

**EFFECT OF THE EXCHANGE RATE ON THE TRADE BALANCE: EVIDENCE  
FROM SELECTED SUB-SAHARAN AFRICAN COUNTRIES**

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**(10203684)**

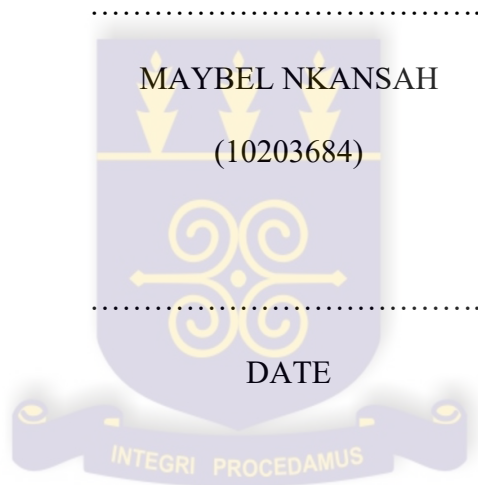


**THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN  
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ECONOMICS DEGREE**

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## DECLARATION

This is to certify that this thesis is the result of the research, I, MAYBEL NKANSAH, have undertaken under the guidance of my supervisors towards the award of MPhil Economics in the University of Ghana. I hereby declare that with the exception of references to other people's works which have been duly cited, this thesis has neither in part nor whole been submitted for another degree elsewhere.



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## ABSTRACT

International trade has enormous impact on a country's economic growth and development as a whole. Governments in every part of the globe pursue various economic policies aimed at improving trade and enhancing economic development. The trade balance is a major indicator in determining a country's trade performance on the international market. An improved trade balance will improve a country's current account balance and GDP as a whole and vice versa. Unfortunately, most of the economies in Sub-Saharan Africa (SSA) have persistently been recording a trade deficit. This continuous deterioration of the current account balance is a reflection of the persistent trade deficit in the region as whole. Thus, this can jeopardize the growth and development process of these economies.

A strong export sector is therefore necessary in order to keep the trade balance in a better position as has been the anchor of the economies of East Asia. Although, a focus on technological advancement, innovation and investment are some of the long term measures to build a strong export sector to remedy the situation, the exchange rate has been cited as one of the most commonly used short term mitigating policies to curtail a falling trade balance. Especially for developing countries, it has been assumed that exchange rate depreciation is an appropriate macroeconomic fundamental to support the export sector (Vitale, 2003).

A lot of the empirical works in this area of research are time series analysis, therefore this research employs a panel analysis of sixteen Sub-Saharan African countries with more recent data to find out if there exists any relationship between the exchange rate and the

trade balance. Specifically, the focus of the study is to find out if the exchange rate can be used as a policy tool in remedying the persisting trade deficit in Sub-Saharan African countries. The study adopted the standard trade balance framework as the empirical model.

Again, the traditional FE and RE models were used to estimate the empirical model using robust standard errors to control for the presence of heteroscedasticity and autocorrelation. However, the presence of endogeneity in the model ultimately informed the use of the System GMM which has the ability to overcome this problem. The empirical results confirmed the assertion by most economic theory and empirical works alike. That is, although there exist a negative relationship between exchange rate and trade balance in the current year, the trade balance tend to improve following an exchange rate depreciation in the second year. Thus, the outcome of the study was found to be consistent with the J-curve hypothesis. Nonetheless, all the other variables were found to adversely affect the trade balance. Particularly, contrary to economic theory and most empirical works, the foreign income was found to negatively impact the trade balance at all lag levels.

It is therefore recommended that, if the exchange rate would be used as a measure to remedy the problem of the persistent trade deficit, it must be accompanied by some macroeconomic fundamentals to control the effect of exchange rate pass throughs and frequent depreciation of currencies in these countries.

## DEDICATION

I dedicate this to the God Almighty for His love and unmerited favor; and to my wonderful husband, Mr. Frank Acquaye and my lovely daughter Awura Amma.



## ACKNOWLEDGEMENTS

I am most thankful to the Almighty God, for giving me grace and strength to sustain me all through this period. Indeed, my God has been faithful to me and I cannot thank Him enough.

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## LIST OF ACRONYMS

ADF - Augmented Dickey-Fuller test

AIC- Akaike Information criterion

AREAER- Annual Report on Exchange Rate Arrangements and Exchange Restrictions

BOP- Balance of Payments

CEMAC- Central African Economic and Monetary Community

FDI- Foreign Direct Investment

FE-Fixed Effects Model

GDP- Gross Domestic Product

GMM- Generalized Method of Moments

IMF- International Monetary Fund

IPS- Im-Pesaran-Shin W test

LLC- Levin-Lin-Chu test

ML- Marshall-Lerner condition

PP - Phillips-Perron test

REER- Real Effective Exchange Rate

RE-Random Effects Model

SAPs - Structural Adjustments Programmes

SBIC-Schwarz Bayesian Information criterion

SSA- Sub-Saharan Africa

TB - Trade Balance

TDR- Trade and Development Report

UNCTAD- United Nations Conference on Trade And Development

WAEMU- West African Economic and Monetary Union

WDI- World Development Indicator

## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background

International trade has enormous impact on a country's economic growth and development as a whole. Governments across the globe including those in Sub-Saharan Africa (SSA), alike pursue diverse economic policies aimed at improving trade and enhancing economic development. Since political independence, domestic policies such as exchange rates, tariff structure, import control, export subsidies, foreign exchange allocation systems, to mention just a few have been at the centre of several trade fora and discussions in SSA.

The exchange rate has been cited as one of the most important instruments that can be used to improve a country's trade balance position. Particularly in the early and mid 1980s and 1990s, the International Monetary Fund (IMF) had most currencies in SSA heavily devalued as part of the implementation of the Structural Adjustment Programmes (SAP). That is, the exchange rate in a given economy often plays a prominent role in the transmission mechanism of monetary policy. Especially for developing countries, it has been assumed that exchange rate depreciation is an appropriate macroeconomic fundamental to support the export sector (Vitale, 2003).

The exchange rate is the price of one country's currency in terms of another currency. Theoretically, depreciation of the exchange rate is good for the export sector, *ceteris paribus*; it would increase competitiveness of domestic exports by making domestic

goods cheaper on the world market. On the other hand, it would cause higher level of import prices, thereby discouraging import consumption locally. That is, with the depreciation of a country's exchange rate against a particular currency, more of the local currency will be required to obtain the same amount of the trading partner's currency in order to be able to purchase the same quantity of the product as before. Therefore, from the domestic perspective, a rise in the real exchange rate, and in this study due to rise in the nominal exchange rate indicates a relative rise in price of imports and a relative fall in price of exports. This favours the trade balance of the devaluing country, all other factors constant.

The trade balance commonly known as Net Exports is simply the difference between a country's exports and its imports. Therefore, a rise in exports and a fall in imports following an exchange rate depreciation would improve a country's trade balance position.

This assertion is supported by the "Absorption" theory<sup>1</sup> (expenditure Switching theory) of the impact of devaluation herein depreciation on the balance of payments (BOP) through the trade balance. That is, by switching expenditure from the relatively expensive foreign goods to the cheaper domestic goods, thereby raising total domestic production and reducing absorption relative to total output, improves the trade balance (Vamvoukas, 2005). According to this theory, as long as a country is operating below full employment level, depreciation which encourages and motivates domestic production will lead to a

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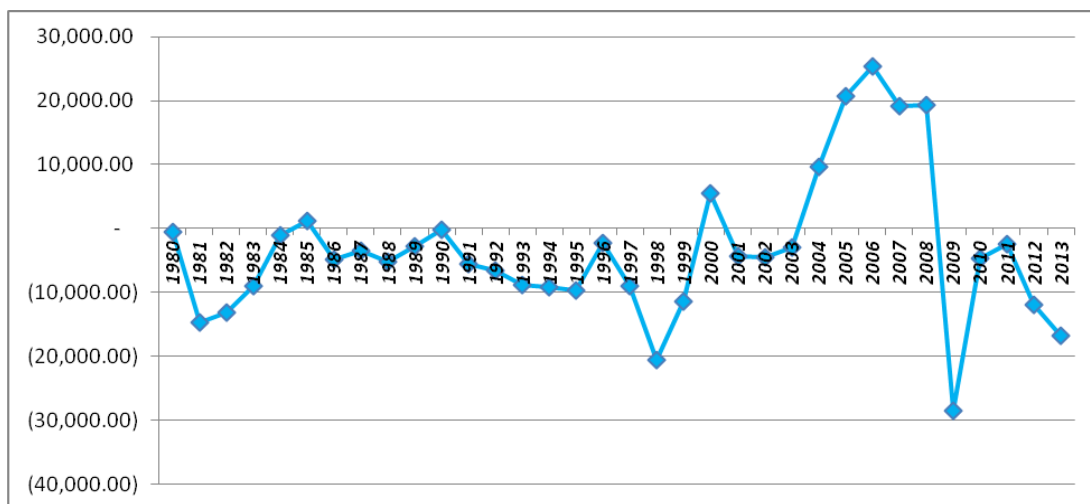
<sup>1</sup> This theory was propounded by Alexander Sydney in 1952. He proposed a number of effects in explaining the theory, the income effect, idle resource effect, terms of trade effect and direct absorption effect.

rise in total output by engaging the idle resources to meet the rise in export demand thereby improving the trade balance.

The level of the trade balance is very crucial in the development and growth process of any economy due to its impact on both the BOP and Gross Domestic Product (GDP). It is the major component of the current account in the Balance of Payments position of a country. Therefore, an improved trade balance will lead to an improvement in a country's GDP and the BOP position. These variables are very important economic indicators in a country's growth performance and likely to attract investment and other growth partners to spearhead the economy on an accelerated growth path.

While other regions like developing Asia has improved especially in recent years with consistent trade surplus, SSA has persistently been in a deficit except for some few selected years, mostly in the mid 2000 where the region recorded a surplus. This is evident from Figure 1.

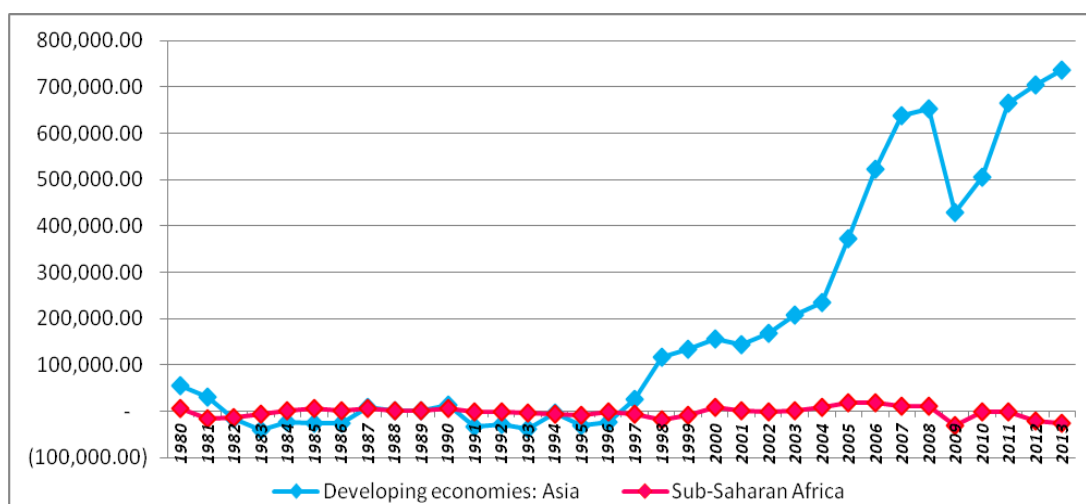
**Figure 1: Trend of SSA trade balance from 1980-2013 (excluding South Africa)**



**Source: UNCTAD Database, 2014 (Figures are in millions of US Dollars)**

It is evidently clear from Figure 1 that SSA economies have persistently been recording a trade deficit. For instance, in years before 1990, SSA recorded only one trade surplus between 1980 and 1990. Except for Angola, Botswana, Cote d'Ivoire, Gabon, Nigeria and a few others, most of the countries in SSA have persistently recorded a deficit. Even, in the mid 2000, where there was a global financial boom, most of these countries like Ghana, Kenya, Lesotho, Senegal and the like could not record a surplus. In particular, those in Eastern Africa have in successive years experienced a trade deficit on the aggregate from 1980-2013. However, in the mid 2000, the region as a whole witnessed a positive trade balance successively with 2006 recording the highest trade surplus ever until 2009 when the effect of global financial crises kicked in. Even so, this is attributed to only a few countries which recorded a sharp growth in their exports as against imports. For instance, merchandise exports for Angola grew from -17.5% in 2001 to 78.9% in 2005 and remained high in other subsequent years until 2009.

**Figure 2: Trend of the trade balance for developing economies in Asia and SSA from 1980-2013**



Source: UNCTAD Database, 2014 (Figures are in millions of US Dollars)

Comparatively, developing Asian economies have in recent times witnessed a persistent trade surplus. From Figure 2, SSA and this region are observed to be at par in terms of the level of their trade balances in the 1980s. More often than not, SSA recorded relatively more favourable trade balance than these Asian economies in those years. However, from the mid 1990s, developing Asian economies has experienced a sharp rise in the trade balance to a record high leaving SSA still crawling in deficits. Except for those developing economies in Southern Asia which have been recording a persistent trade deficit, the rest of the region has been recording a surplus from the late 1980s. This is attributed to the emphasis of the role played by technology in economic growth. That is, particularly, in the entire East Asian economies one can find export orientation and rapid technological progress not to mention the increasing rate of investment (IMF, 1996).

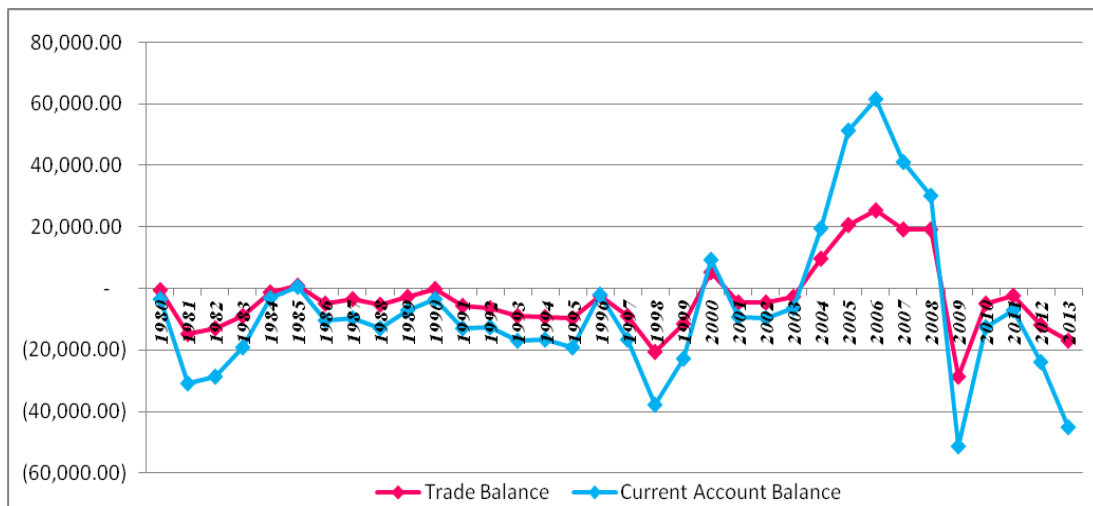
This continuous deterioration of the trade balance in the region has a replica effect on the current account balance. Thus, this can jeopardizes the growth and development process of these economies. According to the IMF regional economic outlook report in 2013, important drivers of the deterioration in current account balances since 2007 have been higher imports and lower official transfers. For Sub-Saharan Africa, current official transfers declined by about 2 percent of GDP compared with the period 2005–2007, returning to the levels observed before the global boom that started in 2005. At the same time, imports of goods and services increased by about 4 percent of GDP, while on average, exports edged down, driven by oil exporters thereby worsening the trade deficit (IMF, October 2013). Again, from the trade and development report by the UNCTAD,<sup>2</sup> if

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<sup>2</sup> United Nations Conference on Trade and Development

current account imbalances are understood to be the outcome of export performance and import demand rather than an international savings transfer, it is also possible to understand why current account surpluses and net foreign asset accumulation can favour longer term growth. The trickling down effect of the worsening trade balance is clearly observable in Figure 3.

**Figure 3: Relationship between SSA Trade and Current Account Balance: 1980-2013**



**Source: UNCTAD Database, 2014(Figures are in millions of US Dollars)**

From Figure 3, although the current account deficit is observed to be worse than the trade deficit, the two have always moved in the same direction over the years. However, it can be observed that the trade deficit has a multiplication effect on the current account. That is, in the years where there were trade deficits, the current account deficit deteriorated further. Conversely, in years of trade surplus, the current account surplus exceeded the former. This is clearly evident in the late 1990s and mid 2000. Hence, the continual current account deficits are further worsened by the persistent trade deficit.

