AN EMPIRICAL ANALYSIS OF THE DETERMINANTS OF TRADE BALANCE IN POST-LIBERALISATION GHANA

By

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Bsc. (Hons) Economics

A Thesis submitted to the Department of Economics, Kwame Nkrumah University of Science and Technology, in partial fulfillment of the requirements for the degree of

MASTER OF PHILOSOPHY

(ECONOMICS)

Faculty of Social Sciences

College of Art and Social Sciences

MAY, 2016

DECLARATION

I hereby declare that this thesis is my own work towards the award of a Master of Philosophy in Economics. To the best of my knowledge and with the exception of those acknowledged in the text, it does not contain any material previously published or accepted for the reward of another degree in this University.

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DEDICATION

This study is dedicated to my parents, Mr. Maxwell Osei Akoto and Mrs. Regina Akoto for their unflinching care, support both physically and financially and their many sacrifices throughout my academic life.

ACKNOWLEDGEMENTS

My first gratitude goes to our Heavenly Father for protecting, guarding and bringing me this far throughout my academic life especially seeing me through my master‟s programme successfully. I owe my whole life and the success of this thesis to the Lord. My second sincere gratitude goes to my supervisor, Dr. Daniel Sakyi for his unlimited support from the beginning of this thesis till the end. I am also grateful to my colleagues and academic group members especially, Mr. Samuel Tawiah Baidoo, Mr. Kojo Baiden-Eshun and Mrs. Aku-Sika Eshun all of economics department, KNUST for their encouragement, support and influence over my academic life. Lastly, I am grateful to fellow researchers whose works were cited in this thesis.

ABSTRACT

The study investigates the determinants of trade balance in post-liberalisation Ghana. The Autoregressive Distributed Lag Bounds test approach to cointegration was used for the estimation. Further, the study employed the variance decomposition and impulse response functions to investigate the dynamic simulations of the variables included in the estimated model. The results show evidence of an equilibrium long-run relationship (cointegration) between trade balance, exchange rate, household consumption expenditure, government consumption expenditure, money supply, foreign income, domestic prices and agricultural growth rate. The study finds that in the long-run increasing levels of household consumption expenditure, government consumption expenditure, money supply, and domestic prices worsens Ghana‟s trade balance whilst foreign income improves it. Exchange rate and agricultural growth rate were insignificant in the long-run. The short-run result also shows that exchange rate, household consumption expenditure, government consumption expenditure and money supply cause a decline in Ghana‟s trade balance. Foreign income, agricultural growth rate and domestic prices were insignificant in the short-run. The long-run and short-run effects of exchange rate on the trade balance show the absence of the Marshall-Lerner condition and the J-curve effect. Further the variance decomposition results show that innovations in household consumption expenditure highly contributed to the forecast error of Ghana‟s trade balance compared to other explanatory variables. The findings and recommendations of the study provide vital information for trade policy reforms.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Economies are increasingly opening through international trade because of the economic environment of globalization in recent times. International trade serves as an important tool in boosting economic and social performance of countries, especially the developing ones (UNCTAD, 2005).

The contribution of international trade to development is however dependent on the context to which it works and on the objective it serves. Various empirical studies have ascertained the importance and benefits of international trade through various channels, including the relationship between (i) trade and economic growth and/or development (see for example, Lee et al, 2004; Mani & Afzal, 2012; Sakyi et al., 2014; Karam and Zaki, 2015); (ii) trade and poverty (see for example, Dollar, 2001; Bhagwati and Srinivasan, 2002; Dollar and Kraay, 2004) and (iii) trade and inflation (see for example; Ashra, 2002; Sachsida et al, 2003; Kim and Beladi, 2005 and Lotfalipour et al, 2013).

In recent years, while many developed countries precisely, the newly industrialized ones have deliberately used the forces of international trade to improve growth and development within a relatively short-time span, many developing countries particularly the least developed ones on the other hand, have embarked on unilateral and multilateral trade liberalisation with very little results in terms of increased growth and development

(UNCTAD 2005, 2013; Shawa and Shen, 2013; Osoro, 2013). It is important to note that, whether a country is reaping the many benefits of international trade or not can be viewed through its trade balance, which can either be in deficit or surplus. Theoretically, trade surplus is viewed as healthy and favourable for an economy as the excess of exports over imports creates net inflows of monetary payments into the domestic economy from the foreign sector. This in effect causes an increase in the national income of the economy and some specific indicators such as savings, investment, consumption and tax revenue which are considered "favorable" for every economy. Countries with persistent trade surpluses have been found to experience certain levels of development and growth in their economies. For instance in a study conducted by Macartney (2008), developed countries such as Canada, Japan and Germany typically have run trade surpluses and hence have enjoyed sustained growth and development.

On the contrary, trade deficit is viewed to be detrimental to an economy as it is believed to be a sign of a country‟s weakness and a source of increased and excessive foreign dependence, at the expense of domestic production and job creation. It symbolizes a sacrifice of future growth since the economy purchases more than it produces implying that, future investment growth is being traded for current consumption. Large trade deficits also generate an environment favorable for financial crises that could affect an economy (Osoro, 2013). Griswold (2007) and Friedman (2002) also note that trade deficits are harmful to an economy. They showed that, trade deficits experienced in an economy can drag down growth and employment levels. Pindyck (1991) also states that, high volatility in a country‟s trade deficits creates insecurities in terms of long-term investment

profitability and in effect lowers the levels of investment activities.

This notwithstanding, it is surprising to note that, the trade balance of most developing countries, particularly those in sub-Saharan Africa, has over the years been in deficits. According to Shawa and Shen (2013), the poor performance in the trade balance of these countries has been the result of (i) the poor economic strategies adopted in their economic reform programs, (ii) the dependence on certain specific primary products for their exports, and (iii) the high dependency on imported manufactured goods. To add, the trade policies adopted by most of these countries have not yielded the desired results.

Various empirical studies have also shown that persistent trade deficits are caused by various macroeconomic variables including, increasing levels of domestic expenditures mainly household consumption expenditure and government consumption expenditure, growth in money supply and high levels of domestic prices (see Saruni, 2007; Duasa, 2007; Waliullah et al, 2010; Mohammad, 2010 and Shawa and Shen, 2013). Though exchange rate depreciation has also been empirically found by various studies (see BahmaniOskooee, 2001;; Petrovic and Gligoric 2010; Petrovic and Gligoric, 2010 and Tandon

2014) to improve a country‟s trade balance given support to the Marshall-Lerner condition, other studies have also refuted the Marshall-Lerner condition by empirically proving that exchange rate depreciation, deteriorated the trade balance of a country (see Singh, 2004;

Duasa, 2007; Danquah, 2008; Sarbapiya, 2012; Tran and Dinh, 2014 and Tutueanu, 2015). Empirically, other studies have also shown that exchange rate depreciation initially

deteriorates the trade balance of a country but further improves it in the long-run (Narayan, 2004; Singh, 2004; Petrovic and Gligoric, 2010 and Tutueanu, 2015).

Ghana has implemented several economic and trade policies reforms with the aim of improving its trade position amongst other economic variables in the quest of promoting economic growth and development. Among these are mentioned: the Economic Recovery Programme (ERP); the Structural Adjustment Program (SAP); Ghana Investment Promotion Centre Act 1994 (GIPC Act 478) amended in 2013 (Act 865); the Free Zone Act, 1995 (Act 504); the Minerals and Mining Law 1986 (PNDCL 153) as amended by the Minerals and Mining (Amendment) Act, 1994 (Act 475) and the Minerals and Mining Act 2006 (Act 703); African Growth and Opportunity Act (AGOA); the Petroleum Exploration and Production Law 1984 (PNDCL 84) and The African, Caribbean and Pacific group of States and the European Union (ACP-EU) Economic partnership Agreements. Again, there have been various efforts to actively improve the country‟s trade position through the establishment of the Ghana National Export Promotion Council (GEPC), the Ghana Export Trade Information Center (GETIC) and the Ministry of Trade.

Prior to the implementation of the reform programs, an import substitution industrialization policy which was aimed at reducing the economy‟s dependence on trade was implemented. During this period, state-owned enterprises in various sectors of the economy were established, ranging from agricultural to manufacturing industries. The import substitution industrialization policy was not sustainable due to continual political instabilities, low levels of factor productivity and gross economic mismanagement. The country for most periods

during this era experienced poor performance in major macroeconomic indicators, including the exchange rate and the trade balance. Although the country recorded a four year trade surplus for the years 1967 to 1969; this was not sustainable as by 1971 it experienced one of its largest trade deficits (Killick, 2010). As Bank of Ghana (2008) and Sakyi (2011) note, the story was not different in most part of the 1970‟s and the early

1980‟s.

The huge trade deficits that characterized the economy during the pre-liberalisation periods were among the many other reasons that Ghana opted for financial assistance from the multilateral institutions, the World Bank and the International Monetary Fund (IMF) (World Bank, 1998). This precipitated the launch of the ERP in 1983 on the basis of liberalisation policy regime with the aim of addressing amongst others the trade deficits experienced in the country (Rodrik, 1999). By 1986, Ghana‟s trade balance had improved significantly from a deficit to a surplus of 0.025% of Gross Domestic Product (GDP). This was attributed to the recovery of the cocoa subsector which was traumatized by bush fires in the early 1980‟s and also through many years of neglect (Bank of Ghana, 2008). As a result of the ERP there were appreciable upswings in macroeconomic indicators, such as the relatively high annual growth rate, significant improvements in the country‟s trade balance, reduction in the level of inflation and improvement in services (Danquah, 2008).

But in 1990‟s due to the external shocks resulting from the increase in crude oil prices and the collapse of Ghana‟s two main export commodities thus gold and cocoa, all hopes of sustaining the early gains of trade surplus were wiped away as the country‟s trade balance turned to deficits again. Though between some years for instance, between 2001 and 2003

trade deficits improved significantly due to the recovery of cocoa and gold prices on the international market the country‟s trade balance has been in deficit for most periods.

