economic performance. Most of the CEMAC countries are struggling with arms conflicts in different parts of the region. For example, the security threat posed by Boko Haram in the north-western CEMAC region, piracy along the Gulf of Guinea, instability in the Central African Republic between the Anti-Balaka and Séléka militias and the rise of separatist groups in the North and South Western provinces of Cameroon. Political violence is creating difficult living conditions for citizens of the respective region and it is hampering free mobility of factors of production which is a key aspect of economic growth and development. For instance, companies cannot trade freely where violence has become unpredictable. Policies geared at enhancing trade at the individual and regional level will be hampered if these security issues are not addressed.

Although the OCA theory laid some of the fundamental criteria necessary for the establishment of the currency area. The transmission mechanism through which common currency can affect growth rates and trade flows include the homogeneity of member states to external shocks, flexibility of labour and wage rate in the currency area, the degree of trade and the level of integration among member states. Section 2.3.2.4 shows that despite many African countries having an open economy, they still failed to satisfy Mckinnon's (1963) criteria of openness. Intra-African trade needs to increase significantly before the criterion of open trade can be useful in justifying optimum currency areas for Africa in general and CEMAC in particular. In the case of CFA currency zone, additional complication arises from the fact that the CFA franc

⁴⁵ See chapter 4, appendix B

is pegged to an external reference currency, the Euro. This affects the central bank's ability to set suitable exchange rate to accommodate macroeconomic fundamental disequilibria. Mundell (1961) argued about labour mobility and how it can moderate real factor prices within the currency union. However, the argument does not hold true for CEMAC countries as the analysis in the three main chapters shows how factor mobility is relatively low in the region. For integration, the analysis has shown the level of integration among member states is too weak to support one of the OCA criteria. The conclusion drawn is that CEMAC customs union is far from being an OCA.

The CEMAC customs union has been growing slower than any regional trade bloc in Africa. There is a huge gap in economic growth compared to that of other trade blocs on the African continent. From table 3.6, the current labour force is not significant to the region's growth and development. The results from chapter two and chapter three also show that FDI and trade openness can affect economic growth and intra-regional trade positively. Net inflow of FDI into the region is mostly diverted to the oil sector. Trade openness within member states can facilitate regional growth and boost intra-regional trade. As more output is produced, opportunity for trade creation can be realised. Trade openness can enable CEMAC member states to diversify the economy away from the oil and mineral sectors.

Recently, the debates of the valuation of the CFA franc has intensified and there was speculation of possible devaluation of the CFA franc during the CEMAC Heads of State Summit held in Ndjamena, on October 25, 2018. However, the devaluation of the CFA franc was not part of the agenda of the summit. The Central Bank Governor brought to attention that there was no reason why CEMAC risks devaluation as the current economic situation in the CEMAC zone is not anywhere near that of 1994, the year of the last currency devaluation.

5.4 Policy Recommendations

The fact that the CFA franc is pegged to the Euro which is one of the major currencies in the world, gives stability to the currency which is an important factor in international trade. However, given the shift of the trade pattern over the years, from having the EU countries as CEMAC's main trading partners to having China and India⁴⁶ (table 2C) as the main trading partners implies a need to revisit the initial arrangement. It is advisable for policy makers to

⁴⁶ See table 2C at the appendix of chapter four

pay particular attention to the real value of the currency. Careful study needs to be carried out to determine if there is reason to relax the value of the fixed pegged to a basket of currencies. This will further avoid a situation where continuous deterioration of the trade balance will force member states to bring about deflationary fiscal policies.

The results of the three chapters show the shortfall of the CEMAC monetary union compared to currency unions in other regions of the world. The negative coefficients of growth rates, intra-regional trade and intra-industry trades against the common currency highlight the fact that more work needs to be done by policy makers and the BEAC central bank. These two institutions including the CEMAC Secretariat in Bangui need to work together to strengthen and create a favourable environment for the actual channels of transmission between common currency adoption and economic growth; common currency and intra-regional trade flow. For these channels of transmission to fulfil its aim, there is need for increased labour mobility, higher level of integration and commitment by member states to prioritise the adoption of regional policies.

One of the key issues that need urgent attention is political instability that is ravaging the region's potential. Domestic political instability and cross border conflict are some of the main sources of uncertainty for the weak intra-regional trade. The economic potential will continue to become widened and unequal if policy makers do not consider it as one of their main priorities. This will continue to increase factor immobility in the region and attract less foreign investors which is a key source of foreign revenue.

Since the CEMAC trade bloc is also among the poorest on the African continent, policies geared toward light manufacturing can make a difference in the growth rate and intra-regional trade flow. Strategic industrial zones can be identified within the region for easy transit between member states. Attention can be paid to low-cost manufacturing to add value to extractive industries. The agricultural sector has been stagnated for long and sharply focused policies to boost the low-productivity agriculture sector can be the starting point for the region to start realizing an increase in intra-regional trade flow.

The CEMAC region needs to improve the quality of its existing infrastructure and develop new ones if the region is to promote regional growth and intra-regional trade. Dilapidated infrastructures, poor road network and shortage of electricity supply are some of the key constraints preventing the growth of firms in the CEMAC region (Buys, Deichmann &

Wheeler, 2006). The CEMAC region has registered huge losses of crops, textile products and other produce due to lack of storage facilities and difficulties in transporting the goods from one country to another within the customs union. The low percentage of industries having access to electricity implies that firms are constantly producing below optimum output and therefore rarely enjoy economies of scale. Access to electricity and technology such as the internet forms the basis of industrial growth and hence increase in trade. Therefore, improvement and development of existing and new power plants can go a long way to facilitate movement of capital and labour. Unless the CEMAC policy makers are determined to tackle these salient problems, economic growth and increased intra-regional trade will still be a challenge.

Conscientious efforts on the part of policy makers in the CEMAC region to eliminate non-tariff barriers to trade among member states will lead to advancement in intra-regional trade flow. The removal of such non-tariff barriers along the main transit corridors in the CEMAC region include decreasing the number of roadblocks and cumbersome border crossing procedures.

Finally, the results in chapter three shows that despite the common currency, CEMAC countries are not better off than their fellow counterparts of the Economic Community of Central African States (ECCAS). Change in trade flow in CEMAC before and after the common currency has been observed. When ECCAS is included as a control in the difference-in-differences model, the evidence suggested that the creation of the common currency did not induce an increase in intra-regional trade in the CEMAC customs union. Since the CFA has not managed to give the CEMAC an edge over the other countries that makes up ECCAS, policy can be shifted toward the strengthening of the institution that makes up ECCAS, for the region has the potential to grow and become an example of a successful trade bloc in Africa.

The CEMAC customs union is one of the least developed in the African continent in terms of growth in intra-regional trade. Collaboration between the CEMAC trade bloc and other trade blocs in Africa can be a valuable tool for stimulating economic growth and regional development. Most of CEMAC member states are small in size and these countries find it difficult to generate adequate goods for competitive exports. Therefore, collaboration with its regional counterparts will act as a way to attract foreign direct investment which will expand production and open new regional markets.

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