It is worth mentioning that, large current account deficits imply a significant dependence on external saving although, the prevalence of Foreign Direct Investment (FDI) is a mitigating factor in many of these countries. Nevertheless, FDI-financed deficits carry risks of their own. Countries are exposed to the risk of a reversal in domestic demand with adverse consequences on employment and economic activity should future investment flows decline in response to a tightening of global financing conditions (IMF, October, 2013).

From the above discussion, it is obvious that, any policy that can mitigate the persistent decline in the trade balance is worth considering by governments in the region. The exchange rate depreciation is cited as one of the most popular economic tools that can be used to improve the trade balance. This is supported by both economic theory and most empirical works (Lerner, 1944; Sydney, 1952; Brooks, 1999; Bahmaani-Oskoe and Ratha, 2004; Dossani, 2012).

One of the most popular theories that support the exchange rate is the Marshall-Lerner condition (ML) which is the core part of the elasticity approach. It supports the assertion that devaluation of a country's currency would improve its trade balance. Formally, according to the condition, the devaluation (depreciation) of the currency will improve the trade balance if the sum of the elasticity demand for import and export is greater than one (in absolute terms). That is, since depreciation has both a positive quantity effect and a negative cost effect through higher import prices on the trade balance, the net effect will depend on the price elasticities which is explained by the ML condition. Empirically however, it has been proven that trade in goods tend to be inelastic mostly in the short

run. This is because it normally takes time to change consuming patterns and trade contracts (Bahmani-Oskoe & Ratha 2004). Thus, the condition may not be satisfied in the short run. All things being equal, the trade balance may even worsen in the short run since prices tend to adjust quickly but imports and exports do not fluctuate easily in terms of volumes. Therefore, although the depreciation has caused changes in relative prices, the lag in the adjustment of the quantity effect tend to negatively impact the trade balance in the short term. Hence a positive relationship between these two is only a long run effect (Ryan, 1993) giving rise to the J-curve phenomenon.

The J-curve effect is the time path of the trade balance. It explains the lag in ML condition, that is, there is an initial worsening of the trade balance after a depreciation but improves later when quantities are fully adjusted to the initial price changes. Hence, the trade balance would only see an improvement if any, in the long run where the ML condition will be met.

## **1.2 Problem Statement**

Trade deficit is not only experienced by economies in the SSA region. Many real world economies including advanced economies record trade deficits. However, the situation is quite manageable in the developed economies due to their higher levels of productivity which produces large export capacities. Unfortunately, the chronic and deteriorating nature of the trade deficit in SSA region makes it a cause of worry to governments and other economic stakeholders due to its replica effect on the current account balance. This subsequently worsens the fiscal deficit and possible accumulation of external debts. That is, an increase in the current account deficit as a result of an appreciation of the real

exchange rate and a concomitant loss of competitiveness of domestic producers may be temporarily financed by a net capital inflow. Nonetheless, it will sooner or later require some form of adjustment, normally a real depreciation. Exchange rate overvaluation has mostly been the common and the most consistent predictor of the financial crises that have characterized the developing world over the past years (UNCTAD, 2008).

The problem of the trade deficit stems from lower export levels due to supply side constraints. That is, economies in the region do not have the infrastructural resources needed to produce such products as manufactures which are rather more competitive on the international market to boost their exports. Needless to say, export competitiveness is very crucial in improving any country's trade performance. The exchange rate has been cited as one of the most commonly used policies in improving export competitiveness and subsequently the trade balance. Although, a focus on technology and innovation to improve the level of productivity and export diversification in Sub-Saharan Africa is the long term and permanent solution to improving the trade performance and as such the deficit in the region, the exchange rate can be used to mitigate the problem at least in the short term. That is, the exchange rate in a given economy often plays a prominent role than the interest rate in the transmission mechanism of monetary policy. Especially for developing countries, it has been assumed that depreciation is an appropriate macroeconomic fundamental to support the export sector (Vitale, 2003). This implies that there are two elements to be noted on devaluation and the impact of trade balance. Firstly, it is supposed that a country has export potential, and depreciation has the price elastic for export goods in foreign markets. Secondly, it is also assumed that depreciation is supported by sound macroeconomic fundamentals and can maintain competitiveness in

foreign markets i.e. the economy has capacity to produce more output for export (Alemu, 2014).

In spite of the above theoretical analysis and other theories alike, a positive effect of currency depreciation on the trade balance in reality cannot be said emphatically, particularly in small economies like the SSA economies where they are mostly net importers. Any definite conclusion of the effect of exchange rate depreciation on a country's trade balance therefore, will be biased unless supported by some empirical studies since the relationship between the two is controversial.

### **1.3 Research Questions**

The questions of concern that this study seeks to find out are;

- ❖ Do exports and imports of SSA actually respond to changes in the exchange rate?
- ❖ How do exchange rate changes affect the trade balance in SSA?

The outcome of the above questions is very important in establishing a relationship between the exchange rate and the trade balance in the region.

### **1.4 Research Objectives**

This study seeks to primarily analyze the relationship between the exchange rate and the trade balance in Sub-Saharan Africa. The main objective of this research is to;

- ❖ Estimate the effect of the exchange rate depreciation on the trade balance using empirical data from selected Sub-Saharan African countries.
- ❖ Find out if the J-curve exists in the region.

### **1.5 Justification and Significance of the Study**

As has previously been discussed, the trade balance in any country is a very important subject area for discussion. This is also a major concern area for SSA economies where the situation worsens year on year. This has attracted lots of research interest both within and outside the region.

A lot of literature studies have gone into this area in order to explain the poor export performance in the region and the associated higher imports resulting in the trade deficit (Kassim, 2013; Manduna, 2005). Others have also gone further to investigate the relationship between the trade balance and the exchange rate and how it can be used as a short term mitigation to the persistent deficits in the region. The most recent study in this area is the one done by Judith Olivier Canipe in 2013. This however, focused on testing the ML condition in Ghana prior to 1981. Similarly, those done by Moses Joseph Shawa and Yao Shen (2013), Dominique Njinkeu and Ernest Bamou (2011), Salman Dossani (2012) and M.A Loto (2011) for Tanzania, Cameroun, Malawi and Nigeria respectively. The focus of most previous studies were country specific and conclusions done for SSA as a whole based on the similarities of the trade characteristics of SSA economies. That is, most of these studies are time series analysis for specific individual countries and not on the aggregate level. However, not much panel analysis has been done to study the relationship between the exchange rate and the trade balance in SSA.

Therefore, this study is still necessary not only because it adds to the existing literature but also because;

- ❖ It uses a panel analysis with more recent econometric techniques
- ❖ It adds more recent data
- ❖ It uses an expanded sample size
- ❖ It unearths possible changes in the trade structure

Most of the studies done were in the 1990s and early 2000s. The most recent panel literature for SSA countries with a relatively long period of study is one done by Glenville Rawlins in 2011 and Lanre Kassim in 2013. The period of study though long enough is however, from 1960-2006 and 1981-2010 respectively. Although quite recent, the trade dynamics in the region could have changed. For instance, the level of diversification indices of merchandise export for the region from that of the world structure has been falling steadily recently from the consistent high close to 0.8 to below 0.7 (UNCTAD database, 2014). That is, although imports still exceed exports in the region, level of manufactured exports has improved, hence a possible rise in the export elasticity.

Again, movements in the trade balance have not followed a specific pattern since 2010 although it is a deficit. Therefore, there is the need to probe further the empirical relationship between the real exchange rate and the trade balance. This research is therefore being done in order to establish any such possible positive relationship between the two variables. Thus, if the exchange rate can be used as a policy tool in these recent times to improve the trade deficit in the region.

## **1.6 Scope and Source of Data**

The study uses panel data on sixteen (16) SSA countries<sup>3</sup> for the period 1980-2013. Not all the SSA countries are used in the study due to the inconsistency and insufficiency of data availability for most of these countries. This also, excludes South Africa due to their distinct macroeconomic and trade characteristics from the rest of the region. The period of study is limited to recent times due to unavailability of data for some key variables of interest to this research from the 1960s. However, the number of countries involved in the study and the period of study are long enough to give room to analyze relational patterns of the variables. The data used by the study is a secondary data on SSA's trade balance, exports and imports for the region, real effective exchange rate Figures, GDP and all other relevant data. This is mainly sourced from UNCTAD database, World Development Indicators, IMF and World Bank database and other related articles.

## **1.7 Organization of Study**

The study is organized into six (6) chapters with the following outline. This introductory chapter, which is chapter one provides a background to the study, discusses the problem statement and outlines the significance and objectives of the study. Following this is chapter two which gives an overview of the exchange rate and trend of the trade balance in SSA which are the focus of this study. Chapter three reviews both theoretical and empirical literature on the relationship between the exchange rate and the trade balance. Chapter four on the other hand, provides the methodology and the theoretical framework employed in this research. Chapter five analyses and discusses the empirical results.

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<sup>3</sup> See Appendix I for the list of countries

Chapter six, which is the final chapter, presents the summary, conclusion and policy recommendations based on the findings of this research.

## **CHAPTER TWO**

### **OVERVIEW OF EXCHANGE RATE SYSTEMS AND THE TRADE BALANCE**

#### **2.1 Introduction**

This chapter presents a discussion of the trend in the trade balance and exchange rate systems in Sub-Saharan Africa. Following this section is the analysis of the trend of the trade balance in SSA. The subsequent sections focus on the overview of the exchange rate systems and their classification in the region.

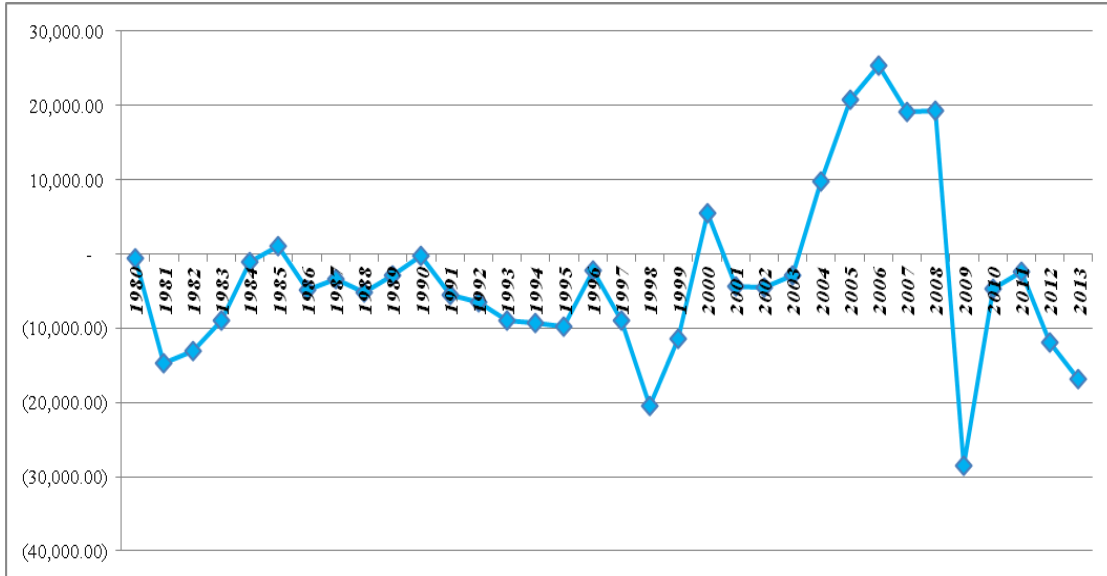
#### **2.2 Trend analysis of the trade balance in SSA**

The trade balance is the difference between a country's total value of merchandise exports and imports in a given year, hence often referred to as Net exports. Therefore, when the value of total exports exceeds imports, there is a trade surplus. On the other hand, when the total annual value of imports exceeds exports, then there is a trade deficit. Unfortunately, many economies of SSA, often record negative trade balances. Most SSA economies have been experiencing high import growth compared to exports over the years leading to a persistent deterioration of the trade deficit. Figure 4 shows the trend of SSA trade balance from 1980 to 2013.

From Figure 4, although there has been some record of trade surplus, SSA has mostly recorded trade deficit over the years. Particularly, for two decades (between 1980 and 2000) there was only one record of a positive trade balance which was in 1985.

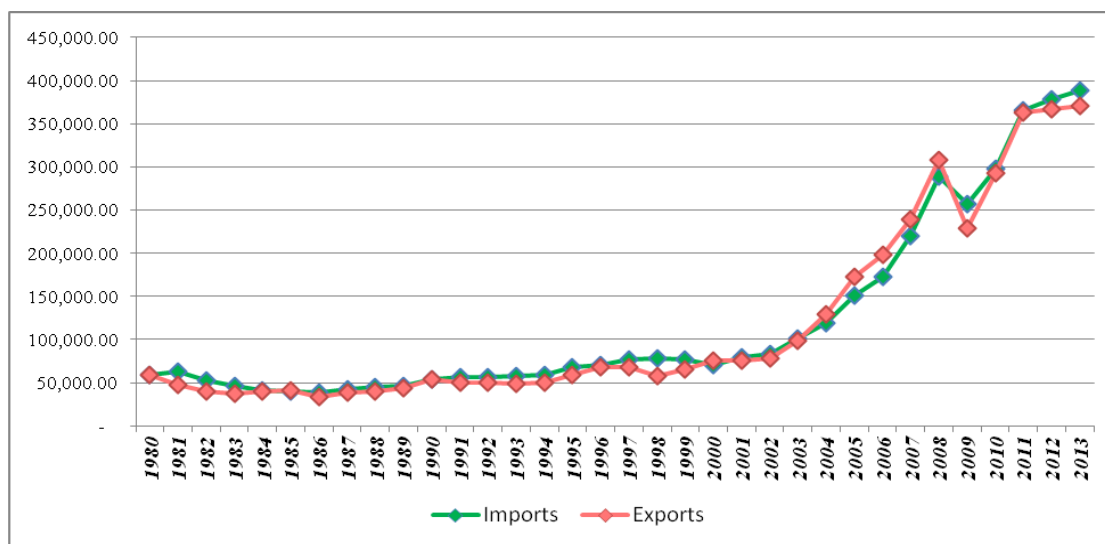
Unfortunately, all the subsequent years recorded trade deficits until 2000, where the region experienced a surplus. Nonetheless, the global economic boom which started in 2005 positively influenced the region’s trade. Thus, the region witnessed years of surplus consecutively in the mid 2000 (2004-2008). This was however, short lived due to the insertion of the global financial crisis in 2007 (IMF, 2013).

**Figure 4: Trend of SSA trade balance from 1980-2013**



**Data Source: WDI, 2015**

The chronic trade deficit can be attributed to the fact that imports in the region tend to grow faster than exports most of the time. However, exports in 2004 increasingly exceeded imports successively until 2008 resulting in the positive trade balance in those years after which it fell sharply below imports as shown in Figure 5. Whereas empirical data shows a decline in both exports and imports in the region, growth of exports fell by a greater margin of 14% with imports falling by only 2.4% in 2009 (WDI, 2015). This is by far, the region’s worst performance for the past 3 decades with a deficit of US \$28,540.56 million (UNCTAD, 2014). This is evidenced in Figure 5.

**Figure 5: Trend of exports and imports from 1980-2013**

**Data Source:** UNCTAD, 2014

From Figure 5, SSA exports in most of the years lie below that of their imports leading to a deterioration of the trade balance. In 1985, however, whereas imports fell by 2.1%, exports on the other hand increased by 6.1%. This could be attributed to the implementation of the IMF SAPs which included trade liberalization in a number of SSA countries (Kassim, 2013). Subsequently, imports exceeded exports but by relatively lower amount. Therefore, although the region still experienced trade deficits, there was a steady improvement until 1998 and 2009, where exports fell sharply below imports. These two years have witnessed the region's highest recorded trade deficit. This could be due to the concentration of their exports in only few commodities mostly in their raw state (Manduna, 2005). Unfortunately, these products are mostly less price elastic, hence making them less competitive on the world market (Babatunde and Olufin, 2007). On the other hand, SSA imports are mostly manufactures which are more competitive in the international market, relatively more income elastic and more expensive than their

exports. Again, most of these manufactures, such as electronics, automobiles, machinery and equipments amongst others have very little or no substitutes in the individual economies. Consequently, their demand is less responsive to price changes. Therefore, using the exchange rate as a policy instrument to improve the trade deficit without any fundamental macroeconomic backing normally becomes difficult. Hence, the persistent trade deficit in spite of the numerous depreciations of the major currencies in the SSA.