1.2 Statement of the Problem

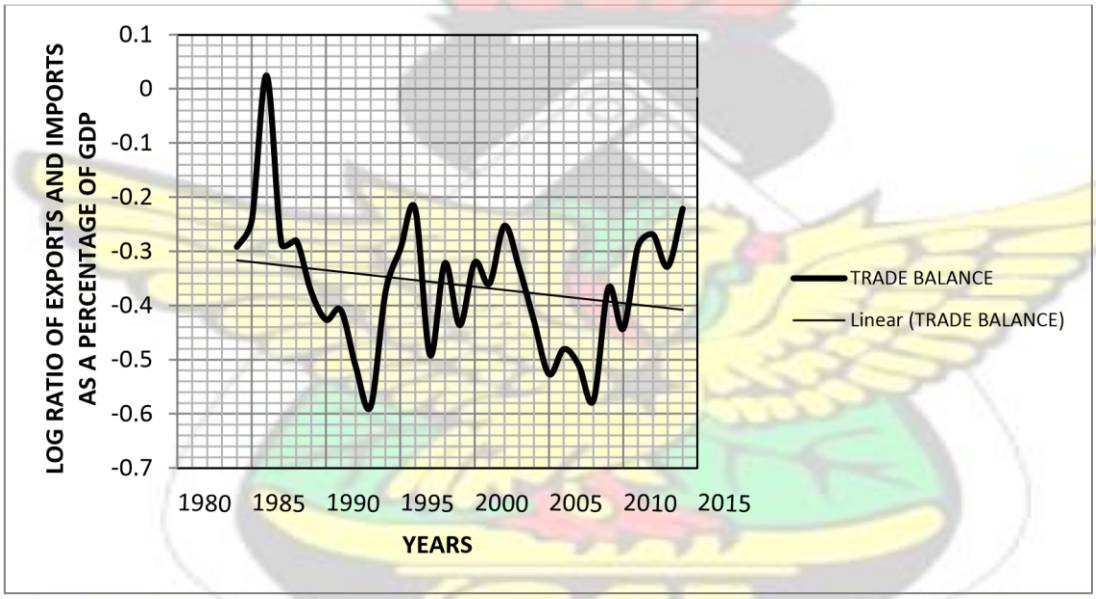
The macroeconomic crises and changes in the international trade patterns in the era of globalization have caused the need for a clearer understanding of the factors underlying a country‟s trade balance position.

Ghana in 1983 implemented the ERP with the aim of improving the country‟s overall economic performance including its trade performance preferably from deficits recorded during the pre-liberalisation era to surpluses. As earlier indicated, though there were significant improvements in Ghana‟s trade balance after the implementation of the liberalisation policies (ERP and SAP) by 1986 when the country recorded a trade surplus of 0.025% of GDP, it was not sustainable as for most periods the country recorded deficits in its trade balance (See Figure 1.1). Trade surpluses recorded in 1986, according to the Bank of Ghana was as a result of the tremendous recovery of the cocoa sector which had suffered years of neglect and also traumatized by bush fires in the early 1980‟s. At the time, export earnings increased as imports reduced hence improving the country‟s trade balance position.

However, the early gains of trade surplus couldn‟t be sustained as in the 1990‟s the country experienced deficits in its trade position once again. Ghana experienced trade deficits of 0.42% in 1990, 0.51% in 1992 and 0.29% in 1995 of the country‟s GDP during the early nineties with one of the worse trade positions occurring in 1993 as the country recorded a

deficit of 0.58% of the country‟s GDP (See Figure 1.1). This could be as a result of the twin external shocks which hit the country in the early 1990s. These shocks resulted in an increase in crude oil prices on the international market and also led to the collapse of two major export commodities of the country, namely cocoa and gold. All hopes of sustaining the early gains of trade surplus were wiped away as the country has since then experienced trade deficits till date.

Figure 1.1: Trends or trade balance in post-liberalisation Ghana



Source: Author's construction

Though during some periods there were significant improvements in the country‟s trade deficits, the country‟s trade position in most periods were poor. For instance, between 2001 and 2003 there were significant improvements in the country‟s trade balance as deficits improved from 0.35% of GDP in 2001 to 0.25% of GDP in 2003. This was as a result of the quick recovery in the prices of cocoa and gold on the international market (Bank of Ghana, 2008). However between 2004 and 2008, Ghana experienced trade deficits of 0.42% of GDP

in 2004 to 0.57% of GDP in 2008. And this was one of the worst trade positions the country ever experienced. In recent times the situation still prevails as the country recorded deficits of 0.44%, 0.28%, 0.26, 0.32% and 0.21% of GDP in 2010, 2011, 2012, 2013 and 2014 respectively. From a quick look at the trends in the country‟s trade balance (see Figure 1.1) it is evident that though the trade liberalisation policies embedded in the ERP were mainly aimed at improving the country‟s exports in order to improve its trade balance significantly to drive the growth of the economy, there has been very limited result.

A report by UNCTAD (1999) states that the trade balance of an economy is vital in attaining some levels of growth and development. Therefore trade deficit is a problem to hasten economic growth and development. A trade deficit of Ghana‟s size in postliberalisation era, thus $990.8 million as at 2013 requires an intensive exploration of the determinants of trade balance as the first step to address the problem. Hence the question is what could be the principal causes of these persistent trade deficits? Many studies have been conducted on determinants of trade balance in other countries (see for example,

Duasa, 2007 in Malaysia; Saruni, 2007 in Tanzania; Mohammad, 2010 in Pakistan; Nienga, 2010 in Kenya; Sarbapiya 2012 in India; Shawa and Shen 2013 in Tanzania and Narayan, 2004 in New Zealand) but to the best of the authors‟ knowledge, only a few studies (see for example Bhattarai and Armah, 2005; Danquah, 2008 and Bentum-Ennin, 2008) have been conducted in Ghana.

The studies (Bhattarai and Armah, 2005, Danquah, 2008 and Bentum-Ennin, 2008), assessed the impact of specific macroeconomic variables on Ghana‟s trade balance.

Specifically, these authors analysed the effects of exchange rate on Ghana‟s trade balance over the periods, 1970 to 2000 1986 to 2005 and 1985 to 2007 respectively. In all studies, the main focus was to find out the effects of exchange rate on the trade balance. The authors also included foreign income, money supply and domestic output to assess their impact on trade balance. However, upon several studies reviewed in other countries, many other macroeconomic variables might affect the trade balance of a country. In addition, the present study does not only focus on the post-liberalisation period but extends the data till recent years.

1.3 Objectives of Study

The main purpose of this study was to analyse the determinants of trade balance in postliberalisation Ghana. To do this, the following specific objectives are set:

- To determine the relationship between exchange rate and the trade balance by providing an empirical test of the Marshall-Lerner condition and the J-Curve effect in Ghana.

- To determine the impact of other macroeconomic variables including household consumption expenditure, government consumption expenditure, money supply, foreign income, agricultural growth rate and domestic prices on Ghana‟s trade balance.

- To investigate how Ghana‟s trade balance responds to innovations (shocks) in exchange rate, household consumption expenditure, government consumption expenditure, money supply, foreign income, agricultural growth rate and domestic prices.

1.4 Research Hypotheses

The hypotheses tested in this study include the following:

1. H_o: The relationship between exchange rate and trade balance is zero

   H_1: The relationship between exchange rate and trade balance is statistically different from zero

2. H_o: The relationship between household consumption expenditure and trade balance is zero

   H_1: The relationship between household consumption expenditure and trade balance is statistically different from zero

3. H_o: The relationship between government consumption expenditure and trade balance is zero

   H_1: The relationship between government consumption expenditure and trade balance is statistically different from zero

4. H_o: The relationship between money supply and trade balance is zero

   H_1: The relationship between money supply and trade balance is statistically different from zero.

5. H_o: The relationship between foreign income and trade balance is zero

   H_1: The relationship between foreign income and trade balance is statistically different from zero.

6. H_o: The relationship between agricultural growth rate and trade balance is zero

H_1: The relationship between agricultural growth rate and trade balance is statistically different from zero

7. H_o: The relationship between domestic prices and trade balance is zero
   H_1: The relationship between domestic prices and trade balance is statistically different from zero

1.5 Justification of the Study

Consumption of certain goods and services which are unprofitable and/or not possible to produce domestically for many reasons are enabled through international trade. Capital and technology are also obtained from international trade. Therefore having a favourable trade balance generates foreign currencies needed for importation of consumable goods and services as well as capital not possible to produce domestically. Trade balance is a key component in every country‟s current account balance hence can have far-reaching impact on balance of payment, growth and development.

Though Ghana‟s export sector played a key role in the growth of the country in postliberalisation era, specifically in 1986 when it recorded a trade surplus resulting from the implementation of the economic recovery program, its foreign trade has being immensely suffering from persistent trade deficits in most post-liberalisation periods thereby having adverse effects on the country‟s foreign currency reserve. Therefore, identifying the causes of these persistent trade imbalances is highly important due to the fact that the country cannot continue to incur trade deficit of substantial sizes forever. Finding the determinants of these trade imbalances is a diagnosis of the problem and can propose essential policy prescriptions

to be pursed. Considering also, the fact that trade contributes highly to the GDP of the country, an in-depth knowledge of the drivers of the trade balance cannot be ignored with reference to growth and development.

In addition, the trade balance of an economy is an area in modern economics which is of great concern to many institutions such as, the World Bank, Bank of Ghana, International Monetary Fund (IMF) and Ministry of Finance and Economic Planning (MoFEP) but for Ghana, much research has not been done to assess the determinants of trade balance.

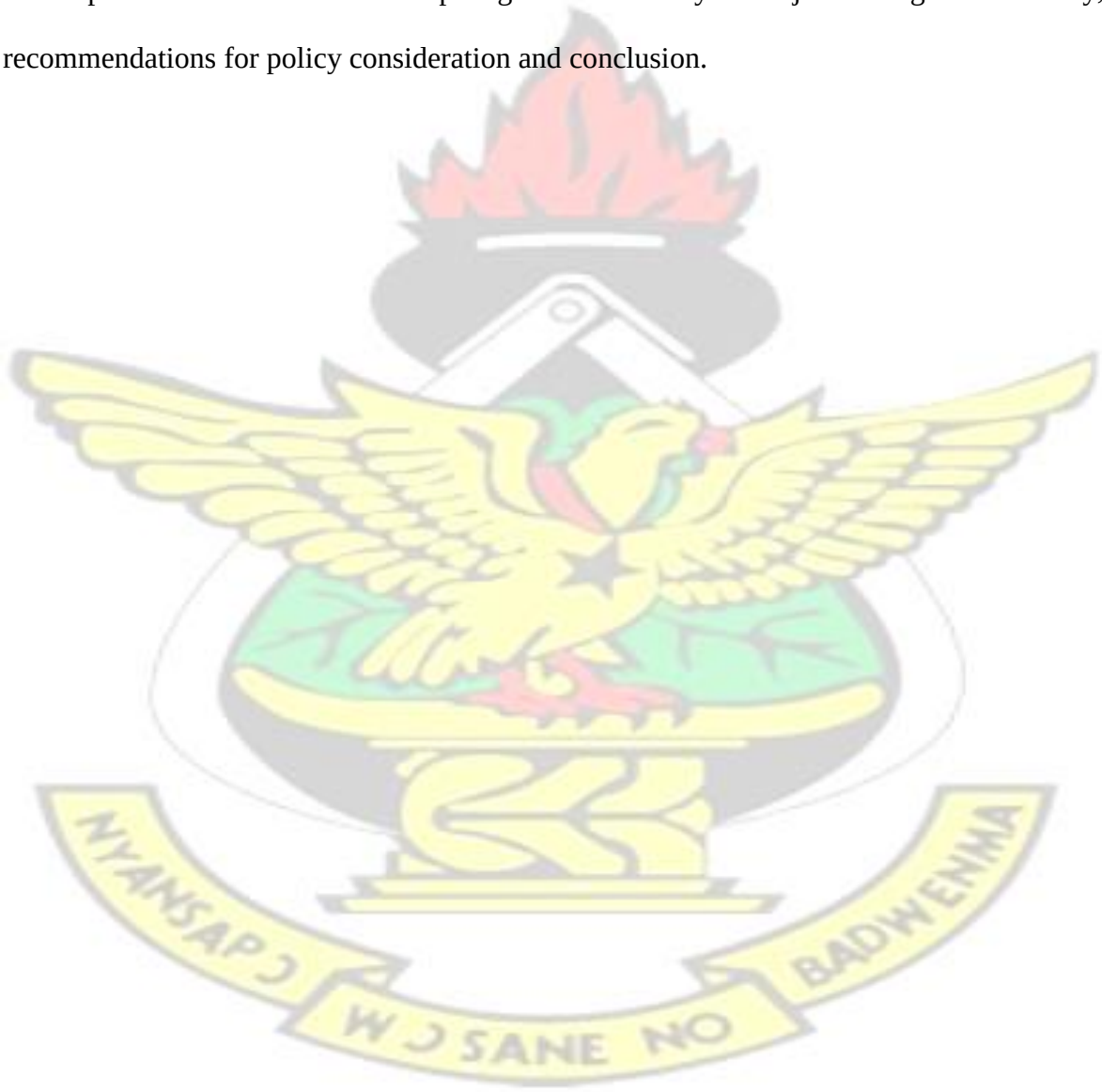
Finally, the study would not only reveal the major malaise affecting Ghana‟s external trade but eventually present a study which would be a relevant contribution to the empirical literature on trade balance.