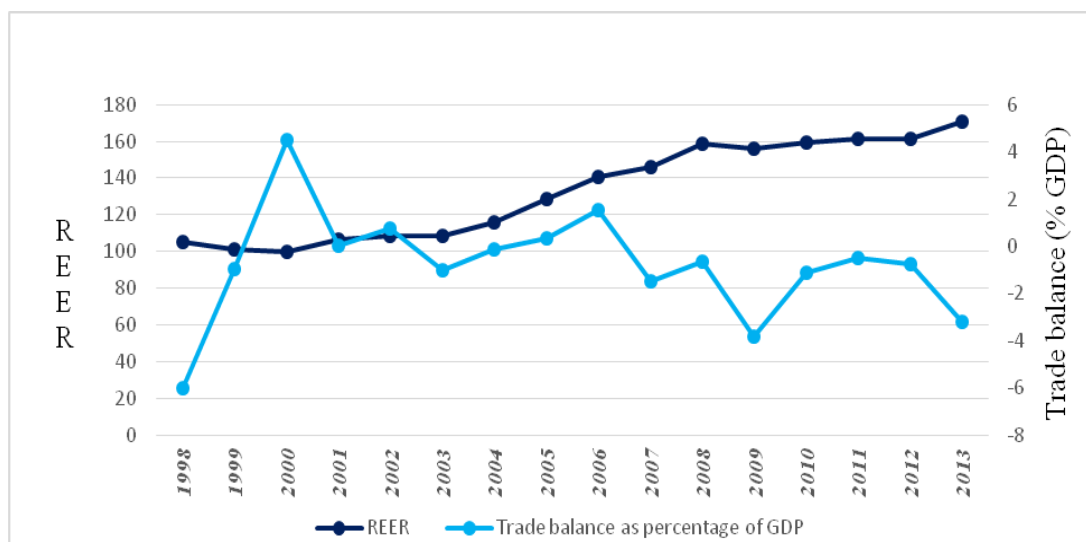
It is evidently clear from Figure 6 that the relationship between the Real Effective Exchange Rate and the trade balance does not follow a specific pattern in SSA. The Real Effective Exchange Rate (REER) is the weighted average of a country's currency against a basket of other major currencies adjusted for inflation.<sup>4</sup> For instance, between 1998 and 2000, the REER appreciated by approximately 4.7%. However, contrary to economic theories, the trade balance as percentage to GDP rather improved from -5.99% in 1998 to 4.49% in 2000. One may argue that, this increment may not necessarily be as a result of an improvement in the trade balance but perhaps a decline in the region's GDP. On the contrary, SSA economies as a whole recorded a positive growth in the GDP from 2.27% in 1998 to 3.46% in 2000. Nonetheless, the REER and the trade balance as percentage to GDP appear to follow a similar direction from 2002 to 2006. In 2002, when the REER further depreciated, the trade balance recorded an improvement from 0.02% to 0.76% in that year. Subsequently, there was a slight decline in the REER in 2003. In this same year, the trade balance recorded a deficit of -1.03% of GDP. In the years that followed up to 2006, as the REER gradually depreciated year on year, the share of the trade balance in GDP steadily improved. This was however, short-lived. Since 2007 to 2013, the REER

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<sup>4</sup> Values below 100 indicates an appreciation and those above signifies a depreciation

has consistently depreciated, on the other hand the trade balance has continuously been recording a deficit. Therefore, from Figure 6, the relationship between the two economic variables cannot be said emphatically without any empirical analysis.

**Figure 6: Relationship between the trade balance and the real effective exchange rate in SSA<sup>5</sup>**



Source: UNCTAD, WDI-2015

### 2.3 Exchange rate systems in Sub-Saharan Africa

Exchange rate regime is the way an authority manages its currency in relation to other currencies and the foreign exchange market. It is closely related to monetary policy and the two are generally dependent on many of the same factors. In the 1960s and 1970s when independence became very popular in the region and most countries had just gained their political freedom, governments adopted several trade policies in the bid to protect their domestic industries against foreign competition. In terms of exchange rate policy, the fixed exchange rate system was adopted, where governments formally and

<sup>5</sup> The graph does not show trend of the relationship between REER and the trade balance as percentage of GDP prior to 1998 due to the unavailability of REER data for those years

deliberately adjusted the exchange rate in order to cushion economic activities domestically, discourage imports, increase international competitiveness amongst other reasons to spearhead economic growth and development in the economy. Since the end of the Bretton Woods system of fixed exchange rates in the early 1970s, the number of countries running de jure<sup>6</sup> flexible /floating exchange rate regimes has grown steadily (Slavov, 2011:p3). Apart from South Africa and few other countries, most SSA countries implemented fixed exchange rate regimes prior to the structural reforms era. However, after the reforms were implemented many SSA countries have changed to floating/flexible exchange rate regimes apart from very few ones like Djibouti (World Bank, 2012).

Most countries in Sub-Saharan Africa have over the years undergone some measures of real foreign exchange rate depreciation. This became particularly popular in the mid 1980s with the incorporation of exchange rate reform as a component of the SAPs. One of the major aims of such exchange rate policy was to balance the worsening terms of trade at that time and with a view to improving trade performance (Ndlela and Ndlela, 2002). For instance in the case of Ghana, prior to the implementation of the SAP, it was believed that overvaluation of the local currency, *the cedi*, was one of the major causes for the poor export performance in the country. During the implementation of the SAP, the *cedi* was devalued by up to 800% in 1983, gradually moving the economy to a floating exchange rate system and was devalued again by 90% between 1983 and 1986 (Spooner and Smith, 1991).

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<sup>6</sup> A de jure exchange rate system is the type of system officially claimed by the authorities of a country. this may be different from what pertains in practice in that country (IMF, AREAER 2014).

However, not all SSA countries migrated from the fixed to a flexible exchange rate regime. Most Eastern African economies and those under the CFA zone still have their currencies pegged to a particular currency or group of currencies mostly dominated by the US dollar. In Table 1, it is clearly observed that all of these countries are operating a soft peg exchange rate system.

There are two main forms of exchange rate systems; fixed (Pegged) exchange rate and flexible (floating) exchange rate systems. In the middle of the spectrum are soft pegs exchange rate systems. Most countries in SSA are however, not under a strictly fixed or flexible exchange rate system in practice. According to the IMF classification of exchange rate systems based on de facto<sup>7</sup> system however, many real world economies including most SSA countries are in the middle of the spectrum. Intermediate exchange rate systems tend to be a more appropriate solution for most countries than are corner solutions suggested by the bipolar view (Frankel, 1999). That is, most countries do not practice strictly fixed or flexible exchange rate system. These intermediate exchange rate systems have been distinguished into four major categories: hard pegs (such as exchange arrangements with no separate legal tender and currency board arrangements); soft pegs (including conventional pegged arrangements, pegged exchange rates within horizontal bands, crawling pegs, stabilized arrangements, and crawl-like arrangements); floating regimes (such as floating and free floating); and a residual category, other managed

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<sup>7</sup> A de facto exchange rate system is the system actually practiced in the economy, sometimes contrary what has been officially announced by government (de jure).

(AREAER, 2014).<sup>8</sup> The next section briefly describes the various exchange rate systems as defined by the AREAER.

### ***2.3.1 Description of the Exchange Rate Systems***

*Hard Peg:* This is an exchange rate system where the national currency is fixed to a respectable foreign currency. This regime is used by several countries to maintain price stability. That is, hard pegs usually go hand in hand with sound fiscal and structural policies and low inflation. They tend to remain in place for a long time, thus providing a higher degree of certainty for pricing international transactions. However, the central bank in a country with a hard exchange rate peg has no independent monetary policy because it has no exchange rate to adjust and its interest rates are tied to those of the anchor-currency country (Stone *et al*, 2008). There are two main forms of hard peg exchange rate systems. These are No separate legal tender and Currency board.

*No separate legal tender:* This is a confirmation of the country authorities' de jure exchange rate arrangement. The currency of another country circulates as the sole legal tender (formal dollarization). Adopting such an arrangement implies complete surrender of the monetary authorities' control over domestic monetary policy.

*Currency board:* This arrangement is a monetary arrangement based on an explicit legislative commitment to exchange domestic currency for a specified foreign currency at a fixed exchange rate, combined with restrictions on the issuance authority to ensure the fulfillment of its legal obligation. This implies that domestic currency is usually fully

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<sup>8</sup> AREAER is the IMF Annual Report on Exchange Rate Arrangements and Exchange Restrictions which provides a yearly description of the foreign exchange arrangements, exchange and trade systems, and capital controls of all IMF member countries

backed by foreign assets, eliminating traditional central bank functions such as monetary control and lender of last resort, and leaving little room for discretionary monetary policy. Some flexibility may still be afforded, depending on the strictness of the banking rules of the currency board arrangement.

*Soft Peg Regime:* This is more flexible than hard pegs. That is, these are countries whose currencies maintain a stable value against an anchor currency or a composite of currencies. The exchange rate can be pegged to the anchor within a narrow (+1 or -1 percent) or a wide (up to +30 or -30 percent) range, and, in some cases the peg moves up or down over time, usually depending on differences in inflation rates across countries. Although soft pegs maintain a firm "nominal anchor" (that is, a nominal price or quantity that serves as a target for monetary policy) to settle inflation expectations, they allow for a limited degree of monetary policy flexibility to deal with shocks. However, soft pegs can be vulnerable to financial crises which can lead to a large devaluation or even abandonment of the peg. This type of regime tends not to be long lasting (Stone et al, 2008). There are different forms of soft peg exchange rate systems. These include the following;

*Conventional peg:* For this category the country formally (de jure) pegs its currency at a fixed rate to another currency or a basket of currencies. The basket is formed, for example, from the currencies of major trading or financial partners and weights reflect the geographic distribution of trade, services, or capital flows. The country authorities stand ready to maintain the fixed parity through direct intervention (via sale or purchase of foreign exchange in the market) or indirect intervention (via exchange rate related use of interest rate policy, imposition of foreign exchange regulations, exercise of moral

suasion that constrains foreign exchange activity or intervention by other public institutions). The exchange rate may fluctuate within narrow margins of less than plus or minus 1% around a central rate or the maximum and minimum values of the spot market exchange rate must remain within a narrow margin of 2% for at least six months.

*Stabilized arrangement:* This entails a spot market exchange rate that remains within a margin of 2% for six months or more (with the exception of a specified number of outliers or step adjustments) and is not floating. The required margin of stability can be met either with respect to a single currency or a basket of currencies, where the anchor currency or the basket is ascertained or confirmed using statistical techniques. Classification as a stabilized arrangement requires that the statistical criteria are met and that the exchange rate remains stable as a result of official action (including structural market rigidities).

*Crawling peg:* This is where the currency is adjusted in small amounts at a fixed rate or in response to changes in selected quantitative indicators, such as past inflation differentials vis-à-vis major trading partners or differentials between the inflation target and expected inflation in major trading partners. The rate of crawl can be set to generate inflation-adjusted changes in the exchange rate (backward looking) or set at a predetermined fixed rate and/or below the projected inflation differentials (forward looking).

*Crawl-like arrangement:* The exchange rate must remain within a narrow margin of 2% relative to a statistically identified trend for six months or more (with the exception of a specified number of outliers), before the exchange rate arrangement cannot be considered as floating. Usually, a minimum rate of change greater than allowed under a stabilized

(peg-like) arrangement is required; however, an arrangement is considered crawl-like with an annualized rate of change of at least 1%, provided the exchange rate appreciates or depreciates in a sufficiently monotonic and continuous manner.

*Other managed arrangement:* This category is a residual and is used when the exchange rate arrangement does not meet the criteria for any of the other categories. Arrangements characterized by frequent shifts in policies may fall into this category.

*Floating exchange rate system:* This is largely market determined, without an ascertainable or predictable path for the rate. Floating regimes offer countries the advantage of maintaining an independent monetary policy. In such countries, the foreign exchange and other financial markets must be deep enough to absorb shocks without large exchange rate changes. Also, financial instruments must be available to hedge the risks posed by a fluctuating exchange rate. The central bank's intervention may be either direct or indirect and serves to moderate the rate of change and prevent undue fluctuations in the exchange rate, but policies targeting a specific level of the exchange rate are incompatible with floating. Indicators for managing the rate are broadly judgmental (e.g. balance of payments position, international reserves, parallel market developments). Floating arrangements may exhibit more or less exchange rate volatility, depending on the size of the shocks affecting the economy.

*Free floating:* this is where the intervention by the central bank occurs only exceptionally and aims to address disorderly market conditions. That is, the intervention is usually limited to at most three instances in the previous six months, each lasting no more than three business days.

### 2.3.2 Classification of the exchange rate systems in SSA

The classification system is based on the members' actual, de facto arrangements as identified by IMF staff, which may differ from their officially announced, de jure arrangements. The system classifies exchange rate arrangements primarily on the basis of the degree to which the exchange rate is determined by the market rather than by official action, with market-determined rates being on the whole more flexible. Table 1 shows SSA economies and their de facto exchange rate systems.

**Table 1: Classification of SSA Exchange rate system**

Hard Pegs		Soft Pegs	Floating Regimes	Other managed arrangement
No separate legal tender	Currency Board			
Zimbabwe	Djibouti	Cape Verde	Ghana	Gambia
		Comoros	Kenya	Nigeria
		Sao Tome and Principe	Madagascar	Rwanda
		WAEMU <sup>9</sup>	Malawi	Liberia
		CEMAC <sup>10</sup>	Mozambique	
		Lesotho	Seychelles	
		Namibia	Sierra Leone	
		Eritrea	Tanzania	
		Burundi	South Africa	
		Democratic Rep. of Congo	Uganda	
		Guinea	Mauritius	
		Angola	Zambia	
		Botswana	Somalia	
		Ethiopia		
		Swaziland		

Source: AREAER, October 2014

<sup>9</sup> Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali and Niger

<sup>10</sup> Cameroon, Central African Republic, Chad, Republic of Congo, Equatorial Guinea and Gabon

According to the Friedman's hypothesis, the exchange rate can be a better policy tool under a flexible exchange rate regime than that of a fixed exchange rate system. The reason according to the theory is the presence of some kind of price stickiness. Friedman argued that when economies are hit by real shocks the countries that can change relative prices more quickly have smoother adjustment in terms of quantities. In particular, Friedman noted that in a world with sticky prices the speed at which relative prices adjust depends crucially on the exchange rate regime. Under a flexible regime, relative prices can adjust immediately through changes in the nominal exchange rate, while under fixed regimes the changes happen at the rate permitted by the nominal stickiness, which is usually much slower. Therefore, flexible regimes should have smoother quantity responses and quicker relative price adjustments to real shocks than do fixed regimes. Once the nominal price stickiness is relaxed, differences across regimes should vanish (Broda, 2002). This pre-supposes that, the lag in quantity adjustment after a devaluation cited by the J-curve phenomenon mentioned earlier is likely to even delay further under a fixed exchange rate system.

#### **2.4 Concluding remarks**

Sub-Saharan Africa has recorded persistent trade deficits with only few years of surplus. The region's worst record was in 1998 and 2009 which also witnessed an appreciation of the real effective exchange rate. However, the trend in the trade balance cannot be attributed to the movements in the exchange rate wholly. That is, in the mid-2000, where the region recorded successive trade surpluses, the real effective exchange rate rather appreciated contrary to economic theory. The Friedman's hypothesis argues that, the

exchange rate can be a better policy tool under a flexible exchange rate regime than that of a fixed exchange rate system. The reason, according to the theory is the presence of some kind of price stickiness under the fixed regime. However, the exchange rate system in most SSA countries is neither strictly floating nor fixed. With the exception of fifteen (15) countries that are practicing either the pegged or floating regime with occasional government intervention, a chunk of SSA countries are operating intermediate exchange rate systems (soft peg). Some countries appear to actively limit fluctuations in the external value of their national monies. Calvo and Reinhart dubbed this behaviour “fear of floating” and showed that it is rather pervasive across regions and levels of development (Calvo and Reinhart, 2002; 2005). Some target the money supply or the inflation rate; others practice “managed floating.”

## **CHAPTER THREE**

### **LITERATURE REVIEW**

#### **3.1 Introduction**

This chapter presents the theoretical and empirical review of some of the relevant literature that provide explanations to the relationship between the real exchange rate and the trade balance. The next section is the review of theoretical literature which focuses on the various theories propounded in relation to this research area. This is followed by the empirical review which looks at the empirical studies done by earlier researchers. This is to expound the gaps in the existing literature and establish the essence and contribution of the current study in this area of research.

#### **3.2 Theoretical Review**

Several theories have evolved over the years to explain the mechanism involved in manipulating the exchange rate of an economy as a policy tool in improving its balance of payments or trade balance. Amongst them is the simple "elasticity" approach following the classic paper by Joan Robinson (1950), the "absorption" approach developed by Alexander S. Sydney(1952), the Keynesian "multiplier" approach, the Keynesian "policy" approach pioneered by James Meade, and most recently the "monetary" approach stemming from the work of Robert Mundell (Johnson, 1975). Differences between these approaches have occasionally been the focus of sharp controversy, mostly in the case of the elasticity and absorption approaches. Recently, the

case of the monetary approach has also been contrasted with other approaches that have in common an emphasis on elasticities or the influence of exchange rate changes on trade flows via relative price changes and international elasticities. Some of these theories that support a relationship between the exchange rate and the balance of trade are discussed below.

The discussion will however, be centered on the elasticity approach since that is the most recognized analytical tool in assessing the relationship between the exchange rate and the trade balance and as such the focus of this research. In the section that follows, devaluation and depreciation have been used interchangeably, since at the time these theories were propounded devaluation was much more popular but for the purpose of this study devaluation will mean the same as depreciation and as such would have the same effect on the analysis being done. Conversely, balance of payments and balance of trade are used interchangeably.

### ***3.2.1 The Elasticities Approach to the Balance of Trade***

The traditional approach to the analysis of the balance of payments is embodied in the elasticities approach. This model seeks to explain the balance of trade, i.e. exports and imports, by a microeconomic approach which focuses on the choice between domestic and foreign goods. The theory is based on the following assumptions:

- ❖ Product prices are fixed in domestic currency.
- ❖ Income levels are fixed in the devaluing country.
- ❖ Demand for imports and supply of exports depend on the nominal prices fixed in the home currency unit.

The elasticity approach was initially developed by Bickerdike-Robinson-Metzler in the middle of the twentieth century (Chee-Wooi&Tze-Haw, 2008). According to this theory, other factors held constant, the relative price of a domestic and foreign goods and services will determine the quantities of each purchased. Hence the theory is based on the premise that exports and imports are determined by relative prices. The relative price of the home and foreign good is determined by their absolute prices and the exchange rate (Gowland, 1983). Relative prices can change either as a result of a change in the exchange rate or of a change in absolute prices, both domestic and foreign. These are often combined into an index of competitiveness. According to the theory, an improvement in competitiveness must lead to a rise in the volume of exports and/or a fall in the volume of imports, i.e. demand curves slope downwards. However, one is interested in the value of exports as well as the volume. That is, there are a number of scenarios and in each case the effect of the depreciation on the trade balance varies depending on the extent of their elasticities.

- ❖ The above scenario is the normal situation where both exports and imports are fairly elastic. Thus devaluation reduces value of imports and at the same time increases export values thereby improving the trade balance.
- ❖ When both exports and imports are inelastic, that is, when the demand curve is steep and the supply curve is backward bending or downward sloping, the effect on the trade balance in this case is ambiguous and will depend on the degree of inelasticity.

In the second scenario, although a depreciation would cause a fall in the values of both export and import, if the decrease in value of domestic imports is greater than the

decrease in value of domestic exports then the trade balance will improve (Lerner, 1944). If on the other hand, exports are more elastic than imports, then the depreciation would lead to a worsening of the trade balance since the fall in export revenues would be greater than the fall in import expenditures. The elasticity approach is demonstrated in reality by policy makers when a country is facing a deficit in the trade balance. The policy makers have to take into account the responsiveness of imports and exports due to a change in the exchange rate to calculate to what extent devaluation would improve the trade balance. If the foreign demand for exports and domestic demand for imports are relatively elastic a small change in the spot rate can correct a deficit, and if they are relatively inelastic a large change in the spot rate is required to correct a deficit (Daniels & VanHoose, 2004).

The first scenario reflects a stable foreign exchange market equilibrium, whereas the second is the case of an unstable equilibrium. The condition that guarantees the first scenario reflects the Marshall-Lerner condition.

### ***3.2.2 The Marshall-Lerner Condition***

The Marshall-Lerner condition was developed by Abba Lerner (1944), which is an extension of Alfred Marshall's price elasticity of demand to foreign trade to show the effect of a depreciation on the trade balance from different scenarios. The Marshall-Lerner condition is the core part of the elasticity analysis of the impact of depreciation on the balance of trade. Formally, according to the condition, the devaluation (depreciation) of the currency will improve the trade balance if the sum of the elasticity of demand for export and import (in absolute terms) is greater than unity. The condition states that if policy makers devalue a currency in order to get a positive effect on the trade balance, the demand for the nation's exports and the nation's demand for imports needs to be

sufficiently elastic. The condition under the simplest of circumstances is that the two elasticities together must exceed one (Brown & Hogendorn, 2000).

In general, if the sum of the two elasticities is less than one then in reaction to a depreciation the trade balance will deteriorate and if the sum is greater than one the trade balance will improve (Lerner, 1944). The crucial feature of the condition is that it is the sum of the elasticities which must exceed one, not each elasticity separately. That is, if the export elasticity is zero, the value of exports will be unchanged after a depreciation. In this case, the change in the value of imports will determine what happens to the trade balance. Similarly, if the import elasticity is zero, the values of imports will remain constant and the effect of the depreciation on the balance of trade will depend upon the effect of the lower foreign currency price of exports. Hence, so long as the sum of elasticities exceeds unity, then an improvement in international competitiveness will improve the country's balance of trade (Gowland, 1983).

For the Marshall-Lerner condition to hold, the increase in imports must be offset by a larger increase in exports to improve the trade balance (Chee-Wooi & Tze-Haw, 2008). The reasoning above can also be explained by the volume effect and the value effect. For a depreciation to improve the trade balance the increase in export volume and decrease in import volume, that is the volume effect, would have to outweigh the increase in import prices due to the value effect (Hacker & Hatemi-J, 2004). If the trade balance is balanced from the start, a full Marshall-Lerner condition is met if the trade balance rises above its initial value. The Marshall-Lerner condition has been examined by many researchers who have reached the result that after a depreciation in the exchange rate the trade balance

improves in the long-run. For example, Bahmani-Oskooee and Niroomand (1998) tested for various countries, Bahmani-Oskooee (1986) for developing countries and Houthakker and Magee (1969) for a number of countries, most of them developed.

The Marshall-Lerner condition although the most common analytical method used in many researches to establish the relevance of the exchange rate as a policy tool in improving wide trade deficits has some deficiencies and limitations due to some of its restrictive assumptions. These limitations are discussed with reference to Gowland (1983).

The analysis above implicitly assumed that there was only one good exported and imported, which is an unrealistic assumption for any real world economy. Hence, this gives rise to aggregation and practical problems as well as the problem of elasticity pessimism (Gowland, 1983). Again, the condition implicitly assumes that all supply elasticities are equal to infinite or to put it another way, that there are no supply constraints on the volume of trade. This is a serious limitation, and so a major justification for the absorption approach in which these are central. It is very unlikely that domestic producers could increase their output by very much in response to an increase in foreign demand, especially for small economies as in SSA. Almost certainly, they would choose to increase price as well, as their supply increases thereby partly offsetting the level of competitiveness arising from the depreciation.

The major factor missing in the elasticities analysis is income effects; they are implicitly assumed away (i.e. it is partial analysis). So the condition assumes that the income elasticity of demand for all goods is zero. This therefore, ignores such mechanisms as;

- ❖ A change in relative prices increase exports
- ❖ The increase in exports in turn increases income
- ❖ The higher level of income subsequently leads to more imports.

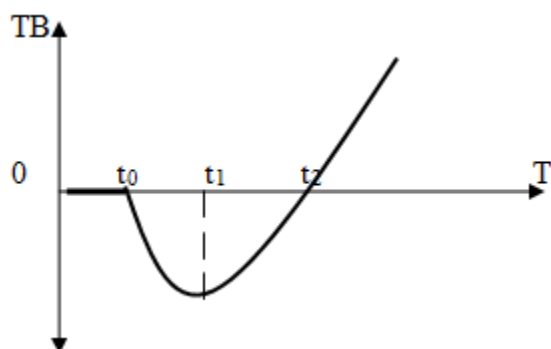
This latter increase in imports can be such that there is no improvement in the balance of trade despite the rise in exports depending on the degree of income elasticity of imports or the marginal propensity to import as in the simple Keynesian multiplier analysis.

A major limitation to the condition however, is that it takes account of only the effects that occurs simultaneously with exchange rate changes and does not allow for processes of adjustment following a sudden change in the exchange rate (Aoki, 1983). This lag in the Marshall-Lerner condition is explained by the J-Curve phenomenon.

### ***3.2.3 The J-Curve***

The J-Curve reflects how a devaluation of a country's currency affects its balance of trade over time. It explains the initial worsening of the trade balance after a depreciation and the subsequent improvement later when quantities are fully adjusted to the initial price changes. Empirically, it has been proven that trade in goods tend to be inelastic mostly in the short run. This is because it normally takes time to change consuming patterns and trade contracts (Bahmaani-Oskooee & Ratha, 2004). Thus, the Marshall-Lerner condition may not be satisfied in the short run. All things being equal, the trade balance may even worsen in the short run since prices tend to adjust quickly but imports and exports do not fluctuate easily in terms of volume. Therefore, although the depreciation has caused changes in prices, the lag in the adjustment of the quantity effect tend to negatively impact the trade balance in the short term. Hence a positive

relationship between these two is only a long run effect (Ryan, 1993). This gives rise to a “J-like” pattern in the time path of the trade balance, hence the name J-curve effect as portrayed in Figure 7.



**Figure 7: The J-Curve**

**Source: Author's own construction**

Figure 7, assumes an initial equilibrium of the trade balance, where the values of exports equal the value of imports. Depreciation of the exchange rate at time  $t_0$  causes the trade balance (TB) to fall below zero (deficit). In the medium-run however, domestic demand will shift from foreign goods towards domestic production of substitute goods, causing an improvement in the trade balance that starts to rise from the bottom of the J-curve at time  $t_1$ . The increase in domestic exports continues the improvement of the trade balance (Gärtner, 1993) exceeding its initial value (above zero), and begins to record a surplus from  $t_2$ . This is where the Marshall-Lerner condition is realized if the trade balance is initially set to zero as in the case of Figure 7. The time frame for the J-curve, before the Marshall-Lerner condition sets in and improves the trade balance, is said to be anytime between a few months to two or three years. However, it is worth mentioning that, this

finding is the outcome of studies for mostly developed countries (Dornbusch, Fischer & Startz, 2004; Miles & Scott, 2002; Mackintosh et al, 1996). The J-curve has been empirically proven by many researches, amongst them are; Magee (1973), Wilson (1993), Bahmani-Oskooee and Alse (1994), Demirden and Pastine (1995), Marwah and Klein (1996), Hacker and Hatemi-J (2003) and Narayan and Narayan (2004). However, there are also researchers who have not found any evidence for the theory of the J-curve. Bahmani-Oskooee and Ratha (2004) did not detect a J-curve phenomenon in the short-run but they did find a favorable long-run effect on the trade balance. Moffett (1989) found a weak J-Curve shaped more in the form of a wave. However, others did not find any support for the J-Curve phenomenon (Bahmani-Oskooee and Goswami, 2004; Flemingham, 1988; Shirvani and Wilbratte, 1997; Rose, 1991 and Rose and Yellen, 1989).

### **3.3 Empirical Review**

Although economic theories suggest positive scenarios with respect to the effect of depreciation of the exchange rate on trade balance and economic growth, the results from empirical research is inconclusive. It has sometimes even been found that depreciation negatively impacts on the trade balance depending on the trade composition of the country involved. Some studies show that there should be a set of necessary conditions on the size of import demand, export demand and supply elasticities of depreciation. This conforms to the required necessities stipulated by the Marshall-Lerner condition in the elasticity analysis. The state of the global economy could affect the export sector. When the global economy is in recession, depreciation may not bring much impact on the

demand for export goods abroad and vice versa. With these uncertain consequences of devaluation among other things, the outcome of studies in this area is mixed and depends on the trade characteristics of the country(s) under study.

In their study, Alemu and Lee (2014) in examining the effects of currency depreciation on selected Asian economies, found no evidence for the effect of depreciation to improve trade balance of about 14 Asian economies. This was perhaps due to the fact that exports did not respond as expected, mainly because of a decline in terms of trade for primary commodities and manufactured products or due to heavy dependence on import goods which may be more expensive in local currency terms. This affirms the terms of trade effect of the absorption theory by Alexander (1952). In their study, after conducting the Hausman test, Alemu and Lee (2014) chose the random effects model (REM) as the appropriate estimation method for their analysis. In addition to that, they also used the feasible general least squares (FGLS) for corrected heteroscedasticity standard errors for the purpose of consistency in results. Apart from currency depreciation, they used such other variables as degree of openness of the economy to foreign trade, level of industrial development, inflation, lending interest rate, the population size and physical infrastructure of the country.

The empirical results in both methods of estimation revealed that the effect of currency devaluation on the trade balance was statistically insignificant. In other words, no evidence was found for devaluation to boost trade balance in the 14 Asian economies they studied. However, other control variables such real GDP per capita, extent of dependency on manufacturing exports, degree of openness and physical infrastructure were found to positively and significantly influence trade balance. On the other hand,

inflation and high lending interest rates have negative impact on trade balance. This conforms to the PPP theory in the role played by relative prices such that, high domestic prices (inflation) could dampen the relative effectiveness of depreciation in improving the trade balance by offsetting the response of real exchange rate to the nominal depreciation. Using the sub-sample of relatively industrialized Asian economies Alemu and Lee (2014) found that devaluation has a strong positive effect to improve trade balance. This is due to the fact that those relatively bigger and stable economies like Korea, Singapore, India and China are producing high-tech products which are competitive export goods and price elastic. The demand for these products will increase more than the decrease in price, thereby increasing export revenue. Similarly, these countries are also in a better position to produce substitute goods for domestic consumption if imported goods become expensive as a result of devaluation. This somewhat affirms the elasticity and absorption analysis (resource allocation effect) of the balance of trade.

The study however, did not emphasize on the role played by price and income elasticities of the exports and imports in the analysis but were rather assumed based on the commodity composition of the export and imports of the countries involved. Moreover, the foreign income level is also a very important component in determining the impact of depreciation on the trade balance but was also not considered in the model. That is, as the income of the trading partners expands, all things being equal would lead to a rise in the demand of their imports (exports of the home country). Therefore, the home country having a depreciation of its currency will increase the real income of foreign consumers and as such the tendency to increase their exports, hence improving the trade balance (Bahmaani-Oskooee and Cheema, 2009). Of course, this is dependent on the degree of

income elasticity of their exports. Again, Alemu and Lee (2014) did not include any time effect in their analysis to analyze the short run and long run dynamics of the relationship between currency depreciation and the trade balance for those 14 selected Asian countries. This could inform the expectation of policy makers when using the exchange rate as a policy tool in influencing trade.

Bahmaani-Oskooee and Cheema (2009) however, employed disaggregated bilateral data between Pakistan and her 13 largest trading partners who accounted for about 70% of her total trade as at 2003 in order to test the short-run and the long-run effects of real depreciation of the Pakistani rupee. In their model specification, they rather adopted Bahmaani-Oskooee and Brooks (1999) and Arora et al. (2003) by using the simple trade balance equation. They regressed the trade balance directly on the real exchange rate while controlling for real income at home and in the foreign country. They employed an error correction modeling format by following Pesaran et al. (2001) bounds testing approach. Thus, by differencing the variables, they regressed the log of the trade balance on the other variables and their lags as well as the lag of the trade balance.

The two econometric techniques used for this purpose were the bounds testing approach and Johansen's co-integration approach. Two information criteria (Akaike Information Criterion and Schwarz Bayesian Criterion) for model selection were employed and a number of diagnostic tests were conducted in order to ensure the appropriateness of the econometric results. In their empirical results, the bounds testing approach provided some evidence of short run effect of real exchange rate on the trade balance. However these short run dynamics were inconsistent with the J-curve hypothesis. The long run results showed evidence of a positive and significant relationship between real exchange rate and

trade balance in almost half of the trading partners in the sample. One policy implication of their findings however, is that not all trading partners are affected by real depreciation of Pakistani currency. The two largest trading partners, i.e., China and U.A.E. will be hurt by depreciation of Pakistani rupee. Contrary to the first results, Johansen's co-integration approach did not provide much evidence in support of the J-curve nor any evidence of a significant long-run impact of the real exchange rate on bilateral trade balance.

Again, using a pooled mean group estimator, Kassim (2013) found a positive and a significant relationship between the real exchange rate and the trade balance. That is, using a sample of 28 Sub-Saharan African countries, he analyzed the relationship between trade liberalization and the balance of payment. He employed the traditional trade balance model by regressing the trade balance on the domestic and foreign incomes and of course the real exchange rate. He went further to include other control variables as trade liberalization dummy and terms of trade. Imposing a one period lag on all variables, the model was transformed into an ARDL (1, 1, 1, 1, 1) dynamic panel model. He used the pooled mean group (PMG) estimator due to its ability to vary coefficients, error variances and intercepts in the short run and also constrain parameter estimates to be equal across panel in the long run. These give PMG advantage over the traditional fixed effects and generalized method of moments (GMM) estimators. He found real exchange rate to be significantly positive indicating that exchange rate devaluation could improve the trade balance. He also found a 10 percentage points increase in domestic income growth worsens the trade balance as a share of GDP by 5.3 percentage points. The only statistically insignificant variable in the model was foreign income growth, although the results showed that a 1 percentage point increase in foreign income growth improves the

trade balance by 0.34 percentage points of GDP. The results also showed that the trade liberalization dummy which was the main variable of interest negatively impacts the trade balance. This outcome is similar to that of Santos-Paulino and Thirlwall (2004) for developing countries, Pacheco-Lopez and Thirlwall (2007) for Latin American countries and Santos-Paulino (2007) for least developed countries.