1.6 Scope of the Study

Trade balance is a broad and complex concept, hence there could be various determinants in the form of micro and macroeconomic factors that could influence it in one way or another but the study only considers major determinants. For the purpose of this research, only macroeconomic factors were considered. In addition, the study was limited to the 1984 to 2014 period. That is thirty-one (31) observations using annual data. The main reason for the choice of this period is due to the fact that this study sought to investigate trade balance in post-liberalisation Ghana.

1.7 Organization of the Study

This study is organized in five chapters. Chapter one is devoted to the general introduction. It considers the background of the study, problem statement, objectives of the study, hypotheses, and scope and delimitations of the study. Chapter two concentrates on the review of related literature. Chapter three focuses on methodology. Chapter four analyses the empirical results. The final chapter gives a summary of major findings of the study, recommendations for policy consideration and conclusion.



CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter is devoted to the literature on the determinants of trade balance. It is divided into two main sections. The first section explores the theoretical literature while the second section reviews empirical studies related to the subject.

2.2 Theoretical Literature

Theories reviewed here are, the Marshall-Lerner condition, the J-curve effect and the monetary approach to the balance of payment. Furthermore, theoretical literature on the relationship between government consumption expenditure and trade balance; household consumption expenditure and trade balance are reviewed.

2.2.1 The Exchange rate and the Marshall-Lerner condition

Theoretically, the exchange rate has an impact on the trade balance. One way of ascertaining this link can be discussed in terms of the Marshall-Lerner condition.

The elasticity of demand for exports and imports are not only important in determining the terms of trade for a country, impact on quotas and tariffs, and impact on economic growth but also plays a key role in assessing how a devaluation (depreciation) aids in improving the trade balance position of an economy. Currency devaluation is mainly aimed at altering relative prices in countless ways that will encourage exports and discourage imports. Devaluation is the deliberate increase in the domestic currency as against a foreign currency,

hence raising the domestic price of imports. In relation to the increasing levels of domestic prices its effect is however solely dependent on the demand elasticity. Specifically, at a higher demand elasticity (i.e. > 1), then devaluation will cause a relatively large decline in the volume of imports in the domestic economy, and will achieve its intended effect. On the contrary, if the demand elasticity is low (i.e < 1), though devaluation will cause some level of decline in imports, the volume of the reduction might not be enough to offset the rise in domestic currency price. Hence, to achieve an intended effect thus, improving the trade balance the demand elasticity has to be relatively high.

Furthermore, the elasticities depend on the strength of the substitution and income effects. In terms of the substitution effect, if there is a relatively large volume of substitutes for imports on the domestic market, then the substitution effect will be strong implying a large decline in imports. On the contrary, if domestic imports largely constitute necessities where there are few or no domestic substitutes, then the substitution effect on imports will be relatively small implying poor prospects for the intended aim of the devaluation. Many at times, such instances are evident in developing countries, although developed nations such as France, Japan, Germany and the United States do not have substitutes for certain major imported goods such as oil (Dunn and Mutii, 2000). On the other hand, the income effect is seen to be powerful if only imports have a significant part on an average citizen‟s budget. This is why devaluation is unpopular under this circumstance. When devaluation causes the prices of domestic goods such as fuel and food on the consumers‟ budget to increase, it causes real income to decline hence reduces the purchases of other goods including imported goods.

In line with exports, devaluation of the domestic currency will cause both a reduction in foreign currency price and an increase in local currency prices, with relative elasticities of demand and supply determining the consequences. In a situation where local currency price of exports are held constant, implying an infinitely elastic supply function, as the foreign currency price falls resulting from the devaluation thereby causing foreigners to purchase more of the domestic exports. On the contrary, if foreign currency prices of exports are held fixed instead, implying an infinitely elastic foreign demand for such goods, domestic currency price of exports rises resulting for the devaluation and hence will increase domestic exports on the international market.

When the elasticities of the demand for exports and imports are relatively low, devaluation in the domestic currency can deteriorate the trade balance rather than improving it. If the prices of the goods are fixed in the exporters‟ currencies, a condition needs to be satisfied to achieve a desired response of the exchange rate to the trade balance. The condition states that, the elasticities of demand for long-term exports and imports must in summation be more than one. This means that the average of both exports and imports should be more than one. If they add up to exactly one, then there will be no change in the trade balance in case of devaluation. A perverse effect of devaluation on the trade balance occurs if the sum of the demand elasticities of exports and imports is less than one. This condition is what is termed the Marshall-Lerner condition. This condition was postulated by Alfred Marshall and Abba Lerner.

2.2.2 The Exchange rate and the J-curve Effect

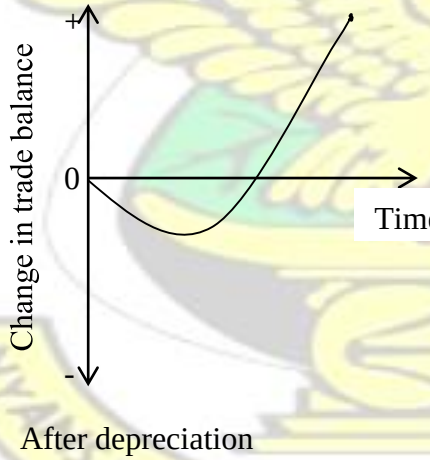
The relationship between the real exchange rate and the trade balance can also be discussed in terms of the J-curve effect. Following the Marshall-Lerner condition is the J-curve effect. The intuition behind the J-curve effect is that, a worsening trade balance resulting from a depreciation of a particular currency may be temporary. Likewise, exchange rate instabilities may only be a problem in the short-run. Since the second half of the 1980‟s the J-curve effect has served as an important theory in explaining the temporary problem caused in the trade balance resulting from depreciation in the currency.

Generally, individuals take some time to adjust their preferences towards substitute goods. Economists believe that this is due to the fact that, in the short-run demand is more inelastic as compared to the long-run. This is particularly strong for the import elasticity demand, because the import demand curve is derived from the difference between the domestic supply curve and demand curve of the product; with both demand and supply being more inelastic in the short-run than in the long-run, the difference between the demand and supply is more inelastic in the short-run. This implies that, when there is depreciation in a currency, causing a consequent increase in prices of imports residents of that particular country may continue to buy foreign goods because they have not adjusted preferences towards locally produced substitutes (an inelastic demand curve) and also because local substitutes might have not been produced (a domestic inelastic supply curve). Imports can therefore fully decline only after consumers have decided to adjust their preferences by purchasing locally produced goods which are available at the time. Likewise, domestic exports also expand resulting from depreciation if only domestic production increases in order to produce more for export and also if foreign consumers patronize these products.

Depreciation will worsen the trade balance of an economy in the short-run but consequently improves if both the import demand and export supply is more inelastic in the short-run as compared to the long-run. The time path changes in trade balance may look as shown in Figure 2.1. A depreciation is assumed to occur at time 0, and the trade balance worsens immediately after depreciation because individuals temporarily spend more on imports and also because exports do not increase sufficiently. But after some time, when the elasticities of both imports and exports increase, the trade balance eventually improves.

This can clearly be seen in Figure 2.1. The shape of the Time path in the figure follows the J-pattern hence the name, J-Curve effect.

Figure 2.1 J-curve Effect after depreciation



2.2.3 Monetary Approach to Balance of Payment

Economic theory postulates that the money supply of an economy can influence its trade balance. This can be discussed in terms of the monetarist approach to the balance of payment.

Theoretically, the monetarist approach emphasizes the overall supply and demand of money and how it affects the Balance of Payment (BoP) in an economy. The monetary approach to the balance of payment explains how changes in demand and supply of money affect the overall BoP. Since trade balance is a major component of balance of payment this theory is relevant for the study.

Proponents of this theory are of the view that, "a BoP deficit (trade deficit) is always and everywhere a monetary phenomenon" and in effect can only be corrected through monetary measures. The theory is expressed as the relationship between demand and the supply of money. Demand for money in this context depends on income (Y), prices (P) and interest rate (I) as shown below:

$MD = f(Y,P,I)$.....(2.9)

On the other hand money supply is a function of monetary base which the summation of domestic credit (D) and foreign reserves (R). For simplicity, money supply is expressed as:

$MS = D + R$.....(2.10)

In equilibrium money demand equals money supply and it is expressed as;

$MD = MS$ or $MD = D + R$.....(2.11)

Changes in a country‟s foreign reserve can cause a BoP deficit or surplus. Thus,

$\Delta R \Delta\Delta MD \Delta\Delta D$ or $\Delta R \Delta B$.....(2.12)

where B represents BoP and it is expressed as the difference between a change in money demand and a change in money supply. If an economy experiences BoP surplus it implies a reduction money supply. On the contrary if an economy experiences a BoP deficit it implies an increase money supply. BoP equilibrium is however achieved when money demand and money supply are equal.

Suppose the monetary authority increases its domestic money supply, with no change in money demand, at a given exchange rate, the economy will experience BoP deficit. This is so because; individuals with large cash balances may increase their consumption on goods and securities which comprises of both domestic and foreign goods and securities causing an increase in prices of such goods thereby increasing the importation of goods and foreign assets. And this may first result in a trade deficit which trickles down to cause a current account deficit and hence a BoP deficit. In simple terms, if the monetary authority (central bank) supplies more money than being demanded the excess supply is eliminated through outflows hence worsening the trade balance in effect the BoP.