Alternatively, Rawlins (2011) examines the relationship between real exchange rate and trade balance using data from a group of 21 SSA countries. The study was however, on bilateral basis (between the 21 SSA countries and four developed economies- UK, US, France and Japan). He adopted the simple trade balance equation for his model specification, thus regressing the trade balance over real exchange rate and the domestic and foreign income. He later introduced the Almon Distributed Lag to take care of the possible delayed effect of exchange rate depreciation on the trade balance. He used an autoregressive process in estimating his model. The unit root test did not reject the null hypothesis of its existence with high p-values except for the foreign income represented by world GDP. A further cointegration test using the Johansen-Fisher test was performed for all the individual panel countries variables against the developed countries. The results indicated that at least one cointegration relationship existed in more than half of the countries and in some cases multiple relations exist as confirmed by the Trace and Eigen Value test. This suggests a possible long run relationship between the trade balance and the real exchange rate. This results is consistent with that of Dosani (2012) for Malawi.

Chiu et al. (2010) in their study applies the heterogeneous panel cointegration method to examine the long-run relationship between the real exchange rate and bilateral trade

balance of the U.S. and her 97 trading partners for the period 1973– 2006. Using new annual data, the empirical results indicate that the devaluation of the US dollar deteriorates her bilateral trade balance with 13 trading partners, but improves it with 37 trading partners, especially for China which is consistent with Brooks (1999). In the panel cointegrated framework, a long-run positive relationship between the real exchange rate and the bilateral trade balance exists for the U.S. Based on international trade theory, in the short run the devaluation of a country's currency has little influence on the volumes of exports and imports since the elasticities of import demand and export supply are small similar to the case of small economies as in SSA , but it leads to a drop in the prices of exports and an increase in the prices of imports, which results in a worsening of the trade balance. However, in the long run as elasticities of import demand and export supply increase, the sum of them is larger than 1 (Marshall–Lerner condition is supported), and then the trade balance improves. Chiu et al. (2010) concluded that the real exchange rate is a major determinant of the U.S. trade balance.

Canipe (2012) did a similar work for Ghana to establish any justification for devaluation by the World Bank prior to 1983 using the Marshall-Lerner Robinson condition. She however, did not specify any model for the trade balance to establish and possible effect of the devaluation. She directly estimated price elasticities from import and export demand equations using the imperfect substitution model. She followed others like Loto (2011) for Nigeria and Musila (2002) for Malawi to specify separate models for both imports and exports which assumed the demand for exports and imports is determined by a variable of relative prices, which includes the nominal exchange rate, and an income variable. Thus, expressing export as a function of real exchange rate and foreign income,

whereas import is regressed over the real exchange rate and domestic income. The coefficients of the real exchange rates in the two models were of relative importance to determine the price elasticities of export and import, respectively, to test for the condition. Similarly, the ones for the foreign and domestic income are to determine the income elasticities. The first empirical test she performed used the OLS procedure to estimate the aggregate import and export demand equations. The Prais-Winsten procedure was then applied to those estimates in order to correct for autocorrelation. She applied the same model to the cocoa industry, Ghana's leading exporting commodity at the time and also repeated the model for bilateral trade between Ghana and its major trading partners at the time.

The empirical results from the OLS procedure estimated price elasticity of import and export of 0.180 and 0.245 respectively whereas, the Prais-Winsten procedure which corrected for autocorrelation resulted in 0.328 for imports and 0.164 for exports. This positive import price elasticity supports the hypothesis that Ghana had a very inelastic demand for imports. Although it was expected that imports would decrease with the devaluation, as imports were relatively more expensive, the quantity demanded decreased very little, so that the value of goods imported actually increased. The summation of these OLS estimated trade elasticities of 0.425 and 0.492 from the two estimations showed that the Marshall-Lerner-Robinson condition did not hold for Ghana. Conversely, on bilateral basis, she found that although the elasticities were different in each country's case, with imports elasticities relatively higher in this case, that of export was still very low that they still could not meet the ML condition. In the cocoa sector, she performed the test just for exports and found the elasticity not to be significantly high enough, hence

would require a significant devaluation to see the sort of improvement in exports necessary to benefit the trade balance. Hence, the devaluation was not justified and was consistent with Loto's (2011) findings for Nigeria. The work was very straight forward and concise with respect to the specific objective of the study. However, specifying a model that could regress the trade balance on the real exchange rate directly could have enriched her findings. That is, the values of the trade elasticities alone are not enough to conclude the devaluation was not justified at the time since it did not improve on the trade balance in that period. Hence, the possible existence of a J-curve effect at the time was overlooked.

Agbola (2004) also examined the impact of depreciation/devaluation on trade balance of Ghana and he made use of data spanning the period 1970 and 2002 in his analysis. The Johansen multivariate co-integration procedure revealed that Ghana's trade balance and key determinants are co-integrated, and thus share a long-run equilibrium relationship. The Stock-Watson dynamic OLS model (DOLS), which he estimated showed empirical evidence of significant long run relationship between Ghana's trade balance and real domestic and foreign income, domestic and foreign interest rates and exchange rates. However, his empirical result supported the fact that depreciation/devaluation does not improve the trade balance of Ghana in the long run. The response in trade balance to movements in the exchange rate appears to be characterized by an M-curve phenomenon (Agbola, 2004).

Dosani (2012), using the multivariate cointegration estimation method (Johansen, 1988), on the other hand found that the impact of exchange rate devaluation on trade balance is significant in the long run for Malawi. Although, Malawi just like most SSA economics

is a net importer with its export mainly agricultural products and about 70% of its being tobacco, Dosani's study found the trade balance to be responsive to the nominal exchange rate changes. Dosani's (2012) work adopted the model specification of Kapoor and Ramakrishnan (1999). That is, regressing the trade balance over the nominal effective exchange rate (NEER), domestic and foreign income; after obtaining the first difference for the variables, confirming the existence of cointegration and hence a long run relationship was assumed to exist between the variables. However, the trade balance was found to be more responsive to changes in domestic income than to changes in NEER and foreign income.

One can however, say that the results obtained by Dosani (2012) could be biased and the relationship between the trade balance and the exchange rate could have been overestimated. That is, the use of the nominal instead of the real exchange rate and the omission of prices in the model undermine the effect of relative prices in determining the impact of devaluation on the trade balance. This is because prices could dampen the expected effects of depreciation on the trade balance by partially offsetting the effect on the real exchange rate after a nominal depreciation. A table analysis by Rawlins (2011) indicated that the percentage change in the real exchange rate by the end of the year following the nominal devaluation does not accurately mirror the latter. In fact, in 11 of the 21 countries the percentage change in the real exchange rate the following year is less than 50 percent of the nominal devaluation. Furthermore, for 14 of the countries, by the end of the third year after initial depreciation of the real exchange rate, more than 50% of the initial real depreciation had been erased by unfavorable price differentials with trading partners. For six of the 22 countries, a real appreciation actually set in by end of

the third year. In only five of the countries analyzed was it found that the nominal devaluation was successful. Similarly, Yiheyis (2005) uses data from a selected grouping of countries in Africa to assess the impact of devaluation on aggregate output. Results indicate that output growth, which eventually leads to improvements in trade balance, is influenced by improvements in monetary and fiscal policy. In the absence of such stringent measures in a post-devaluation setting, domestic price level can surge to unsustainable levels thereby offsetting the impact of the devaluation on the trade balance. This could even lead to a discouraging trade balance following a devaluation of the exchange rate. For a predominantly importing economy like those in SSA, ensuring domestic price level is kept at bay may determine whether devaluation impacts trade balance positively or negatively.

### **3.4 Concluding remarks**

It is evident that lots of literature studies have been done in this area of research to establish the relevance of the exchange rate as a policy tool in correcting wide trade deficits at least in the short term. Most of these studies use the elasticity approach (Marshall-Lerner Condition and the J-Curve) in their analysis.

Although the real exchange rate has been found to be relatively more effective in influencing the trade balance in the advanced economies (Narayan, 2006; Bahmani-Oskooee and Wang, 2007; Koo and Zhuang, 2007), the results have generally been mixed in both advanced and developing economies. Whereas others found no strong evidence that currency depreciation can indeed improve the trade balance (Alemu and Lee, 2014; Canipe, 2012), others mostly using Johansen cointegration method concluded although a

short run relationship may not be very strong, a long run relationship between currency depreciation and the trade balance cannot be ignored (Bahmaani-Oskooee and Cheema, 2009; Agbola, 2004; Dosani, 2012; Chiu et al, 2010).

The difficulty in explaining any underlying relationship between the two variables may be the fact that different variables are used in different models under the various studies since no single model can capture all the macroeconomic variables that affect the exchange rate and the trade balance. Not to mention the oversimplification of this complex relationship by the simple econometric techniques used in these analyses especially over the short run.

This study, therefore aims at providing further evidence on the relationship between the exchange rate and the trade balance in SSA using recent data and econometric techniques.

## CHAPTER FOUR

### THEORETICAL FRAMEWORK AND METHODOLOGY

#### 4.1 Introduction

This chapter discusses the theoretical framework and statistical techniques employed in analyzing the relationship between the trade balance and exchange rate. It also discusses the model for empirical estimation giving details about the variables of interest, the estimation technique as well as the sources of data.

#### 4.2 Theoretical Framework

Movements in the exchange rate affect both prices and volumes of exports and imports. Particularly, an exchange rate depreciation, implies a rise in foreign prices and a fall in prices of domestic exports. That is, with the depreciation of a country's exchange rate against a particular currency, more of the local currency will be required to obtain the same amount of the trading partner's currency in order to be able to purchase the same quantity of the product as before. Theoretically, depreciation of the exchange rate is good for the export sector, *ceteris paribus*; it would increase competitiveness of domestic export by making domestic goods cheaper on the world market. On the other hand, it would cause higher level of import prices, thereby discouraging import consumption locally. This favours the trade balance of the home country. the main objective of this study is to use econometric techniques to confirm or otherwise this analysis. The study employs a standard framework for the model using the simple trade balance equation. As

an empirical model, the trade balance model has been used by several researchers to illustrate the relationship between the trade balance and the real exchange rate. Studies such as Bahmaani-Oskooee and Cheema (2009), Rawlins (2011), Dosani (2012), Niyitegeka and Tewari (2014) amongst others make use of the standard trade balance model due to its feasibility and simplicity. Although the choice of variables may differ among studies, the model has proven to be a useful tool in this research area.

**4.2.1 The Traditional Trade Balance Equation Formulation**

Following Kruger (1983), the simple Keynesian equation for the trade balance equation can be written as;

$$B = B (Y, R_N P^* / P) \dots\dots\dots (1)$$

Where;

B is the Trade Balance

Y is Real income

R<sub>N</sub> is Nominal exchange rate

P\* is the Foreign Price Level

P is the Domestic Price Level

According to Rawlins (2011), by incorporating the monetarist view of open economy following the assumptions made by Branson (1983), equation (1) can be rewritten as;

$$B = B (Y, Y^*, R) \dots\dots\dots (2)$$

This is based on Branson (1983) assumptions that there is a global market where all goods are perfect substitutes as stipulated by the “Law of One Price” such that both domestic and foreign currency price of a particular commodity are equal. Similarly,

domestic and foreign financial assets are perfect substitutes, hence both domestic and foreign interest rates are equal except for any expected changes in the exchange rate (Rawlins, 2011).

From equation (2),  $Y$ ,  $Y^*$  are domestic and foreign incomes respectively and  $R$  is the real exchange rate which conforms with the relative version of the purchasing power parity theory and can be expressed as;

$$R = R_N P^*/P \dots\dots\dots (3)$$

Where;

$P$  and  $P^*$  are the domestic and foreign price levels, respectively.

In assessing the effects of changes in the exchange rate on the trade balance, whether at the aggregate or at the bilateral level, it is a common practice to regress a measure of trade balance directly on real exchange rate while controlling for real income at home and in the foreign country as has been done by most studies. Therefore, the model specification for this study using the simple trade balance equation from equation (2) above can be expressed as in equation (4) following those by Bahmaani-Oskooee and Brooks (1999), Bahmaani-Oskooee and Cheema (2009) and Rawlins (2011).

$$B = \beta_0 + \beta_1 R + \beta_2 Y + \beta_3 Y^* + \varepsilon \dots\dots\dots (4)$$

Equation (4) can further be expressed in natural logs. Since the data for this study is a panel data, the actual model for this study from (4) is outlined as;

$$\ln B_{it} = \beta_0 + \beta_1 \ln R_{it} + \beta_2 \ln Y_{it} + \beta_3 \ln Y^*_{it} + \varepsilon_{it} \dots\dots\dots (5)$$

$i = 1, 2, \dots, N$  (representing individual countries under study)

$t = 1, 2, \dots, T$  (representing the time period)

The sign of the coefficient of the real exchange rate ( $\beta_1$ ) is very important in determining whether currency depreciation is a good policy tool in improving the trade balance. That is, since the Marshall-Lerner condition suggests an improvement in the trade balance following a real depreciation, the sign of  $\beta_1$  would have to be positive and significant to suggest any possible improvement in the trade balance and any possibility for the satisfaction of the condition.

### 4.3 Model for Empirical Estimation

In order to estimate the effect of the exchange rate on the trade balance, this study uses the panel regression model. That is, given the nature of the study, panel data is used since it is ideal in the study of dynamics or change because they follow the same individual units through time, making the results more accurate. Another important variable, trade openness, as used by Alemu and Lee (2014) is included in the model. Therefore, a log linear model similar to other empirical works aforementioned based on the trade balance model to be estimated could be expressed as;

$$\ln B_{it} = \beta_0 + \beta_1 \ln R_{it} + \beta_2 \ln Y_{it} + \beta_3 \ln Y^*_{it} + \beta_4 TO_{it} + \varepsilon_{it} \dots\dots\dots (6)$$

where:

$TO_{it}$  = level of a country's openness to trade

The variable for trade openness has been included in the model as a control variable. It is measured as the ratio of the sum of exports and imports to GDP. That is, an economy's degree of openness to trade plays a vital role in its foreign trade performance. This has a

high possibility of influencing the relative response of imports and exports to the changes in the exchange rate. The dependent variable is normalized to take into account differences in the size of countries; hence, trade balance as a percentage of GDP is adopted. The explanatory variables are in percentages. The Real Effective Exchange Rate has been used in place of the real exchange rate since the study uses aggregate data making the effective exchange rate more appropriate. A country's annual percentage growth of real GDP has also been used as a measurement for domestic income, with world GDP growth being used as a proxy for foreign income. The volume of trade expressed as a percentage of GDP is used as a measure of the level of trade openness. The data for all these variables are sourced from the World Bank Development indicators database (WDI, 2015). However, using the Schwarz-Bayesian Information Criterion (SBIC)<sup>11</sup>, a two period lag of all explanatory variables have been included in the model. Therefore, the model for estimation in equation (6) can be rewritten as;

$$\ln B_{it} = \beta_0 + \beta_1 \ln REER_{it} + \beta_2 \ln REER_{it-1} + \beta_3 \ln REER_{it-2} + \beta_4 RGDP_{it} + \beta_5 RGDP_{it-1} + \beta_6 RGDP_{it-2} + \beta_7 WGDP_{it} + \beta_8 WGDP_{it-1} + \beta_9 WGDP_{it-2} + \beta_{10} TO_{it} + \beta_{11} TO_{it-1} + \beta_{11} TO_{it-2} + \varepsilon_{it} \dots \dots \dots (7)$$

Where;

REER is the Real Effective Exchange Rate

RGDP is the Real GDP

WRGDP is the World/ foreign Real GDP

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<sup>11</sup> Detailed results of lag length selection is reported in Appendix II

#### 4.4 Description of Explanatory Variables

The variables of interest used in the study are motivated by both theoretical and empirical considerations. The explanatory variables of major interest to the study are the real exchange rate, the real domestic and foreign incomes which are informed by the standard trade balance framework. These variables and the controlled variables together with their proxies are discussed in the subsequent paragraphs.

*Real Effective Exchange Rate:* The exchange rate simply reflects the price of one currency in terms of another. The REER is the nominal effective exchange rate, which is a measure of the value of a currency against a weighted average of several foreign currencies divided by a price deflator or index of costs (WDI, 2015). That is, it is the weighted average of a country's currency against a basket of other major currencies adjusted for inflation. The weights are decided by comparing the relative trade balances, in terms of one country's currency, with each other country within the basket. The REER is mostly preferred to the RER by most studies in this research area. This is because it does not just take into account prices (purchasing power of the local currency for foreign goods), it also takes into account a basket of foreign currencies as opposed to dealing with one currency.