On the contrary, when money supplied by the monetary authority is lower than money demanded at a given exchange rate it leads to a BoP surplus. Subsequently, due to the high demand for money, individuals acquire domestic currency by selling out goods and securities to foreigners and restrict their expenditures relatively to their income in other acquire money balances. In other words, when individuals‟ demand more money than being supplied by the

central bank, then the excess demand will be settled by the inflows from the rest of the world and thereby improving the trade balance.

2.2.4 Government Expenditure and Trade balance

The interaction between government expenditure and trade balance can theoretically be viewed through various channels. However, the study explains this interaction through three channels including the savings-investment gap, the IS-LM Mundell-Fleming model and the absorption approach to balance of payments.

The savings-investment identity approach is a concept in national income accounting which postulates that by the expenditure approach the sum of private consumption expenditures, domestic investment, government expenditure and net exports equals the gross domestic product of an economy. Thus,

$$Y \equiv C + I + G + (X - M) \quad (2.13)$$

where Y represents national income, C represents private consumption expenditure, I represents domestic investment expenditure, G represents government expenditure, X represents exports, M represents imports and $(X - M)$ represent net exports/ trade balance.

Again, from the income approach of the national income identity national income of an economy equals the sum of private consumption, savings and taxes. Thus,

$$Y \equiv C + S + T \quad (2.14)$$

where S represents savings, T represents taxes revenues of the government and all other variables are as previously defined.

Equating equation 2.13 and 2.14 gives:

$$C + I + G + (X - M) = C + S + T \quad \text{.....(2.15)}$$

By rearranging, equation 2.15 can be re-written as:

$$(X - M) = (S - I) + (T - G) \quad \text{.....(2.16)}$$

Equation 2.16 expresses trade balance as the sum of private savings and government savings. This implies that private savings and government savings determine imbalances in a country"s trade balance. Specifically, all other things being equal an increase in investment by the private sector will cause deterioration in the trade balance of an economy. Similarly, an increase in government expenditure will also cause deterioration in the trade balance of an economy, ceteris paribus.

Again, the interaction between government expenditure and trade balance can be explained in the context of the IS-LM Mundell-Fleming model. As government expenditure increases in an open economy, it causes aggregate demand to increase hence causing an outward shift in the IS-curve. The outward shift in the IS curve causes a rise in the level of equilibrium interest rate. According to the Mundell-Fleming model, higher levels of interest rate triggers net capital inflows from abroad resulting in an appreciation of the domestic currency.

Appreciation of the domestic currency will adversely affect net exports as domestic imports become relatively cheaper and domestic exports expensive on the international market. As imports increases relative to exports, it causes a decline in net exports (trade balance).

Finally, the interaction between government expenditure and trade balance can be explained by the absorption approach to balance of payment (BoP). It can be noted that, since trade balance is a major component of the BoP, this theory is closely linked to the study. This approach emerged in the 1950s by Harberger (1950), Meade (1951) and Alexander (1952, 1959). This approach identifies, BoP as the difference between the national income of an economy and domestic expenditures. Hence can be written as:

$$B = Y - E \quad \text{.....(2.17)}$$

where B represents balance of payments, Y represents national income and E represents domestic expenditure. Proponents of this approach are of the view that, an economy experiences a favourable balance of payments if its national income increases more than its domestic expenditures. Hence, in that respect, an increase in government expenditure, which is a share of domestic expenditure, will cause the BoP (trade balance) to deteriorate. In other words, holding national income constant, an increase in government expenditure (a share of domestic expenditure) will cause a decline in the BoP (trade balance).

2.2.5 Household Consumption Expenditure and Trade Balance

In theory, the interaction between household consumption expenditure and trade balance can be discussed using the expenditure approach to national income accounting identity. This approach states that the sum of government expenditure, household consumption expenditure, investment and net exports make up the gross domestic product of every economy. Thus,

$$Y \equiv C + I + G + (X - M) \quad \text{.....(2.18)}$$

where, Y represents gross domestic product, C represents household consumption expenditure, G represents government expenditure and $(X - M)$represents trade balance/net exports. In order to ascertain a link between the trade balance and household consumption expenditure, equation 2.18 is re-arranged to give:

$$(X - M) \equiv Y - C - I - G \quad \text{.....(2.19)}$$

Equation 2.19 implies that gross domestic product (national output) has a positive relationship with trade balance whilst household consumption expenditure, investment and government expenditure negatively affect trade balance.

The consumption path of individuals can either be on domestic goods or foreign goods. Hence household consumption expenditures can either be diverted to the purchase of domestic goods or foreign goods. If a chunk of household consumption expenditures is diverted to the purchase of foreign goods, thereby implying high levels of importation into the domestic economy it causes a decline in trade balance. In other words, trade balance will

deteriorate if individuals of the economy purchase more foreign goods, hence causing a rise in imports relative to exports.

2.3 Empirical Review

This section of the chapter reviews empirical studies on the determinants of trade balance in the developed and developing countries. Specifically, the review captures literatures on both time series and panel studies.

2.3.1 Time Series Studies on the Determinants of Trade Balance

Several studies have been devoted to the determinants of trade balance by the use of time series methodologies. Among these are mentioned; Rose (1991), Brada et al (1997),

Bahmani-Oskooee (2001), Shawa and Shen (2013), Kayhan et al (2013), Alawin and Maghareez (2013), Sulaiman and Abdul-Rahim (2014) , Turkay (2014), Tutueanu (2015) among many others.

Rose and Yellen (1989) investigate the J-curve hypothesis on both bilateral and aggregate American data using cointegration techniques and find no statistical reliable evidence of the hypothesis. Their study employs the cointegration analysis on quarterly data from the

US and other OECD countries spanning from 1960:1 to 1985:3.

Using cointegration techniques on monthly data spanning from 1974 to 1986, Rose (1991) investigates the empirical relationship between real exchange rate and real aggregated trade balance for five major Organization for Economic Cooperation and Development (OECD)

countries (UK, Canada, Germany, Japan, and US) and finds that, exchange rate is a statistically significant determinant of trade balance. The study further finds evidence of the Marshall-Lerner condition.

Brada et al (1997) employs the Engel-Granger cointegration technique and the polynomial curve analysis to investigate the relationship between real exchange rate and trade balance during the pre and post 1980 based on changes in trade policies in Turkey. The result shows that there is no functional relationship between real exchange rate and trade balance in the pre-1980 period. The results further showed that during the post-1980 period, trade balance was responsive to changes in the real exchange rate. The study therefore concluded that, in the post-1980s adequate exchange rate policies were able to maintain a satisfactory trade position in Turkey.

Bahmani-Oskooee (2001) using quarterly data over 1971(I) – 1994(IV) period of 11 middle eastern countries, employed the cointegration estimation technique specifically, the EngleGranger and Johansen-Juselius cointegration technique showed that real depreciation has a favourable long-run effect on the trade balance of most non-oil exporting middle eastern countries.

Catao and Falcetti (2002) employs the Autoregressive Distributed Lagged (ARDL) method with a lag structure of the auto-regression selected by the Schwartz Bayesian Criterion and the vector error correction models on Argentina data spanning from 1975 to 2000. The results

showed that, the major drivers of Argentina‟s trade balance include export sensitivity to commodity prices on the international market; domestic absorption and high income elasticities for imports.

Thungsuwan and Thompson (2003) by employing cointegration techniques on data spanning from 1970 to 2000 assess the determinants on trade balance in Thailand. The results showed that exchange rate and foreign income improved Thailand‟s trade balance whilst inflation and domestic income caused a decline in the trade balance position. Further, the study found that, agricultural growth rate has a positive effect on trade balance in Thailand and hence contributes to economic growth.

By employing cointegration techniques and the impulse response function (IRF) on annual data from a period of 1970 to 2000 Narayan (2004) tests the J-curve effect in New Zealand. The result finds no cointegration between trade balance, real effective exchange rate, domestic income and foreign income. In other words, the results show that there is no stable long-run relationship amongst the variables. The results further shows a causal connection in both directions between foreign income and trade balance and also found a one way link between real exchange rate and trade balance. Again, there was a clear existence of the j-curve pattern for New Zealand‟s trade balance based on the IRF results. More succinctly, the results show that for the first three years depreciation in the New Zealand dollars worsens the trade balance and later improves it, confirming the J-curve

effect.

Analyzing the effects of exchange rate volatility on India‟s trade balance and testing for the presence or otherwise the J-curve effect, Singh (2004) employs the error correction model (ECM) and generalized autoregressive conditional heteroskedasticity (GARCH) model. The study uses quarterly data from 1975:02 to 1996:03. The result obtained from the study shows that the J-curve is not supported in India‟s trade balance. The study further reported that exchange rate volatility has no impact on India‟s trade balance. The short-run results show that domestic income and real exchange rate play a key role in improving India‟s trade balance. The effect of foreign income on India‟s trade balance was however insignificant.

Bhattarai and Armah (2005) conducted a study to examine the effects of exchange rate on Ghana‟s trade balance and employed cointegration techniques specifically, the vector autoregressive (VAR) and error correction models (ECM) on an annual time series data spanning from the period of 1970 to 2000. The results showed that there was a stable long run relationship between trade balance and exchange rate. The long-run results show that the Marshall-Lerner condition for successful devaluation is barely met. The long-run and short-run results also show that income levels are not important determinants either of the import or export demand of Ghana. The overall conclusion drawn from the study was that, for improved trade balance in Ghana, coordination between the exchange rate and demand management policies should be strengthened and be based on the long-run fundamentals of the economy.

Onafowora and Owoye (2006) using cointegration, vector error-correction techniques, Granger-causality tests and generalized impulse response analysis consider the causal relationship between trade balance and budget deficit in Nigeria from a period of 1970 to 2001. The researchers found a positive long-run equilibrium relationship between budget deficit and trade deficit. Contrary to the conventional theory, this study highlights that the direction of causality is from trade deficit to budget deficit which was attributed to the fact that Nigeria is mainly dependent on the export of petroleum products. The study further shows a positive correlation between trade balance and money supply and real exchange rate whilst increases in domestic income and rising interest rates worsened Nigeria‟s trade deficit in the long-run. According to the researcher, this was because an increase in domestic income causes a raise in demand for foreign goods and services while rising interest rates encourages capital inflow that causes an appreciation of the domestic currency.

Saruni (2007) employed the Ordinary Least Square (OLS) regression analysis for data spanning from 1970 to 2002 in Tanzania and concluded that, foreign direct investment, government expenditure and private consumption expenditure were the main contributors to Tanzania‟s trade balance despite the negligible coefficient of foreign direct investment.

The result also showed that, trade liberalisation was a contributing factor to Tanzania‟s trade deficits. Government expenditure, foreign direct investment and foreign income where found to have positive impact on Tanzania‟s trade balance whilst household consumption expenditure, real exchange rate and trade liberalisation had a negative influence.

Duasa (2007) employed cointegration techniques, specifically the Bound testing approach within the ARDL framework in the case of Malaysia during 1974 to 2003. He concludes that money supply and income plays a major role in determining the long-run behaviour of

Malaysian‟s trade balance as compared to the exchange rate. Specifically, money supply was found to have a negative effect on trade balance whilst income had a positive effect. Though real exchange rate was found to have a positive relationship with trade balance its impact was statistically insignificant, hence refuting the Marshall-Lerner condition in

Malaysia‟s case. He further concluded that, policy wise, the difficulties in trade balance as regards to Malaysia‟s context, would better be corrected through its policies on income or growth and money supply rather than the exchange rate regime.

Danquah (2008) uses the ADRL approach to cointegration to examine the effects of exchange rate on Ghana‟s external balance during 1986 to 2005. The study assesses whether real exchange rate is a principal cause of imports, exports and the overall trade balance. The results indicate a stable long run relationship between real exchange rate, exports, imports and trade balance. The results further showed that, elasticities of imports and exports with respect to real exchange rate are inelastic and as such Ghana‟s trade balance is not responsive to changes in exchange rate both in the long-run and the short-run contracting the effects of depreciation.

Konya and Singh (2009) employed cointegration and Granger causality techniques on data from 1950/1951 to 2003/2004 to analyse the trade balance of Indian with the main focus on the agricultural and manufacturing sector. The results of the study showed a positive relationship between agricultural growth rate and trade balance in the long-run. The study further concluded that the growth rate in agriculture and the manufacturing sector had a positive influence on the growth of the Indian economy.

Employing the bounds testing approach to cointegration and error correction models developed within an autoregressive distributed lag (ARDL) framework, Waliullah et al

(2010) examines the determinants of Pakistan‟s trade balance from a period of 1970 to 2005. The researcher finds evidence of cointegration between trade balance, foreign income, exchange rate and money supply. The results further showed that, the depreciation of exchange rate is directly related to trade balance in the long and short run showing consistency with the Marshall-Lerner condition. Also there was strong evidence that money supply and foreign income play a strong role in determining the behaviour of trade balance. Specifically, money supply had a negative effect whilst foreign income had a positive effect on Pakistan‟s trade balance. On the other hand, it was stated that even though exchange rate regime can help improve upon Pakistan‟s trade balance it has a weaker influence as compared to income and monetary policy. The short-run results were consistent with the long-run except for foreign income which was negative and

insignificant in the short-run.

Mohammad (2010) also explores the principal factors of Pakistan‟s trade balance using the Johansen co integration approach and error correction model during 1975 to 2008 and found that, foreign income, foreign direct investment, inflation, domestic household consumption and real effective exchange rate significantly affect Pakistan‟s trade balance. More specifically, the researcher found that foreign income, foreign direct investment and exchange rate had a positive effect on trade balance in Pakistan whereas inflation and domestic household consumption impacted negatively in the long-run. In the short-run, except for foreign income and inflation, all other variables had similar results as in the long-run. Foreign income had a negative but insignificant relationship with trade balance whilst the coefficient of inflation was positive but insignificant in the short-run.

Nienga (2010) investigated the determinants of trade balance from 1920 to 2010 in Kenya. He proposed that, real exchange rate, government consumption expenditure, domestic income and money supply (M3) were the main significant factors affecting Kenya‟s trade balance. The researcher employed OLS and found that real exchange rate and domestic income had a positive effect on Kenya‟s trade balance whilst government consumption expenditure and money supply had a negative effect.

Petrovic and Gligoric (2010) employs both the Johansen cointegration and ARDL approach to cointegration to investigate the impact of exchange rate on trade balance over the period

1980 to 2008 in Serbia. The results showed that in the long-run exchange rate depreciation improves the trade balance in Serbia and further confirms the J-curve pattern in the shortrun and long-run results.

Korap et al (2011) using ARDL bounds testing estimation techniques on data spanning from 1990:Q1-2007:Q3 in Turkey found that, as real exchange rate depreciate it improves the Turkish trade balance. The study further found that trade balance is negatively affected by domestic real income and positively affected by foreign income in the long-run. The researchers further observed that, there was no significant effect of crude oil prices on trade balance in the case of Turkey. In the short-run, foreign income was found to have a negative but insignificant relationship with trade balance.

Sarbapiya (2012) employs various econometric techniques and tools including Augmented Dickey-Fuller (ADF), Johansen co-integration, vector error correction models (VECM) and OLS to observe the long and short run trade behaviour for India over the period of 1973 to 2011. The results of the analysis suggest that there is a long run as well as short run causality among inflation, exchange rate, FDI, household consumption and foreign income. Foreign income and FDI had a significant positive impact on balance of trade whilst household consumption and inflation and exchange rate impacted negatively on the balance of trade in the long-run. The short-run results were found to be similar to that of the longrun.

Osoro (2013) employed the Johansen cointegration and error correction modeling techniques on data from Kenya within a period of 1963-2012. The results showed that, the trade balance is positively correlated to FDI, budget deficit and exchange rate, and further explained that, FDI has a positive effect on the trade balance due to the fact that Kenya‟s trade balance was negative during the specified period. Furthermore, real exchange rate depreciation was found to improve upon Kenya‟s trade balance in a strong and significant way.

Shawa and Shen (2013) by employing the OLS estimator on data from a period of 1980 to 2012, finds that the main influencing factors of Tanzania‟s trade balance include, foreign direct investment, human capital development, real exchange rate, household consumption expenditure, government consumption, inflation, natural resource availability, foreign income and trade liberalisation. The study found that household consumption expenditure, government consumption expenditure, inflation and real exchange rate had a negative effect on trade balance, hence causing deterioration while foreign direct investment, human capital development, natural resource availability, foreign income and trade liberalisation had a positive effect, hence improving Tanzania‟s trade balance.

Kayhan et al (2013) using quarterly data for the period 1987Q1–2011Q3 employed the bootstrap process based on the Toda-Yamamoto causality and frequency domain analysis methods and obtained a bi-directional causality between trade deficits and government expenditure in Turkey. Contrary to the Toda-Yamamoto causality analysis, the frequency domain causality analysis finds, the causality running from government expenditure to trade deficit exists in the short run or medium term whilst a causal relationship runs from trade deficit and government expenditure in both the long-run and the short-run. In light of the literature and theoretical frameworks, the study implied that, reduction in government expenditures will successfully reduce trade deficits.

Alawin and Maghareez (2013) employs Granger causality and cointegration technique on data from 1980 to 2010 in Jordan found that, real gross domestic product and foreign direct

investment have a significant effect on trade balance unlike real exchange rate which the authors attributed to the fact that Jordan nominal exchange rate was fixed since 1995.

Sulaiman and Abdul-Rahim (2014) tests the j-curve pattern on Thailand‟s trade in forest products with the rest of the world. The study employs the Bounds Test within the ARDL framework on data spanning from 1970 to 2010. The study also assesses the short-run and long-run dynamics of Thailand‟s trade balance and various determinants. The results of the study showed the absence of the J-curve pattern in Thailand‟s trade in forest products. The long-run results showed that, Thailand‟s national income improved its trade balance whilst, foreign income, exchange rate and forest policy caused trade balance to deteriorate. In the short-run Thailand‟s national income was found to have a positive and significant impact on trade balance. The impact of foreign income, exchange rate and forest policy were however statistically insignificant in the short-run.

Turkay (2014) employs the Johansen cointegration and error correction model on annual time series data spanning from 1980 to 2012 to test the validity of the Marshall-Lerner condition in Turkey. The study confirms the validity of the Marshall-Lerner condition in Turkey in the long-run. However, the short-run results show that exchange rate had an insignificant relationship with Turkey‟s trade balance.

Tutueanu (2015) examines the J-curve effect on international trade in Romanian forest products. The study employs the Bounds testing approach within the ARDL framework on

annual time series data spanning from 1990 to 2014. The results of the study showed the absence of the j-curve pattern for the trade balance of forest products. The results further showed that in the long-run Romanian‟s national income and world income had a positive and significant impact on the trade balance of forest products in Romanian.

Varga (2015) analyses the impact of the agricultural sector on the employment and foreign trade balance in Hungary. The study employs descriptive analysis on data spanning from 2004 to 2014. The results showed that over the sample period, the agricultural sector was the second largest contributor to exports and has improved Hungary‟s trade balance year after year. Again the share of agriculture is higher in exports than in imports of Hungary, hence causing a significant improvement in Hungary‟s trade balance.

2.3.2 Panel Studies on the Determinants of Trade Balance

Relatively, some works have used panel data techniques to investigate the determinants of trade balance in various countries. Among these are the study by UNCTAD (1999), Parikh and Stirbu (2004), Khan and Hossain (2012), Hu (2012), Tandon (2014), Tran and Dinh

(2014), Kundu (2015) among many others.

UNCTAD (1999) using panel data from 16 developing and industrialized countries for 26 years (1970 to 1995), employed the random-effects and fixed-effects models to examine the effects of growth, purchasing power of exports of developing countries, the growth rate of industrial countries and economic liberalisation on trade balance. The results showed that, acceleration of growth rates in developing countries improved the trade deficit while economic liberalisation worsened it significantly. Also, the study concluded that better terms

of trade and rapid economic growth in industrial countries helped lessen the trade deficit in developing countries.

Parikh and Stirbu (2004) uses OLS, fixed effects and random effects econometric techniques on 42 developing countries dispersed over three geographical regions of Asia, Latin America and Africa during the period of 1970-2000 to investigate the relationship between trade liberalisation, trade balance and economic growth. The findings according to the researchers was that trade balance deteriorates during liberalisation regimes in few countries during the period while for some countries like Coasta Rica, Kenya, El Salvador, Uganda, Chile and Mauritius experienced positive impacts. Also trade balance was also found to deteriorate with a rise in economic growth in Asian economies included in the study while there was no such evidence for both the African and Latin American countries in the study.

Vohra (2006) by employing various panel estimation techniques on data spanning from 1973 to 2003 analyses the trade balance of some selected less-developed countries. The study that exchange rate causes a decline in the trade balance of these countries whilst domestic income and foreign income improved it. The results further showed a positive and significant relationship between growth rate in agriculture and trade balance some lessdeveloped countries, thereby causing an improvement in their economic growth while for remaining countries though the results were negative they were insignificant.

By employing the fixed effects and linear mixed models within panel data analysis techniques on data spanning from 1990 to 2007 in 32 emerging countries and industrialized economies, Falk (2008) showed that trade balance is positively and significantly related to real foreign GDP per captia of the respective trading partners. Also real domestic GDP per capita was found to have a negative effect on the trade balance. Though, a depreciation of the real exchange rate index was found to cause improvements in the trade balance, countries with negative trade balance and /or large positive net foreign investment position however, had their trade balance less sensitive to movements in the real effective exchange rate index.