Again, REER can be used as an indicator of price competitiveness in international trade (Kipier and Kesriyeli, 1997; Walters and de Beer, 1999). Hence, the REER could yield a more accurate results in determining the relationship between the exchange rate and the trade balance since the study is on aggregate basis and not bilateral. A change in the real exchange rate affects the trade balance through the response of exports and imports. A

fall in the real exchange rate (appreciation) of a country is purported to adversely affect the trade balance, whereas a rise in the real exchange rate (depreciation) improves the trade balance. This is supported by many economic theories such as the elasticity and absorption theories of the balance of payments. Empirically, however the results have generally been mixed especially for developing economies as in SSA. Whereas, others found no justification for past exchange rate depreciations (Canipe, 2012), others like Andersson and Styf (2010) found evidence of a positive relationship between the two for developing economies.

*Domestic Income:* The level of a country's income plays a vital role in the level of activities undertaken by the country in the international market. That is, how much an economy can produce in excess of domestic consumption for export and how much they can spend on foreign goods will depend on its income level. Therefore, this is an important variable in determining the trade balance at a given exchange rate. A rise in the domestic income at a given price level increases the purchasing power of the economy for both domestic and foreign goods. That is, there exist a positive relationship between domestic income and imports, thus, an increase in the domestic income leads to a rise in a country's imports. However, given that the level of imports is a negative component to the trade balance, this rise in imports adversely affects the trade balance. Hence, a rise in the level of domestic income would reduce the trade balance of the economy, all things being equal. Therefore, an estimate of  $\beta_2$  is expected to be negative, although a positive estimate for  $\beta_2$  is still possible if increase in domestic income reflects expansion in the production of import-substitute goods (Bahmani-Oskooee, 1986). In measuring the level of domestic income in this study, the real GDP has been used as a proxy. This is the sum

of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. GDP used in the study is annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are however, based on constant 2005 U.S. dollars (WDI, 2015).

*Foreign Income:* the level of income of a country's trading partners is a major determinant of its exports. That is, as the income of trading partners increases, they tend to demand for more goods including those outside their countries, which tends to increase demand for local goods internationally thereby raising exports. However, export is a positive component to the trade balance. Hence, a rise in exports will improve the trade balance. Thus, a rise in the level of foreign income would improve the level of the trade balance. Hence, an estimate of  $\beta_3$  is expected to be positive, although a negative estimate is not impossible. That is, if increase in foreign income comes from an expansion in foreign production of substitutes, then demand for domestic goods will not increase but may rather fall (Bahmani-Oskooee and Cheema, 2009). In measuring the foreign income, world real GDP has been used since the study is on aggregate level with SSA foreign partners being the rest of the world.

*Level of Trade Openness:* Trade openness is the ratio of the sum of exports and imports to GDP. The trade ratio measure has been used by this study above other measures of this variable because it is popular and the most commonly used measure by researchers due its data availability and ease of calculation. However, this measure of trade openness has been criticized to be misleading since it does not primarily captures a trade policy or the effect of it (David, 2007). That is, a low or high ratio does not necessarily imply a change in trade policy (eg: high tariff or non-tariff barriers to foreign trade), but may be due to

factors such as size of the economy (GDP) and geographic remoteness from potential trading partners (OECD Science, Technology and performance Scoreboard, 2011). However, this does not make this measure inferior to the others since none of them is driven by any economic theory (David, 2007).

The degree of openness of an economy to international trade affects the level of import and export activities. This influences the rate of response of both exports and imports to both absolute price and exchange rate changes alike, hence their relative impact on the trade balance. Most empirical studies have found strong and consistent evidence of higher exports and imports to be associated with a country's high intensity in trade (Wu and Zeng, 2008), Kassim (2013). Hence, it can be said that a country with high participation in foreign trade could improve its trade balance since it has a larger trade volume. That is, an exchange rate depreciation may be able to cause the needed rise in export supply to yield the necessary volume effect for any possible improvement in the trade balance.

However, this assessment is inconclusive unless supported by some empirical study. This is because the level of trade openness includes the sum of exports and imports, therefore depending on which side of the spectrum is high the trade balance can either improve or deteriorate. That is, if further increase in an economy's participation in trade results in high export growth relative to imports, then the level of trade openness would positively affect the trade balance. On the other hand, if imports grow faster than exports following a further liberalization of the economy to trade, then trade openness would worsen the trade balance. Therefore, the relationship between the trade balance and the level of an

economy's openness to trade is uncertain. Hence, the sign of the coefficient  $\beta_{10}$  is indeterminate.

**Table 2: Summary of the expected signs of the coefficients of the explanatory variables**

<b>Explanatory Variable</b>	<b>Coefficient</b>	<b>Expected sign</b>
Real Effective Exchange Rate	$\beta_1$	Positive (+)
Domestic Income	$\beta_4$	Negative (-)
Foreign income	$\beta_7$	Positive (+)
Level of Trade openness	$\beta_{10}$	Uncertain

#### **4.5 Diagnostic Analysis**

Some diagnostic analyses are carried out in the study before and after the estimation the empirical model specified in equation (7). They include unit root, heteroscedasticity, autocorrelation, and multicollinearity among others tests. While the unit root test is a pre-estimation diagnostic analysis, heteroscedasticity, autocorrelation, and multicollinearity are largely post-estimation diagnostic analysis. This is to ensure the general fitness of the variables as well as the models that are employed in this present study.

##### **4.5.1 Stationarity or Unit Root Test.**

According to Gujarati (2003 pp.713), "a stochastic process is said to be stationary, if its mean, and variance are constant overtime and the value of covariance between two time periods depends only on the distance between the two time periods and not on the actual time at which the covariance is computed". Although econometricians generally consider that unit root is usually a problem of time series data, it is both appropriate and important

that the variables in a panel dataset are also tested for stationarity. This is to avoid the occurrence of unrelated regressions, sometimes known as spurious regressions. The use of unit root and cointegration test in panel data analysis has enormous advantages as compared to the already established time series approach. The first advantage is that, finite sample power of the test is tremendously improved by pooling cross-sections and time series. In contrast, the conventional unit root tests (e.g., Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP)) have been found to have lower power, in particular when the sample size is small. A number of researchers including Levin, Lin, and Chu (2002) and Im, Pesaran, and Shin (1997; 2003) show that, there is a considerable improvement in the power of unit root tests when using panel data other than the univariate testing procedures.

In the literature, several authors have proposed unit root tests based on different assumptions. This study, however, settles on four distinct panel unit root tests on the variables for the period covering 1980-2013: Levin-Lin-Chu's (LLC)  $t^*$ , Im-Pesaran-Shin's  $W$ , the ADF-Fisher  $\chi^2$  and PP-Fisher  $\chi^2$  statistics. Among these tests, LLC test is based on the common unit root process assumption that the autocorrelation coefficients of the tested variables across cross-sections are identical. However, the Im-Pesaran-Shin (IPS) and ADF-Fisher  $\chi^2$  and PP-Fisher  $\chi^2$  tests rely on the individual unit root process assumption that the autocorrelation coefficients vary across cross-sections. In all the test specifications, we include deterministic time trend. Also cross-sectional means are subtracted in order to minimize problems arising from cross-sectional dependence. The Schwarz-Bayesian information criterion (BIC) is used to determine the country-specific lag length for the ADF regressions, with a maximum lag of 2 regarding the LLC and the

IPS tests. Further, the Bartlett kernel was used to estimate the long-run variance in the LLC test, with the maximum lags determined by the Newey-West bandwidth selection algorithm.

#### ***4.5.2 Heteroscedasticity, Autocorrelation, Multicollinearity And Endogeneity***

The problems of heteroscedasticity (which is usually associated with cross-sectional data) and autocorrelation (which is usually a time series data) are sometimes observed even in panel datasets. The modified Wald test for group-wise heteroscedasticity in fixed effects regression and the Wooldridge test or the Lagrange-Multiplier test for autocorrelation model are employed to test for Heteroscedasticity and Autocorrelation respectively. A test for the severity of multicollinearity is carried out using the Variance Inflation Factor (VIF) technique which is further confirmed by a pair-wise correlation matrix. Finally, the Wu-Hausman test is used test for the presence of endogeneity in the model.

#### **4.6 Estimation Technique**

The empirical panel model specified as given by equation (7) in the previous section of this chapter is estimated using the system Generalized Method of Moment. The choice of the system GMM stems from the evidence that the empirical model specified in equation (7) is characterized by endogeneity. For instance, the domestic income variable is highly endogenous in the model as it is also determined by the dependent variable (trade balance) (see Zhang, 2012; Asici, 2011). Further in equation (7), domestic income is highly correlated with regressors such as trade openness, exchange rate depreciation among others (Jawaid and Raza, (2012). Similarly, trade openness, exchange rate and trade balance variables are highly correlated. As a result the empirical model is estimated

using the two-step system Generalized Method of Moment (GMM) developed by Arrelano and Bover (1995). In addition, the technique is able to overcome econometric problems such as cross-sectional dependence of countries and multi-correlation which are prevalent in macro panel models (Arrelano and Bover, 1995). Furthermore, the technique produces efficient parameter estimates than many traditional techniques such as Ordinary Least Squares (OLS), Random and Fixed Effects particularly in instances of endogeneity.

However, for the purpose of confirming the robustness of the system GMM results, the study estimates the empirical model (i.e. equation 7) with the Fixed and Random effects which are considered as traditional panel techniques using robust standard errors to control the presence of heteroscedasticity and autocorrelation problems. The FE is applied under a crucial assumption that the unobserved cross-country heterogeneity is correlated with the regressors included with the models. However, in the RE estimation the assumption of correlation between the unobserved heterogeneity and included regressors is relaxed.

One of the merits of the use of RE over FE is that the former allows for the inclusion of time-invariant variables which may be relevant in explaining the nexus between trade balance and exchange rate depreciation. An example of such time-invariant variable this study could have considered is geographical distance between the SSA countries and their trading partners. In situation where the unobserved heterogeneity is correlated with the regressors of the model, the FE produces consistent and efficient estimates while the RE does not. On the hand, if the null hypothesis of no correlation between the unobserved heterogeneity and regressors is accepted, the RE will produce estimates that

are both consistent and efficient. In this situation, the FE estimates will be though consistent but inefficient.

In this regard, a rule of thumb for the acceptance or rejection of results produced by either the FE or RE is very imperative and the Hausman test (1975) provides this rule of thumb. Hence, the Hausman test subsequently chooses between the FE and RE.

However, it must be noted that, although robust standard errors correct for heteroscedasticity, making RE and FE still appropriate, in the presence of endogeneity and multicollinearity a system Generalized Method of Moments is most preferred. The reason being that System GMM does not just overcome heteroscedasticity and first-order autocorrelation which weakens the econometric validity of the FE and RE regressions, it also deals with the problem of endogeneity. This underscores the superiority of the system GMM over the traditional FE and RE in this study. The vital diagnostic tests for system GMM estimation include but not limited to first and second-order autocorrelation test and a Sargan test statistics of over-identification of instruments employed (Baltagi, 2008; Arellano and Bover, 1995).

#### **4.7 Concluding remarks**

This chapter explored the main theoretical underpinning for the study. Based on theory and empirical studies, a number of variables which are thought of to influence trade balance in SSA alongside exchange rate depreciation have been included in the model of the current study. The chapter also dealt with the issue of variable description, measurement, justification for their choice as well as their *a priori* economic expectation

particularly, in terms of signs. Discussion on the estimation techniques employed (System GMM, FE and RE Models) as well as the various diagnostics analyses aimed at ensuring the fitness of variables and models has also been made. By this, the chapter has set out a good platform for the estimation and discussion of results.

## CHAPTER FIVE

### DATA ANALYSIS AND DISCUSSION OF RESULTS

#### 5.1 Introduction

The chapter commences with description of the datasets collected on the study variables, namely trade balance, exchange rate, trade openness, domestic income and world/foreign income. This is followed by a discussion of the results on the pre-estimation sensitivity analysis (i.e. unit root test). The chapter concludes with the presentation and discussion of results, emanating from estimating the empirical model.<sup>12</sup>

#### 5.2 Unit root/Stationarity test Results

The test results of the Levin, Lin and Chu, Fisher and IPS unit root tests of the variables in levels are shown in Table 3 below. The Schwarz- Bayesian information criterion (BIC) is used to determine the country-specific lag length for the ADF regressions, with a maximum of one (1) lag for the IPS test.

The null hypothesis for all the tests is that all the panels contain unit root as against the alternative that at least some panels are stationary or do not contain unit root. In all specifications (i.e. Levin, Lin and Chu, Fisher unit root ADF test and IPS), deterministic time trend is included and cross-sectional means are also subtracted in order to minimize problems arising from cross-sectional dependence.

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<sup>12</sup> Descriptive statistics is reported in the appendix

**Table 3: Unit root/Stationarity test results**

<b>Variables</b>	<b>LLC, <math>t^*</math></b>	<b>IPS, w-stat</b>	<b>ADF-Fisher <math>\chi^2</math></b>	<b>PP-Fisher <math>\chi^2</math></b>
	Stats.	Stats.	Stats.	Stats.
Trade Balance	-2.333***	-2.607***	53.62***	71.03***
Domestic Income	-5.217***	-7.427***	120.1***	234.9***
Real Exchange rate	-3.474***	-3.031***	70.49***	76.05***
Trade Openness	-11.02***	-13.28***	220.6***	389.6***
World Income	-14.78***	-11.59***	187.8***	2015.1***

**Author's Computation**

From Table 3, all the four tests reject the null hypothesis that all the panels contain unit roots. In particular, the tests strongly reject the null hypothesis of unit root at 1%. Thus, it is evident from the tests in table 3 that all the variables are stationary in level implying the variables are integrated of order zero [*i.e.*  $I(0)$ ]. When variables are not stationary in level, they are normally differenced till stationarity is established in which instance a cointegration test is required to examine if a long run relationship could be established. However, if the variables are stationary in level like those established in Table 3, then their long run relationship could be estimated without performing any cointegration test.

This conclusion has two main implications for estimating the empirical model of this study. Foremost, it suggests that since all variables are  $I(0)$  the long run relationships between the trade balance and the set of explanatory variables could be estimated directly without facing the problem of spurious or unrelated regressions and (2) this further implies that testing for potential existence of cointegration may be less useful

given that a cointegration test is required when level variables are non-stationary (see Costantini and Martini, 2009; Baltagi and Kao 2000; Pedroni, 1999, Pedroni, 2004).

### **5.3 Random Effect and Fixed Effect Results**

This section represents the centerpiece of the study. It is concerned with estimating the effect of the exchange rate depreciation on the trade balance in SSA. Traditional panel model estimating techniques are first applied to estimate the empirical model specified in the previous chapter (equation 7). These techniques are Random and Fixed Effects. The Hausman test is subsequently employed to select which technique is most efficient and consistent. Post-estimations are then carried out to examine the econometric validity of the technique endorsed by the Hausman test. The relevant post-estimation diagnostic analyses heteroscedasticity and first-order autocorrelation diagnostic tests. In the case of this study, the robust standard errors have been used in the estimation of the model to correct for the presence of heteroscedasticity and autocorrelation in order to yield consistent estimates. This is presented in Table 4.

The result of the Hausman test which selects the estimation whose parameters are consistent and efficient is also presented in Table 5. This is under the null hypothesis that RE is efficient and consistent. The p-value is significantly less than 1% and thus, the null hypothesis is strongly rejected. This implies that the results of the FE is preferable to that of RE.