Veselkova and Horvath (2008) in a panel data analysis investigates the major factors causing changes in the trade balance of four Central Europe and three Baltic transition economies (Czech Republic, Hungary, Poland, Slovakia, Estonia, Latvia and Lithuania) with an emphasis on the difference between permanent and transitory disturbances to income using quarterly data 1992:1 to 2006:3. The major findings were that transitory shocks to income are the principal causes of changes in the trade balance compared to permanent shocks to income.

Khan and Hossain (2012) employed dynamic panel data analysis techniques specifically, the unrestricted error correction mechanism (UECM) and the generalized method of moments (GMM) estimator on Bangladesh‟s trade balance and 50 of its trading partners for 26 years, thus from 1980 to 2005. The results showed an existence of cointegration implying that, there exists a stable long-run relationship between trade balance and its determinants thus

relative GDP, relative per capita GDP and real exchange rate. The shortrun dynamics also show convergence of trade balance to its long run equilibrium.

Using co-integration analysis, vector error correction model and granger causality test based on quarterly data (1998:1 to 2011:3) between China and the United States, Hu (2012) finds that U.S real GDP and real exchange rate have a significant impact on Chinese exports. The main factors affecting China‟s imports according to the researcher are real GDP and real exchange rate of RMB. Furthermore, the results showed a causal relationship between the RMB exchange rate and trade balance. RMB real exchange rate depreciation was reported to improve the trade balance.

From a panel of regions (Europe, Latin America and Asia) using data spanning from 19802010, Tandon (2014) explores the trade balance-real exchange rate multilateral and bilateral relationship. The researcher by using the Generalized Least Square (GLS), ARCH and Newey West methods of estimation, finds that real exchange rate is a significant determinant of export, imports and the overall trade balance in most regions and countries under study. The study further states that, the response of trade balance to real exchange rate for countries belonging to the currency union was not symmetric. In addition, countries such as Brazil, Mexico, China, Malaysia and the Philippines support theoretically established results, that, a devaluation of the real exchange rate improves trade balance.

Tran and Dinh (2014) employ the use of panel data estimation techniques specifically the fixed effects and random effects models to examine the effects of FDI inflows on trade imbalances in developing and transition countries in Asia. The study further extends the trade balance model to assess the impact of real exchange rate, foreign income, production capacity of the manufacturing sector and domestic absorption. The findings of the study suggest that, FDI inflows cause a decline in trade balance. The study also finds that real depreciation tends to worsen trade balance, hence refuting the Marshall-Lerner condition. The results further showed that, foreign income, domestic absorption and the production capacity of the manufacturing sector improved upon the trade balance.

Kundu (2015) explores the gravity model to examine the relationship between Bangladesh trade balance and BRICS (Brazil, Russia, India, China and South Africa) countries. The study employs panel data estimation technique on data spanning from 1991 to 2013. The results shows that relative GDP, relative per capita GNI, real exchange rate and importweighted distance proxies for transportation cost of the partner countries to the home country. The static panel data analysis also explores cross-country variations as well as the time-invariant country-specific effects on trade balance with heterogeneous economies and found significant effects of all relative factors on Bangladesh‟s trade balance.

2.4 Summary

Theoretical literature reviewed ascertains the relationship between trade balance and various variables considered by this study. Review of the empirical literature shows that most of the studies are carried out in countries mostly experiencing trade deficits such as; Tanzania,

Malaysia, U.S, Kenya, Pakistan, Argentina, New Zealand and Turkey. A chunk of these studies conducted have their sample sizes starting in the 1970s. This has been the case as a number of the countries experienced trade deficits during this period. Generally cointegration, causality and panel techniques have been adopted in conducting these studies. FDI, money supply, domestic income, foreign income, government consumption expenditure, household consumption expenditure and exchange rate are dominant factors found to influence trade balance. Though some studies have ascertained a link between trade balance and certain factors in Ghana (See for example Bhattarai and Armah, 2005 and Danquah, 2008), much work hasn‟t been done to identify the major determinates of

Ghana‟s trade balance. Hence the present study fills this lacuna.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter provides a description of the methodology used to achieve the objectives of the study. It is further divided into four sections. Specifically, the first section presents discussions on specification of the model. The second and third sections present discussions on the data type and source and estimation strategy which entails unit root test, cointegration and error correction techniques, stability and diagnostic test procedures. The final chapter presents discussions on the variance decomposition function (VDF) and impulse response function (IRF) techniques.

3.2 Model Specification

The study adopts the imperfect substitute model of international trade of Goldstein and Khan (1985), Rose and Yellen (1989) and Rose, (1991) where a reduced form of trade balance is developed.

3.2.1 Imperfect substitute model of international trade

The model is based on the "two-country" model of trade and assumes that locally produced goods and imports are imperfect substitutes. The model also assumes that the volume of imported goods by domestic nationals is directly related to real domestic income and inversely related to the relative price of imported goods. Similarly, the volume of imported goods by foreign nationals is directly related to real foreign income and inversely related to the relative price of the imported goods. Thus:

Q_{Dm}

$\square Q_{Dm}(Y,P_m)$.....(3.1)

Q_{Dm}^* $\square$ Q_{Dm}^*

(Y^*,P_m^*).....(3.2)

where Q_{Dm}^* (Q_{Dm})represents the volume of imported goods by the foreign (home) country, $Y^*(Y)$ represents the level of real income in foreign (domestic) output, P_m represents the relative price of imported goods in the home country, and P_m^* represents the relative price of imports abroad.

However the volume of supply of exportables in each country depends on the relative prices of the exportables as shown below:

Q_{Sx}

$Q_{Sx}(p_x)$.....(3.3)

Q_{Sx}^* Q_{Sx}^* (p^*_x).....(3.4)

where Q_{Sx} and Q_{Sx}^* represent the supplies of exportables from home and abroad

respectively; p_x represents the relative price of the domestic country"s exportables, measured as the ratio of the domestic currency price of exportables(P_x)to the domestic price level (P); in the same vain p^*_x is analogously defined as the relative price of the

foreign country"s exportables, defined as the ratio of the foreign currency price of exportables (P_x^*) to the foreign price level (P^*).

Again the relative price of imports is expressed as:

P_{x^*} P_* P_* p_m $E.$ $E.P$ P^x* $rE.p^*_x$.....(3.5)

P

where E represents the nominal exchange rate, thus the domestic currency price of foreign

P_* exchange

and rE represents the real exchange rate, thus $rE = E.P$.

In the same vain, the relative price of foreign imports is

$p^* x$ .....(3.6)

$p_m = rE$ when equilibrium is reached, the relative prices of exports goods in both domestic and foreign countries are equal to the volumes of goods transacted. Thus,

$Q_{Dm} = Q_{Sx}^*$ and $Q_{Dm}^* = Q_{Sx}$.....(3.7)

The trade balance (TB) of the domestic country in real terms can hence be expressed as the ratio of the value of net exports in domestic currency to the domestic price level as shown below:

$TB = p_x.Q_{Dm}^* - rE.p^*_x.Q_{Dm}$.....(3.8)

Therefore, TB can be represented in a partial reduced form as;

$TB = f(rE, Y, {}^{*}Y)$ .....(3.9)

where all variables are as previously defined.

3.2.2 Modification of the Imperfect substitute model of international trade

The imperfect substitute model of Goldstein and Khan (1985) and Rose and Yellen (1989, 1991) as discussed in 3.2.1 section does not fully capture certain key factors that might affect the trade balance of a developing country like Ghana. In view of this, the baseline model of the study is modified to capture key variables that would significantly influence

Ghana‟s trade balance. Various studies (see for example Saruni, 2007; Duasa, 2007; Waliullah et al, 2010; Mohammad, 2010 and Shawa and Shen, 2013) have shown that money supply, household consumption expenditure, domestic prices of goods and government consumption expenditure are significant drivers of trade balance in developing countries. Secondly to avoid aggregation bias the domestic expenditure variable the study substitutes it with the major components of domestic expenditure to assess their distinct impact on Ghana‟s trade balance. To add, according to the World Bank Institute (2010) consumption expenditures which consist of household consumption expenditure and government consumption expenditure are the major components of domestic output, therefore in order to assess their distinct impact on the Ghana‟s trade balance they are captured in the baseline model in-place of domestic output in equation 3.9. Again, Ghana like many developing countries is an agrarian economy hence its export sector is highly dominated by agricultural products. Several studies such as, Thungsuwan and Thompson (2003), Vohra (2006) and Konya and Singh (2009) have ascertained that the growth in the agricultural sector is a major

factor affecting the trade balance of most developing countries. Given this, equation 3.9 is re-specified as:

$$TB = f(rE, HCEX, GCEX, MS, Y^*, AG, DP) \quad \text{.....(3.10)}$$

where TBrepresents trade balance, rE represents exchange rate, Y^* represents foreign income, $HCEX$ represents household consumption expenditure,$GCEX$ represents government consumption expenditure, DP represents domestic prices, MS represents money supply and AG represents the agriculture growth rate. From equation 3.10 the explicit estimable econometric model can be expressed as:

$$\ln TB = \beta_0 + \beta_1 \ln rE + \beta_2 \ln HCEX + \beta_3 \ln GCEX + \beta_4 \ln MS + \beta_5 \ln Y^* + \beta_6 AG + \beta_7 \ln DP + \varepsilon_t \quad \text{...(3.11)}$$

β_i represents parameters to be estimated, t is the time period considered for the study, ε represents the Gaussian white noise and ln implies natural logarithm. All other variables are as previously defined.

Except for agriculture growth rate which is already computed in logarithmic form all other variables are logged as shown in equation 3.11. The series are logged due to the fact that logging i) enables the variables to be converted to the same unit of measurement and ii) minimizes heteroskedasticity in the model (Gujarati, 2004).

In what follows, the aprior expectations of the variables are further discussed. An increase in exchange rate implies depreciation in the value of the domestic currency. Depreciation in

the domestic currency can cause the price of foreign goods to become relatively more expensive as compared to the domestic goods. In effect, it may lead to the competitiveness of domestic exports and will cause a shift of resources from sectors that produce nontradables to sectors producing tradable goods. This implies an increase in domestic export relative to imports thereby improving the trade balance provided the MarshallLerner condition is satisfied. This is consistent with the Marshall-Lerner condition. From the above explanations, it can be deduced that, from equation 3.11 the parameter estimate β_1 is expected to have a positive effect on the trade balance.

Secondly, an increase in household consumption expenditure is likely to deteriorate the trade balance of an economy. Basically, the growth of an economy may result in a significant growth in the standards of living of its citizens. This may lead to high levels of consumption which has to be satisfied by importation of foreign goods if the economy cannot produce enough to meet the domestic demand. In other words if an economy, increases significantly in its growth rates thereby causing an increase in the standards of living of its citizens, it will enable the country‟s households and businesses to consume more goods in the form of either foreign goods or domestic goods. The demand for foreign goods will increase if the country is unable to produce adequately to meet the local demand thereby worsening the trade balance of the economy. Therefore the parameter estimate β_2 is expected have negative effect on the country‟s trade balance.

Government consumption expenditure can increase irrespective of whether the economy is growing or not. Specifically, government consumption expenditure can rise even though the

country might not be producing enough to offset such expenditures. Hence, the effect will be that government imports more goods to satisfy its demands-as always in the case for developing countries causing the trade balance to worsen. The parameter estimate β_3 therefore is expected to have a negative effect on the trade balance.

Again, for every economy, the monetary base is equivalent to the sum of domestic value of foreign reserves and all domestic assets holdings by the monetary authority. A change in the monetary base implies a change in money supply. If individuals demand more money than being supplied the excess demand for money is satisfied by inflows from the rest of the world and in effect will improve the trade balance. On the contrary, if money supplied by the central bank exceeds that of the money demanded, the excess supply of money will be eliminated by outflows of money to other countries and this will in turn worsen the trade balance. This is line with the monetarist approach to balance of payment. Therefore the parameter estimate β_4 is expected to have a negative.

Foreign income is expected to have a positive effect on trade balance. This is so because in this context, foreign income represents the total national income from the rest of the world.

The underlying assumption here is that, when the incomes of Ghana‟s major export trading partners‟ increases, they will import more of Ghana‟s exports thereby improving upon the trade balance. Therefore the expected sign of the parameter estimate $\beta_5$is positive.

The growth rate of the agricultural sector has been found to have a significant impact on the trade balance of many developing countries. An increase in the productivity of the agricultural sector will increase the benefits gained by the producer, the domestic consumer as well as the foreign consumer. Since agriculture is a major component of Ghana‟s export sector, an increase in agricultural products will increase the volumes of exports to the rest of the world thereby improving the country‟s trade balance. Therefore, the parameter estimate β_6 is expected to have a positive effect on trade balance.

Finally, the price of domestic goods has a negative relationship with trade balance. More specifically as the prices of domestically produced goods increases, it induces the quest to purchase relatively cheaper goods in the form of imports from foreign countries. This will cause a rise in imports hence worsening the trade balance. This means that, the parameter estimate β_7 is expected to have a negative sign.

3.3 Data Type and Sources

Variables included in the study are time series variables spanning from 1984 to 2014. The choice of this period is due to the fact that, Ghana experienced major changes in its economy relevant to this study including, the economic recovery program (ERP) and structural adjustment program (SAP) within this period. Again, the choice of this time span is in accordance to the fact that the study seeks to analyse Ghana‟s trade balance in postliberalisation era. This time span is also chosen due to the availability of data of the choice variables.

Except for exchange rate, all variables included in the model are extracted from the World Bank‟s World Development Indicators (2014). Data on exchange rate is obtained from the International Monetary Fund (IMF)-International Financial Statistics (IFS) (2014).

3.3.1 Variable Description

Trade Balance

The dependent variable, trade balance refers to the difference between a country‟s exports and imports over a specified period of time. In other words, it measures the relationship between exports of a particular country to the rest of the world and its imports to the rest of the world. Traditionally, trade balance is measured as the difference between exports and imports of a country. But following a number of empirical studies (See for example, Bahmani-Oskooee, 2001; Onafowara and Owoye, 2006; Duasa, 2007; Khan and Hossian, 2012; Waliullah et al, 2010; Korap et al, 2011; Shawa and Shen, 2013), the study defines trade balance as the ratio of nominal exports and nominal imports of goods and services. Bahmani-Oskooee (1991) provides the following justifications for this measure; i) the ratio as not sensitive to units of measurement and ii) the measure could be interpreted as nominal or real trade balance.

Exchange rate

Exchange rate is defined as the price of a particular nation‟s currency with respect to another nation‟s currency. It measures how much a nation‟s currency can be exchanged for another nation‟s currency. The study employs the use of the real effective exchange rate index

because when computing this index, the weighted average of several foreign currencies against the value of a particular currency is considered. This measure is widely used (See for example, Rose and Yellen 1989; Bahmani-Oskooee, 2001; Singh, 2004;

Narayan, 2004; Onafowora and Owoye 2006; Duasa, 2007; Danquah, 2008, and Tandon, 2014). In assessing the effects of exchange rate on trade balance it is best to use the real effective exchange rate index due to the following reasons; i) inflationary effects of nominal devaluation may take away any favourable effect that exchange rate may have on the balance of trade; and ii) under floating exchange rate regime, one country‟s currency can depreciate against one currency at the same time appreciate against another (BahmaniOskooee, 2001).

Household Consumption Expenditure

Household consumption expenditure generally refers to the market value of all goods and services, including durable products such as cars, washing machines and computers purchased by individual households. Household consumption for this study is measured in nominal terms as a percentage of GDP. Saruni (2007), Mohammad (2010) and Shawa and Shen (2013) used the same measure.

Government Consumption Expenditure

Government consumption expenditure refers to spending made by the government on goods and services used for the direct satisfaction of individual needs or collective needs of citizen in a particular country. For the purpose of this study, government consumption expenditure is measured in nominal terms as a percentage of GDP. Various studies (see Saruni, 2007; Nienga, 2010; Shawa and Shen, 2013) have used the same measure.

Money supply

Money supply refers to the total amount of assets in monetary terms at the disposal of a country within a specified period of time. In relation to this study, M2 is used as the measure of money supply. In Ghana, M2 is defined as money in circulation or in the hands of the public plus money in savings and checking accounts in commercial banks. It is expressed as a percentage of GDP as used in various studies (See Duasa, 2007; Walliullah et al 2010, Nienga, 2010).

Foreign income

Foreign income is the income earned from the rest of the world other than that of the particular country. Ghana‟s major exports are basically dominated by commodities with export destination largely concentrated in industrialized economies. For the purposes of this study, the income of 34 member countries of the Organization for Economic Cooperation and Development (OECD) is used. The main reason for selecting the OECD member countries is that, over the years, there exist a close bilateral trade relationship between most its member countries and Ghana. Most member countries are the main destinations of Ghana‟s export goods. For instance, in a report by the Ministry of Finance and Economic Planning (MoFEP), the members under the European Union (EU); also inclusive under the OECD, received approximately, US$ 3.8 billion worth of goods from Ghana in 2012 which accounted for 49% of Ghana‟s total exports. Moreover, Ghana is amongst many sub Saharan African countries that have benefited from various trade partnership agreements with some OECD member countries such as African Growth and Opportunity Act (AGOA) and the Economic Partnership Agreement (EPA) initiatives.

Foreign income is therefore measured as the average real GDP‟s of these countries as used by various empirical studies. (See for example, Narayan, 2004; Saruni, 2007 and Ju et al

2010). All GDP‟s of the respective countries included in this calculation are measured in real per capita terms.

Agriculture growth rate

This refers to the amount of growth experienced in the agricultural sector over a specific period of time usually annual. Annual growth rates within the specified sample period in the agricultural sector of the Ghanaian economy are used similar to Thungsuwan and Thompson (2003) Vohra (2006) and Konya and Singh (2009).

Domestic Price

Domestic price is defined as the current price level of goods and services produced in a country over a specified period of time. In the context of this study the consumer price index (CPI) which measures the price level of a market basket of consumer goods and services purchased by individuals is used as a measure of domestic price in this study as used by Shawa and Shen (2013).

3.4 Estimation Strategy

Regarding the estimation strategy, the study follows three steps: i) the test of stationarity of the individual series in the regression model or otherwise to determine the order of integration of the variables, ii) the test of the existence of a stable long-run equilibrium

relationship between the variables and iii) the estimation of the parameters of the model in equation 3.11.

3.4.1 Unit Root Testing (Stationarity Test)

In estimating parameters of a time series model, it is required that all data should be tested in order to determine the order of integration of each of the variables specified in the model. Testing for stationarity before estimation is deemed necessary as most time series variables are nonstationary and estimations with these series might produce spurious results. Testing for stationarity enables the researcher to determine the order of integration of the variables so as to choose an appropriate estimator. The study opts for the use of the Augmented Dickey Fuller (ADF), Dickey-Fuller-GLS (DF-GLS) and the Phillip-Perron (PP) tests in carrying out the stationarity test. These tests are employed concurrently for robust results. The lag length is selected using Schwarz Information Criterion (SIC).

3.4.1.1 Augmented Dickey Fuller (ADF) Test

The ADF test developed by Dickey and Fuller (1979) is an augmented version of the Dickey-Fuller (DF) test for more complicated and larger time series models. The augmentation term is included in order to change the residuals into white noise without altering the distribution of the test statistics under the null hypothesis of a unit root. The procedure of stationarity testing using the ADF is similar to that of the DF test but rather applied to a particular model as specified below.

$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \delta_1 \Delta y_{t-1} + \ldots + \delta_{j-1} \Delta y_{t-j+1} + \varepsilon_t$ .....(3.12)

Simply,

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \sum_{t=1}^{J} \delta_1 \Delta y_{t-1} + \varepsilon_t \quad \text{.....(3.13)}$$

where α is a constant term, β is the coefficient of the time trend, j is the optimal lag length, Δ is the difference operator, t represents the time trend and ε represents the Gaussian white noise. The test for stationarity is carried out under the null hypothesis $\gamma = 0$ as against the alternative hypothesis $\gamma < 0$. After computation of the test statistic, it is then compared with the critical values. Therefore, if the test statistics is larger than the critical value, then the null hypothesis of $\gamma = 0$ is rejected implying that there is an absence of a unit root (stationarity). Similarly, the acceptance of the null hypothesis implies that the series has a unit root and hence non stationary. In this case the test statistics is lesser than the critical values.

3.4.1.2 Phillips-Perron (PP) Test

An improvement of the ADF test is usually viewed as a DF test developed to cater for heteroskedasticity and autocorrelation. In light of this, Phillips and Perron (1988) proposed a modification of the ADF test technique by non-parametrically correcting any

heteroskedasticity and serial autocorrelation in the residuals. Specifically, the PP test tries to handle any deviations so as not to achieve white noise in the estimated model. The PP test is specified below;

$$\Delta y_{t-1} = \alpha_o + \alpha y_{t-1} + \varepsilon_t \quad \text{.....(3.14)}$$

From the equation equation (3.6) the null hypothesis and alternative hypothesis are specified as $\alpha = 0$ and $\alpha < 0$ respectively. If the null hypothesis is rejected, then the variable in question is said to have no unit root and hence stationary, otherwise nonstationary.

In relation to the PP test, it is not necessary to state a lag length in the test. Since the PP statistics has the same asymptotic distribution as the ADF t-statistics, the critical values are still used in this context.