**Table 4: Random and Fixed Effects Estimation (Dependent variable: Trade balance)<sup>13</sup>**

Regressors	Random Effects	Fixed Effects
	Coefficient	Coefficient
Exchange rate	-0.009 (0.006)	-0.009 (0.007)
Exchange rate (-1)	-0.002* (0.001)	-0.002* (0.001)
Exchange rate (-2)	0.005*** (0.002)	0.005** (0.002)
Trade openness	-0.639*** (0.160)	-0.639*** (0.159)
Trade openness (-1)	-0.428*** (0.076)	-0.434*** (0.078)
Trade openness (-2)	-0.299*** (0.055)	-0.308*** (0.057)
Domestic income	-0.418*** (0.120)	-0.383*** (0.113)
Domestic income (-1)	-0.364*** (0.037)	-0.339*** (0.039)
Domestic income (-2)	-0.622*** (0.208)	-0.596** (0.208)
World income	-0.182 (0.605)	-0.188 (0.608)
World income (-1)	0.052 (0.446)	0.047 (0.447)
World income (-2)	-0.807 (0.750)	-0.814 (0.756)
Constant	-5.400 (5.734)	-5.187 (6.16)
<b>Regression Diagnostics</b>		
Prob. > Wald	0.000	0.000
R-squared	0.455	0.359
Sigma_u	15.16	27.79
Sigma_e	19.68	19.67
Rho (fraction of variance due to u_i)	0.372	0.666
		0.0000
Heteroscedasticity(H <sub>0</sub> :Homoscedasticity): Prob. > $\chi^2$		
Autocorrelation (H <sub>0</sub> :No first-order autocorrelation): Prob. >F		0.0001
Multicollinearity (1/VIF)		1.50

<sup>13</sup> Robust Standard errors are in parenthesis

**Table 5: Hausman Test for RE and FE**

Coefficients		Difference	Square Root [Diagonal (V_FE – V_RE)]
FE	RE	FE-RE	Standard Error
-0.383	-0.418	0.035	0.110199
-0.639	-0.639	0.000	0.0007182
-0.009	-0.009	0.000	0.0001374
-0.188	-0.182	-0.006	0.0071963
-0.596	-0.622	0.026	0.0076107
-0.308	-0.299	-0.009	0.0027824
0.005	0.005	0.000	0.0002490
-0.814	-0.807	-0.007	0.0035173
-0.339	-0.364	0.025	0.0077164
-0.434	-0.428	-0.006	0.0023487
-0.002	-0.002	0.000	0.0001055
0.047	0.052	-0.005	0.0034087

Null Hypothesis: difference in coefficients not systematic

RE = inconsistent under Alternative Hypothesis, efficient under Null Hypothesis

FE = consistent under Null Hypothesis and Alternative Hypothesis

$\chi^2(12) = (b-B)'[(V_b - V_B)^{-1}](b-B) = 41.52$

Prob. >  $\chi^2$  = 0.000

**Author's Computation**

#### 5.4 Post-estimation sensitivity analysis

The study first estimated the empirical model in equation (7) using the traditional RE and FE models. Although, the Hausman test chose the FE results at the expense of the RE, a post-estimation sensitivity analysis is carried to ascertain the efficiency and consistency of the FE results.

#### 5.4.1 *Heteroscedasticity test*

The Modified Wald test for group-wise heteroscedasticity in fixed effects regression model is employed to test for heteroscedasticity. The results are shown in Tables 6 below. From the results in Table 6, the null hypothesis of homoscedasticity is significantly rejected at 1%. Therefore, heteroscedasticity is said to be present in the FE model.

**Table 6: Modified Wald test for group-wise heteroscedasticity in fixed effect regression model**

**Null hypothesis:  $\sigma(i)^2 = \sigma^2$  for all  $i$**

$$\chi^2(16) = 8301.07$$

$$\text{Prob. } > \chi^2 = 0.0000$$

**Author's Computation**

#### 5.4.2 *Autocorrelation test*

The Wooldridge test or the Lagrange-Multiplier test for autocorrelation is also carried out to test for autocorrelation. The results as reported by Table 7 reject the null hypothesis of no serial correlation among the error terms at 5%. Therefore, there is first-order serial correlation in the FE model.

**Table 7: Wooldridge test for autocorrelation in panel data**

**Null hypothesis: No first-order autocorrelation**

$$F(1, 15) = 25.409$$

$$\text{Prob. } > F = 0.0001$$

**Author's Computation**

#### 5.4.3 *Multicollinearity Test*

The presence of multicollinearity among the regressors is also tested using the Variance Inflation Factor (VIF). From Table 8, the individual VIF and mean VIF are significantly

less than 10. Hence, the level multicollinearity among the independent variables is not severe.

**Table 8: Multicollinearity test**

<b>Variable</b>	<b>VIF</b>	<b>1/VIF</b>
Exchange rate (-1)	2.37	0.42
Exchange rate (-2)	1.92	0.51
Domestic income (-1)	1.88	0.53
Exchange rate	1.77	0.58
Domestic income	1.61	0.62
Domestic income (-2)	1.45	0.69
Trade openness (-1)	1.34	0.74
Trade openness (-2)	1.31	0.76
World income (-1)	1.13	0.88
World income (-2)	1.12	0.89
World income	1.12	0.89
Trade openness	1.06	0.93
<b>Mean VIF</b>	<b>1.50</b>	<b>0.70</b>

**Author's Computation**

As discussed in the previous chapter, although the use of the robust standard errors make RE and FE estimates consistent against heteroscedasticity and autocorrelation present in the model as shown in Tables 6 and 7, system GMM is most preferred due to the presence of endogeneity in the model. The Wu-Hausman test,<sup>14</sup> confirms the presence of endogeneity between the trade balance and the domestic income and trade openness. That is, the null hypothesis of variables being exogenous is strongly rejected at 1% level of significance.

<sup>14</sup> Detailed results of the Wu-Hausman test for endogeneity is reported in the Appendix

Thus, in what follows, the study focuses on the results produced by the system GMM technique.<sup>15</sup> The results of the two-step system GMM estimations of the trade balance effect exchange rate are presented in Table 9.

### **5.5 Discussion of results on the effect of exchange rate depreciation on trade balance in SSA**

Table 9 presents the results of the system GMM employed to estimate the empirical model of the study. This is considered superior to the FE model chosen by the Hausman test due to the presence of endogeneity in the model.

Evidently, the overall model explains approximately 42% of the total variation in Trade balance and is jointly significant at 1% as given respectively by the R-squared and the F-statistic. An optimal lag length of two (2) was selected by the Schwarz Information Criteria (SIC). This means that for each variable, the one-year and two-year lagged values are included as separate explicit regressors. Thus, each variable appears thrice, the level and its one-year and two-year lagged values. For instance, three exchange rate variables are included in the model, namely the level exchange rate in addition to its one-year and two-year lagged values. In Table 9, these exchange rate variables are named as Exchange rate, Exchange rate (-1) and Exchange rate (-2) respectively.

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<sup>15</sup> While the FE and RE are not preferred due to the suspicion of the presence of endogeneity and autocorrelation, they both could be serving as potential robust check for the system GMM.

**Table 9: System GMM results of the effect of exchange rate on trade balance<sup>16</sup>**

<b>Regressors</b>	<b>Coefficient</b>
Exchange rate	-0.008 (0.005)
Exchange rate (-1)	-0.002* (0.001)
Exchange rate (-2)	0.005*** (0.001)
Trade openness	-0.642*** (0.149)
Trade openness (-1)	-0.429*** (0.078)
Trade openness (-2)	-0.302*** (0.060)
Domestic income	-0.392*** (0.105)
Domestic income (-1)	-0.348*** (0.035)
Domestic income (-2)	-0.601*** (0.197)
World income	-0.209 (0.601)
World income (-1)	0.050 (0.428)
World income (-2)	-0.809 (0.714)
Constant	-5.10 (5.48)
Adjusted R-squared	0.4201
Prob. > $\chi^2$	0.000
AR (1) test	0.5455
AR (2) test	0.1421
Sargan test (Prob. > chi2)	0.6642
<b>Author's Computation</b>	

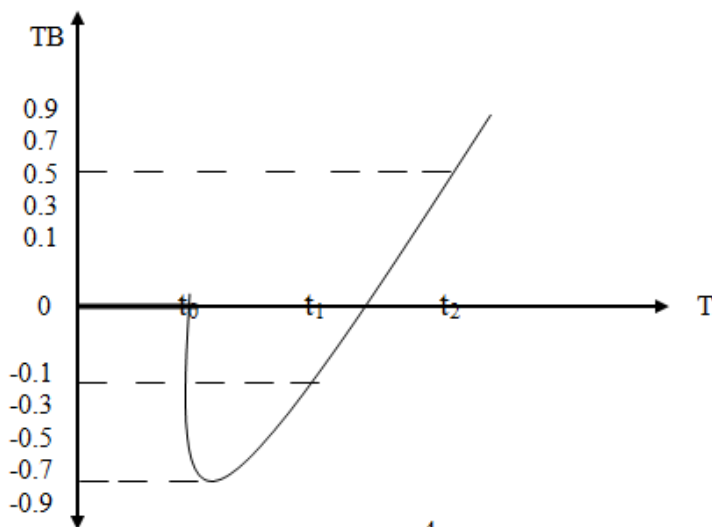
Distinctly, the coefficient of the level exchange rate recorded a negative sign, revealing a negative relationship between the current exchange rate and the trade balance. Thus,

<sup>16</sup> AR (1) and AR (2) respectively are first-order and second-order autocorrelation test. P-values > 0.05 fail to reject the null hypothesis of the presence of both first and second-order autocorrelation in all specifications. The Sargan test is a test of over-identification of instruments used by the GMM technique. The Sargan test statistics shown in Table 9 indicate that over-identification of instruments used is invalid. These two diagnostics unequivocally confirm the robustness of the model and the results as well.

current exchange rate depreciation (i.e. Exchange rate) reduces the current trade balance of the region. Again, it recorded a P-value of 0.140, implying that, the relationship between the exchange rate and the trade balance at time  $t$  is not only negative but also insignificant. This result is similar to Bahmaani-Oskoe and Ratha (2004) and as such consistent with the J-curve hypothesis, that exchange rate depreciation does not improve the trade balance at least in the immediate run but may rather worsen it. Similarly, the immediate past year's exchange rate also reduces the trade balance in the current year. This means that exchange rate depreciation at both time  $t$  and  $t-1$  (say 2010 and 2011) is accompanied by a further deterioration of the region's trade deficit. However, the coefficient of the exchange rate at lag 1 is statistically significant at 10% level of significance with a P-value of 0.064. Although, the relationship between the trade balance and the exchange rate is still negative at this level, a coefficient of -0.002 which is statistically significant is an improvement on their relationship in the current year. This further affirms the J-curve hypothesis and can be said to be the medium run where exchange rate depreciation improves the trade balance from the initial fall resulting from the depreciation in time  $t$ .

However, exchange rate depreciation in two previous years is associated with a rise in the current trade balance with a statistically significant coefficient at 1% level of significance. This result, without taking into consideration the elasticities of exports and imports is consistent with the J-curve hypothesis that a depreciation of a country's currency would improve its trade balance over time. Specifically, the intuition here is that a 1% exchange rate depreciation in a current year results in about 0.8% decline in trade balance in SSA while 1% depreciation of domestic currency in the past year reduces the

trade balance in a current year approximately by 0.2%. However, 1% depreciation of exchange rate in some past two-years improves SSA's trade balance by about 0.5%. This is in line with (Miles & Scott; 2002, Mackintosh et al.; 1996, Dornbusch, Fischer & Startz; 2004) for developed economies which conclude that the timeframe for the J-curve is anytime between a few months and two to three years. Figure 8 shows the time path of the trade balance based on the GMM estimation results.



**Figure 8: Time path of the trade balance based on the results from the System GMM estimation<sup>17</sup>**

From Figure 8, the time path of the trade balance with respect to the values of the coefficients of the real effective exchange rate from the System GMM results in Table 11 depicts the J-curve with  $t_0$  being the year of depreciation. This is based on the assumption that the trade balance is in an initial equilibrium state. Therefore, the trade balance rising above its initial value at  $t_2$  indicates its improvement thereby meeting the Marshall-Lerner condition. In general, these findings do not render support to the view that depreciation or

<sup>17</sup> From Figure 8,  $t_0$  is the year of depreciation (the immediate short run), whereas  $t_2$  and  $t_3$  are the medium run and long run respectively. Values are in percentages

devaluation of a currency is accompanied by favourable trade balance by making exports more competitive relative to imports in the immediate short run. This is perhaps due to the fact that exports do not respond as expected, mainly because of a worsening terms of trade and the lag in volume adjustment to the price changes. However, in the long run ( $t_2$ ), the trade balance can be expected to favourably respond to a currency depreciation in SSA. Thus, the relationship between the trade balance and the exchange rate is only a long term phenomenon as found by Rawlins (2011), Ryan (1983) and other empirical studies.

More so, all the trade openness variables included in the estimation have negative and statistically significant elasticity coefficients. This is similar to the findings of Wu and Zeng (2008). That is, although all the variables of trade openness are significant at 1% level of significance, they tend to worsen the trade balance. This could mean one of these two reasons. First, that SSA is not opened to trade enough to reap the full benefits it presents. Secondly, that the region's increased participation in trade has led to imports growing faster than exports. The latter is similar to Kassim (2013), where trade liberalization was found to reduce the trade balance due to high import growth rate relative to exports. This is however, contrary to Alemu and Lee (2014) which found a country's degree of openness to trade to positively and significantly influence its trade balance. In particular, it was found that it is not only the current openness of SSA to trade that reduces the level of its trade balance but also its greater participation in trade in some previous years. This conclusion is not very surprising. This is because although greater openness offers SSA economies to engage in more trade activities and increase exports, this normally leaves SSA markets flooded with more foreign goods. That is, exports in

these economies are limited by some supply side constraints such as over dependence on primary commodities with very low price and income elasticities (Babatunde and Olufin, 2007), poor infrastructure provision and skill development, poor economic policy and high cost of doing business (Manduna, 2005). These therefore, leave trade openness to favour imports more than exports. Again, this could be due to increased dominance of foreign-based inputs and foreign-based outputs for domestic production and consumption respectively. In particular, a unit percentage expansion in trade in a current year is matched by about 0.64% decline in trade balance in SSA while 1% openness to trade in the past year and past two years reduces trade balance in a current year approximately by 0.43% and 30% respectively. A fundamental observation is that the extent to which SSA's openness to trade reduces its trade balance position is highest in the current year relative to its openness in remote years.

The unambiguous negative effect of trade openness on trade balance in SSA is not surprising considering the heavy dependence on foreign-based goods for domestic production and consumption. This finding however contradicts Alexander (1952). That is, using his "idle resource effect" analysis, SSA economies in order to engage idle resources following increased access to the international market to meet the increased export demand, tend to demand more imports. This is because most of these sophisticated inputs used in manufacturing by domestic producers are not produced locally but imported. Again, with these economies more opened to trade, foreign producers have more access to the local market. With a growing middle class in these economies, taste preference changes and consumption of manufactures and other luxury which are only imported increases. However, a positive effect of a country's high participation in

international trade on the trade balance in SSA cannot be overruled entirely from the above results. This is because, although the results in Table 11 show negative coefficients for variables of trade openness at all levels, their value decreases as the number of lag increases from the level variable to lag two (i.e. -0.641 at level to -0.308 in lag 2). This makes a lot of sense in that, most of these manufacturing inputs imported by domestic producers for production are fixed assets and have a longer life span. Hence, although following a country's increased in the level of its openness to trade, imports may increase as against exports in the short run, the trade balance may improve in the long run with a decline in demand for such goods thereby reducing import expenditure. A negative impact of trade openness can be overcome by more production of import substitutes and an improved export sector, hence producing condition for trade surplus.

Similarly, the elasticity coefficients of domestic income variables are negative and statistically significant at 1%. Evidently, expansion in domestic income of SSA is matched by a fall in its trade balance. This further implies that economic expansion is unable to improve the trade balance position of the region. In particular, a 1% expansion in domestic income in a current year generates about 39% decline in trade balance in SSA while 1% rise in domestic income in the past year and past two years reduces trade balance in a current year approximately by 35% and 60% respectively. This implies for instance that, suppose domestic income of the region increases in period  $t$ , by just 1%, this reduces the trade balance by about 60% in period  $t+2$  and the converse also holds. This affirms the positive relationship between the domestic income and imports as stipulated by most economic analysis. Therefore, since domestic income of SSA grew by 1.49% in 2013 ( $t$ ), then we can expect trade balance of the region to decline by about

89% in 2015 ( $t_2$ ) relative to its 2013 position/value. That is, as the economy's total income expands, there is a rise in the demand for certain types of commodities such as automobiles, electronics etc. Most of these commodities are however foreign based and are also normal goods. Hence, with an increase in income, their demand increases thereby increasing imports. This result contradicts that of Bahmaani-Oskooee (1986) where he found a positive relationship between the trade balance and domestic income. He attributed it to the fact that the countries may have invested in the production of import substituted goods. However, in the case of SSA, even if they reinvest the increment in total income in import substitutes, the fact that some vital inputs still need to be imported to expand production will increase imports which may still worsen the trade balance. This conclusion is similar to findings by Kassim (2013), Rawlins (2011), Alemu and Lee (2014), Andersson and Styf (2010).

Furthermore, contrary to expectation, the elasticity coefficients of world income variables in the system GMM results are negative except for the first lag, but are all insignificant. While insignificant, it is contrary to most economic analysis and empirical work. The reason could be as explained by Bahmaani-Oskooee (1986), that countries tend to reinvest increased income in import substituted goods. So rise in foreign income may even lead to a fall in their imports. It was however, found to improve the trade balance in the immediate past year by 4%. Again, they are also found to be highly insignificant at all levels indicating that world income does not influence or drive the trade balance of SSA. In other words, neither higher nor lower level of world/foreign income is able to drive exports and as such the trade balance of the region. This is similar to the findings by Kassim (2013). This is perhaps due to the region's overdependence on raw and primary

commodities which are not very attractive and highly competitive. That is, the poor composition of the region's exports with low product diversification and concentration leaves the region with relatively fewer export destinations. Again, since most of these goods are not normal goods, a rise in foreign income will only lead to a fall in their demand. These factors adversely affect the trade balance and make changes in foreign income irrelevant to trade of SSA economies.

### 5.6 Concluding remarks

The unit root tests conducted using LLC,  $t^*$ , IPS, W-stat, ADF-Fisher  $\chi^2$  and PP-Fisher  $\chi^2_n$  strongly rejected the null hypothesis of unit root at 1%. The tests showed that all the variables used are stationary in level implying the variables are integrated of order zero [*i.e.*  $I(0)$ ]. Hence, no need for a cointegration test. Again, the presence of heteroscedasticity and autocorrelation in the FE model led to the choosing of the System GMM. Therefore, the study employed the System GMM over the FE model chosen by the Hausman test to estimate the empirical model. This is due to its distinct ability to overcome the possible endogeneity and autocorrelation problems present in the regression. However, the FE and RE results were similar to that by the System GMM in both direction and magnitude.

The results found a weak evidence of the exchange rate to improve the trade balance in the long run. However, the real effective exchange rate had a negative and insignificant coefficient at level. This implies that, the exchange rate cannot improve the trade deficit but rather worsens it in the current year. The coefficient of the exchange rate in the previous year is however, significant but still negative. It was however, found to be

significant and positive in two previous years. This implies that the exchange rate could only improve the persistent trade deficit in the second year following an exchange rate depreciation. This is consistent with the J-curve, thus the trade balance initially worsens following a depreciation but finally rises above the initial value in the long run. Again, both the trade openness variables and domestic income variables were found to strongly worsen the trade balance in all years. Although, a positive long run relationship between the trade balance and trade openness cannot be overruled due to continual falling in the values of the negative coefficients as the lag length increases. Contrary to most theoretical and empirical study, the foreign income was found to worsen the trade balance of SSA. That is, the foreign income variable at all lag levels is highly significant and negative.

## **CHAPTER SIX**

### **SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

#### **6.1 Introduction**

This chapter presents the summary and conclusions of results and findings of the study and further offers recommendations for policy and further research. The next section of the chapter looks at the summary and conclusions of the study while the section 6.3 presents the recommendations of the study. The limitations of the study are discussed in the final section of the chapter.

#### **6.2 Summary and Conclusions**

The level of the trade balance is very crucial in the development and growth process of any economy. It plays a very vital role in the BOP and Gross Domestic Product (GDP) position of a country. It is a major component of the current account in the Balance of Payments position of a country. An improved trade balance is likely to improve a country's BOP and the GDP as a whole. These variables are very important economic indicators in a country's growth performance and likely to attract investment and other growth partners to spearhead the economy on an accelerated growth path. The trade balance is therefore of much concern in any economy due to its inter-relationship with other major economic indicators like the current account, fiscal balance and external indebtedness. Therefore, a deteriorating TB can jeopardize the growth and development

process of any economy. It is therefore, not surprising that it has attracted lots of research studies in recent times.

Governments in both advanced and developing economies alike pursue diverse domestic policies aimed at improving trade and as such the trade balance to enhance economic growth and development. Accordingly, most economic theories have cited the exchange rate as one economic variable that can be used to improve the level of a country's trade balance. However, in spite of the chronic depreciation of major currencies in the region, imports tend to grow faster than exports leading to further deterioration of the trade deficit after a depreciation.

In spite of various theoretical positions on exchange rate-trade nexus, a positive effect of currency depreciation on the trade balance in reality cannot be said emphatically, particularly in small economies like the SSA economies where they are mostly net importers. Any definite conclusion of the effect of currency depreciation on a country's trade balance therefore, will be biased unless supported by some empirical studies since the relationship between the two is controversial. That is, in intuitive terms, when a domestic currency depreciates, the cost of foreign goods increases relative to domestic goods. This leads to a positive quantity effect on the trade balance due to the reduction of imports demand by the domestic consumers and the increased demand for domestic exports by foreign consumers. However, offsetting this is the negative cost effect due to higher cost of imports. The positive net effect therefore will depend on whether or not the quantity effect outweighs the cost effect.

A review of extant literature shows that although empirical investigation into the effect of real exchange rate depreciation on trade balance is of recent, findings on this very important relationship have generally been mixed in both advanced and developing economies. To examine the effect of the exchange rate on the trade balance, this study uses the panel regression model following Rawlins (2011) and Alemu and Lee (2014). Trade openness, size of domestic and world/foreign incomes are included as control variables.

Examining the empirical relationship between exchange rate and trade balance commenced with assessing the unit root characteristics of the study variables. Upon realizing that the study variables are  $I(0)$ , the empirical panel model was estimated using the FE and RE both of which are considered as traditional and conventional panel econometric techniques. Following the Hausman test the results emanating from the FE model were considered preferable to that of RE model. The results of the FE approach was subsequently diagnosed for autocorrelation, heteroscedasticity and multicollinearity; all of which do not support the validity and reliability of the regression results except for the multicollinearity which was not severe. However, the use of the robust standard errors in the FE model made it still appropriate even in the presence of heteroscedasticity all of which support to the validity and reliability of the regression results. Nonetheless, the system GMM was most preferred due to the suspicion of the presence of endogeneity in the model.

In general, these findings do not render support to the view that depreciation or devaluation is immediately accompanied by favourable trade balance. That is, although

exports become more competitive relative to imports, the value of imports rather exceeds that of exports. Thus, the cost effect outweighs the quantity effect at least in the immediate short run, thereby worsening the trade balance contrary to the Marshall-Lerner condition. The imposition of a two lag variable of the exchange rate however, shows evidence of a long run positive and significant relationship between the real effective exchange rate and the trade balance. That is, the negative effect of the exchange rate according to the FE results lessens in lag 1, whereas it turns positive in lag 2, with the variable becoming more and more significant as the lag length increases thereby depicting the J-curve. Hence, the Marshall-Lerner condition is met in lag 2. Thus, the Marshall-Lerner condition is viewed as a long run effect and not a short run condition affirming findings by Ryan, 1993. This is due to the fact that exports do not respond as expected. That is, the region's overdependence on primary commodities for exports does not make them attractive enough to require the needed demand following a depreciation. More so, the region is heavily dependent on import goods which may be more expensive in the local currency after a depreciation.

Again, in line with both economic theory and most empirical works, expansion in domestic income of SSA was found to be matched with a fall in its trade balance. This implies that economic expansion is unable to improve the trade balance position of the region. That is, it is clearly evident that the quest to stimulate economic growth and raise total level of income in SSA is not the key to improve its trade balance position. Unless the rise in income levels are diverted into expansion of the production of import substitutes and not allowed to follow the normal transmission mechanism of high demand for imports.

Contrary to economic analysis and many empirical studies, the elasticity coefficients on world income variables are however negative and insignificant. This indicates that world income does not influence or drive the trade balance of SSA. In other words, neither higher nor lower levels of world/foreign income are able to explain the trade balance of the region. This could be attributed to the unattractive export composition of the region mentioned earlier, hence making most of the exports inferior relative to those from other nations.

Moreover, all the trade openness variables included in the estimation have negative and statistically significant elasticity coefficients contrary to expectation. That is, while greater openness is expected to improve trade balance, the contrary is found to exist in SSA. This conclusion is not very surprising for smaller economies as in SSA since such economies do not have comparative advantage over large economies in relation to the goods they produce for exports. This is because although greater openness offers SSA economies to engage in more exports, this normally leaves SSA's markets flooded with more foreign goods. However, a fundamental observation from the FE results is that the extent to which SSA's openness to trade reduces its trade balance position is highest in the current year relative to its openness in remote years. This presupposes that a positive effect of trade openness on the trade balance in the long run cannot be overruled entirely.

### **6.3 Recommendations for Policy and Future research**

It is evidently clear that a positive and significant relationship between the exchange rate and the trade balance in economies in SSA is a long run phenomenon. Therefore, in the interim, governments can use it only as a short term mitigation measure to ease the

pressure on the trade deficit from deteriorating further and rather improve steadily overtime. It should however, be expected that this would first have adverse effect on the trade balance before yielding any positive results. Even so, this should be accompanied by some fundamental macroeconomic framework to prevent and or curtail the effects of exchange rate pass through from offsetting the relative response of exports to the exchange rate depreciation and its subsequent impact on the trade balance. Nevertheless, governments should put measures in place to restrain frequent depreciation of their currencies. This is because continuous depreciation/devaluation of a country's exchange rate only widens the trade deficit leaving no room for any positive long run effect.

The worsening effect of increase in the degree of trade openness on trade balance could be stemming from SSA's heavy dependence on foreign-based raw materials and inputs for domestic production. It may also stem from SSA's inordinate taste for foreign-based finished products. From policy perspective, following the signing of trade treaties, governments should reduce tariffs of raw materials and other manufacturing inputs that are highly patronized by domestic producers for production. This would reduce cost of production, thereby maintaining a relatively lower domestic and export prices to boost international competitiveness. This would also raise export supply to meet the increasing international demand due to further opening of the economy.

In addition, a rise in the level of productivity in SSA economies is the way to go in building a strong export sector. That is, governments should enact policies that will encourage more foreign investment, innovation and technological advancement. These among others are the anchors of many Asian economies which are surging high in today's international trade. That is, improved technologies and innovation would enhance

the efforts of both labour and capital to raise their contribution to growth by increasing total production.

Again, if SSA economies can see any improvement in their trade balances following a rise in domestic income, they should divert the increment into production of import substitutes. Since most manufacturing inputs are out-sourced from foreign countries, a policy that would encourage and advocate for the increased share of domestic-based inputs in local production can be considered by governments. The question however, is whether there is enough supply of such inputs to meet the demand. By so doing, governments should therefore render support and invest in that sector in order to ensure production of such manufacturing inputs in a very large scale. Also, quality control institutions should be mandated to ensure these inputs are of higher standards in order to attract the needed demand. Encouraging the consumption of locally made products is also a policy in the right direction to improve trade balance.

More so, until SSA's exports become superior or normal in the eyes of the world, expansion in world/foreign income will invariably reduce SSA's trade balance. Exports have to be put in shapes and forms that do not make them appear inferior to the world – “export diversification”.

#### **6.4 Limitations of the Study**

The principal drawback of this study relates to but not limited to unavailability of data. Only sixteen (16) out of a total of forty eight (48) SSA countries were selected for the study because of inadequate consistent data for many of the countries. In fact, it is worthy

to emphasize here that, not all of these sixteen countries actually had consistent data on all the chosen variables for the period under study. This compelled the study to conduct the various estimations using an unbalanced panel dataset. Modeling and estimation with balanced panel dataset is highly useful but given that considerable consistent data do not exist for many environmental variables for many SSA countries sampled for the study, this study has to rely on unbalanced panel data.

Finally, many other variables such as inflation and exchange rate pass through could produce interesting outcome with their inclusion in the set of control variables but are conveniently ignored for the purpose of the current analysis. While we acknowledge this as a potential limitation of the paper, the findings reveal many insightful and relevant implications on the relationship between exchange rate depreciation and trade balance in Sub Sahara Africa.

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## APPENDICES

## APPENDIX I: List of countries used for the study

Burundi	Ghana
Cameroon	Lesotho
Central African Republic	Malawi
Côte d'Ivoire	Nigeria
Dem. Rep. of the Congo	Sierra Leone
Equatorial Guinea	Togo
Gabon	Uganda
Gambia	Zambia

## APPENDIX II: Optimum lag length results

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-1861.43				1.5e+25	77.851	77.9542	78.1239
1	-1429.18	864.49	49	0.000	1.8e+18	61.8825	62.7075	64.0656
2	-1340.39	177.57*	49	0.000	7.5e-25*	-43.4525*	-39.0182*	-31.7185*
3	-1067.72	545.35	49	0.000	5.1e+13	50.9049	53.1736	56.9084
4	-763.958	607.52	49	0.000	2.8e+09	40.2899	43.2805	48.2035
5	-500.154	527.61	49	0.000	2.2e+06	31.3397	35.0522	41.1635
6	1343.86	3688	49	0.000	3.9e+17	60.2247	61.7716	64.318

Author's Computation using STATA 13

## APPENDIX III: Descriptive Statistics

Variable	Mean	Standard Deviation	Maximum	Minimum
Trade openness	79.15	63.808	531.73	6.3203
Domestic Income	3.77	9.5142	149.97	-35.999
Exchange rate	160.67	233.68	3654.34	18.3027
World Income	2.79	1.3233	4.6827	-2.0760
Trade Balance	-16.26	43.460	45.833	-344.57

Author's Computation using STATA 13

**APPENDIX IV: Breusch-Pagan LM test of independence**

**Null hypothesis: Cross-sections are independent**

$$\chi^2(120) = 408.080,$$

Prob. = 0.0000

ENDOGENEITY TESTING						
instrumental variables (2SLS) regression				Number of obs = 486		
				Wald chi2(11) = 22.94		
				Prob > chi2 = 0.0180		
				R-squared = .		
				Root MSE = 87.612		
TRADE_BALANCE	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
TRADE_OPENNESS	3.616501	2.783037	1.30	0.194	-1.838151	9.071153
REER	.0209773	.0346722	0.61	0.545	-.0469789	.0889335
WORLD_INCOME	-.6465827	3.235413	-0.20	0.842	-6.987876	5.694711
lag2DOMESTIC_INCOME	.154106	.8898667	0.17	0.863	-1.590001	1.898213
lag2DTRADE_OPENNESS	.1085447	.3209132	0.34	0.735	-.5204337	.737523
lag2REER	-.0033635	.0267674	-0.13	0.900	-.0558267	.0490998
lag2WORLD_INCOME	3.165441	3.913035	0.81	0.419	-4.503966	10.83485
lag1DOMESTIC_INCOME	-2.074803	.8935522	-2.32	0.020	-3.826133	-.3234725
lag1DTRADE_OPENNESS	.2132738	.5164785	0.41	0.680	-.7990054	1.225553
lag1REER	-.020677	.0319975	-0.65	0.518	-.0833909	.0420369
lag1WORLD_INCOME	-.2459468	3.112697	-0.08	0.937	-6.346721	5.854827
_cons	-14.04776	16.89316	-0.83	0.406	-47.15774	19.06222
Instrumented: TRADE_OPENNESS						
Instruments: REER WORLD_INCOME lag2DOMESTIC_INCOME lag2DTRADE_OPENNESS lag2REER						
lag2WORLD_INCOME lag1DOMESTIC_INCOME lag1DTRADE_OPENNESS lag1REER						
lag1WORLD_INCOME DOMESTIC_INCOME						
estat endog TRADE_OPENNESS , forceweights						
ests of endogeneity						
Ho: variables are exogenous						
Durbin (score) chi2(1) = 16.8502 (p = 0.0000)						
Wu-Hausman F(1,473) = 16.9885 (p = 0.0000)						

**Author's Computation using STATA**

**APPENDIX V: Test for Endogeneity between trade openness and trade balance**

**Author's Computation using STATA**

**APPENDIX VI: Test for Endogeneity between Domestic Income and Trade Balance**

Instrumental variables (2SLS) regression						Number of obs = 486	
						Wald chi2(11) = 8.35	
						Prob > chi2 = 0.6814	
						R-squared = .	
						Root MSE = 165.39	
TRADE_BALANCE	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]		
DOMESTIC_INCOME	20.51939	13.27845	1.55	0.122	-5.505896	46.54467	
REER	.0590841	.0679067	0.87	0.384	-.0740107	.1921788	
WORLD_INCOME	-7.414316	7.582265	-0.98	0.328	-22.27528	7.44665	
lag2DOMESTIC_INCOME	-2.989746	1.676267	-1.78	0.074	-6.275169	.2956764	
lag2TRADE_OPENNESS	-1.090546	.7125899	-1.53	0.126	-2.487196	.3061051	
lag2REER	.0444908	.0542335	0.82	0.412	-.061805	.1507865	
lag2WORLD_INCOME	4.806494	6.577666	0.73	0.465	-8.085494	17.69848	
lag1DOMESTIC_INCOME	-9.480193	5.49276	-1.73	0.084	-20.2458	1.285418	
lag1TRADE_OPENNESS	-4.430767	2.634422	-1.68	0.093	-9.59414	.7326051	
lag1REER	-.0770082	.072844	-1.06	0.290	-.2197798	.0657635	
lag1WORLD_INCOME	.3356678	5.864055	0.06	0.954	-11.15767	11.82901	
_cons	-44.23366	38.57535	-1.15	0.252	-119.84	31.37265	
Instrumented: DOMESTIC_INCOME							
Instruments: REER WORLD_INCOME lag2DOMESTIC_INCOME lag2TRADE_OPENNESS lag2REER							
lag2WORLD_INCOME lag1DOMESTIC_INCOME lag1TRADE_OPENNESS lag1REER							
lag1WORLD_INCOME TRADE_OPENNESS							
. estat endog DOMESTIC_INCOME, forceweights							
Tests of endogeneity							
Ho: variables are exogenous							
Durbin (score) chi2(1)				= 60.4398 (p = 0.0000)			
Wu-Hausman F(1,473)				= 67.1774 (p = 0.0000)			

**Author's Computation using STATA**