3.4.2 Cointegration Testing

Variables in time series analysis are classified as co-integrated if they exhibit long-run equilibrium relationship and share common trends. For the purposes of this study the Bound test within the Auto-Regressive Distributed Lag (ARDL) as proposed by Pesaran et al (2001) is employed. The reasons for employing this approach rather than the conventional approaches such as the Johansen (1998) and Johansen and Juselius (1990) are based on several considerations. The ARDL model provides consistent results irrespective of the order of integration of the variables under study. Thus whether I(1) or I(0) or a mixture of both but not orders greater than one. It also provides an unbiased estimation of the long-run model

and also provides authentic t-statistics though some of the regressors might be endogenous. The ARDL estimation technique is also very efficient in the cases of small samples as in the case of this study. This technique also allows for the introduction of optimal lags of both the dependent and explanatory variables. Implying that, various variables are allowed to have their optimal speed of adjustment to the equilibrium. A generalized representation of the ARDL model is shown in 3.15.

$$\Delta Q = \alpha_O + \alpha_1 t + \alpha_2 Q_{t-1} + \alpha_3 X_{t-1} + \sum_{t=1}^{k} \beta_4 \Delta Q_{t-1} + \sum_{i=1}^{k} \beta_i \Delta X_{t-1} + \varepsilon_t \quad \text{.....(3.15)}$$

where Q is the dependent variable; X is a vector of explanatory variables; t represents the time trend and εrepresents the error term.

The F-test statistic is used in checking the existence of a long-run equilibrium among the variables under study. The null hypothesis for no cointegration among the variables is represented as $H_O : \beta_1 = \beta_2 = \beta_3 = 0$while the alternative hypothesis is represented by

$H_1 : \beta_1 \neq \beta_2 \neq \beta_3 \neq 0$. The F-statistic test is a non-standard which relies on whether the variables included in the model are integrated of order zero I(0) or integrated of order one

I(1), the number of regressors and whether the model contains a trend and/or an intercept. The test involves the use of critical value bounds which depends on the order of integration of the variables. Thus whether I(0) or I(1) or a mixture of both. Basically two sets of critical values (i.e. I(0) series and I(1) series) are generated. The lower bound critical values is the

term used to classify the critical values generated for the I(0) series, whilst the critical values for the I(1) series is referred to as the upper bound critical values.

After generation of the F-statistic estimates, if the F-statistic exceeds the upper critical value, then the null hypothesis is rejected and conclusion is made that, there is an existence of a long-run equilibrium relationship among the variables irrespective of the order of integration. On the other hand, if the F-statistic is below the upper bound critical value then the null hypothesis is accepted implying that there is no cointegration among the variables. However, if the test statistic lies in-between the upper critical value and lower critical value a conclusive inference cannot be made.

3.4.3 Error Correction Model

After the test of cointegration, the long-run relationship among the variables is established using the ARDL test for cointegration. The error-correction model (ECM) within the ARDL framework is estimated in order to obtain the short run and long run relationships among the economic variables understudy. The lag length selection criterion is based on the Schwartz Information Criterion (SIC). A generalized form of the ECM within the ARDL frame work is represented below:

$$\Delta InQ_t = \alpha_o + \alpha_1 InQ_{t-1} + \alpha_2 InX_{t-1} + \sum_{t=1}^{p} \beta_1 \Delta InQ_{t-1} + \sum_{t=0}^{q} \beta_2 \Delta InX_{t-1} + \alpha ECT_{t-1} + \varepsilon_t \quad \text{.....(3.16)}$$

where Q represents the dependent variable, X represents the regressors, β_1 and β_2 represents the long run coefficient estimators, α_1 and α_2 represents the short run dynamic coefficients, λ represents the speed of adjustment parameter, ECT represents the error correction term.

3.4.4 Stability Test

In order to check if the all regression estimates throughout the sample period are stable, the stability test is performed. Plots of Cumulative Sum (CUSUM) and Cumulative Sum of Squares (CUSUMQ) test as postulated by Brown et al (1975) are employed. If the movement of the CUSUM and CUSUMQ residuals lies outside the critical lines then it can be concluded that there is instability in the estimated coefficient and parameter variance over the sample period. On the contrary, if the movements of the CUSUM and CUSUMQ lie within the critical lines then it can be concluded that there is stability among the estimations.

3.4.5 Variance Decomposition and Impulse Response Functions

In order to test for the response of the dependent variable to the shocks from other variables included in the model the study employs the variance decomposition function (VDF) and the impulse response function (IRF) within the vector autoregressive framework. Unlike any causality test the VDF and IRF provides information on the time paths of the variables and their response to shocks from other variables included in the model. The VDF and IRF in the context of the Vector Autoregressive (VAR) estimation are conducted to elaborate the dynamic relations between two variables. The VDF is an innovation in accounting method that divides the h-step ahead forecast error variations of innovations to a variable in

proportions caused by its own innovations or innovations in order variables. The VDF is conducted to determine whether a proportion of forecast variance of one variable is attributed to the effects of the other variable whereas the IRF is conducted to analyse the response of one variable to a sudden temporary change in another variable.

In order to evaluate the VDCs and IRFs, the study first estimates a VAR model in order to compute the VDCs and IRFs as expressed below;

$$Y_t = c + \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \ldots + \beta_q Y_{t-q} + \varepsilon_t \quad (3.17)$$

where Y represents the dependent variable, c is the vector, β_j are parameters, t represents the time trend, p represents the optimal lag length and ε represents the white noise.

In stimulating a standard VDFs and IRFs, the orthogonalized responses are normally used where the underlying shocks of the VAR model are orthogonalized using the Cholesky decomposition. However, Lutkepohl, (1991) and Laurens and Cordoso (1998) state that this approach is variant to the ordering of variables in the VAR model when the correlation between the variables is large. In line with this the study adopts an alternative method thus the generalized forecast error variance as proposed by Pesaran and Shin (1998) and Koop et al (1996). Pesaran and Shin (1998) points out that the generalized forecast error variance decompositions method shows the proportional contribution in one variable due to shocks (innovations) stemming in other variables. The major advantage of the generalized forecast error variance to the orthogonalized forecast error variance analysis is that, it is invariant to

the ordering of the variables in the VAR model because ordering of the variables are distinctively determined by the VAR system. Again, the generalized forecast error variance method simultaneously estimates shock effects amongst the variables. The study therefore uses the generalized approach in estimating the variance decomposition and impulse response functions.

CHAPTER FOUR

ANALYSIS OF DATA AND DISCUSSION OF EMPIRICAL RESULTS

4.1 Introduction

This chapter presents and discusses the results of the study. The results on the stationarity properties of the variables included in the model are first presented. This is followed by the cointegration results, after which results on the estimated coefficients for the long-run and the short-run are presented. Finally discussions on the dynamic simulations of the variables are presented.

4.2 Unit Root Test Results

In analyzing the determinants of Ghana‟s trade balance, the study first tests for the presence of unit root in the series before proceeding to cointegration analysis. In order to ensure that there is a strong evidence of unit root or otherwise in the individual series, the study employs the Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) tests.

The ADF test result (see Table 4.1) shows that, for the model with only constant and no trend, foreign income (LnY^*), exchange rate ($LnrE$) and agriculture growth rate (*AG*) are integrated of order zero, thus I(0) at 1% level of significance. At first difference and with regards to the same model (constant only with no trend), trade balance(*LnTB*) , household consumption expenditure(*LnHCEX*), government consumption expenditure (*LnGCEX*) and money supply (*LnMS*) are integrated of order one [I(1)] at 1% significance level.

While domestic price(*LnDP*) is integrated of order one [I(1)] at 5% significance level.

Table 4.1: Results of ADF unit root test

	Levels		First Difference	
Variables	**Constant**	**Constant & Trend**	**Constant**	**Constant & Trend**
LnTB	-3.024087	-2.877001	-7.674649***	-7.738803***
LnrE	-4.445366***	-4.639262***	-	-
LnHCEX	-2.486880	-2.879771	-5.843152***	-5.736566***
Ln Y*	-4.711020***	-4.766879***	-	-
LnGCEX	-2.778876	-3.203482	-5.353471***	-5.247336**
LnDP	-2.724304	-1.014972	-3.032974**	-3.406466**
LnMS	-1.727211	-2.395540	-6.329766***	-6.267760***
AG	-6.290299***	-6.233313***	-	-

Note: *** and ** denotes significance at 1% and 5% respectively
Source: Author"s own construction

Again, for the model with both constant and trend at the levels *LnrE* , *LnY** and *AG* are I(0) at 1% significance level. At first difference, *LnTB*, *LnMS* and *LnHCEX* are significant at 1% hence are integrated of order one, I(1), whilst *LnGCEX* and *LnDP* are integrated of order one, thus I(1) at 5% significance level.

The PP-test results are quite similar to the ADF test. In the model with only a constant and no trend, *LnrE* , *LnY** and *AG*are each integrated at levels and hence are I(0) at 1% level of

significance. *LnDP* is also I(0) at 5% error level. At first difference, *LnTB, LnHCEX* , *LnGCEX* and *LnMS* are each significant at 1% error level implying I(1). In addition, for the model with both constant and trend *LnrE* , *LnY** and *AG* are significant at the levels at 1% error level. At first difference, *LnTB, LnHCEX , LnMS , LnDP* and *LnGCEX* are each significant at 1% error level and are therefore integrated of order one, I(1).

Table 4.2: Results of PP unit root test

	Levels		First Difference	
Variables	**Constant**	**Constant & Trend**	**Constant**	**Constant & Trend**
LnTB	-2.933185	-2.771399	-7.863627***	-9.456890***
LnrE	-4.357832***	-6.748616***		
LnHCEX	-2.486880	-2.957504	-7.132233***	-7.041726***
Ln Y*	-4.777358***	-4.808771***		
LnGCEX	-2.855749	-3.270030	-9.400935***	-8.787884***
LnDP	-3.081985**	0.306396		.-5.324958***
LnMS	-1.721323	-2.382757	-6.349105***	-6.289396***
AG	-7.737917***	-9.00268***		

Note: *** and ** denotes significance at 1% and 5% respectively
Source: Author‟s own construction

The results obtained in both tests (ADF and PP tests) show mix results in terms of the order of integration of the variables. In other words the underlying series of the variables in the study are integrated of order zero I(0) and order one I(1) hence offering support for the use

of ARDL bounds test to cointegration. This implies that all the variables were found to be mean reverting.

4.3 Cointegration Test Results

In order to determine the possible presence of cointegration thus a long-run equilibrium among the variables included in equation 3.11, the study adopts the bounds testing approach within the ARDL framework to test for cointegration. The results are presented in

Table 4.3.

The ARDL model (1, 1, 2, 2, 2, 2, 2, 1) selection was based on the Schwartz Bayesian Criterion (SBC). The result in Table 4.3 shows that there exists a stable long-run relationship among the variables included in equation 3.11. The computed F-statistics of 11.94 is larger than the upper bound critical value of 4.50 at 5% level of significance. In this case the null hypothesis of no cointegration is rejected implying that there is a stable long-run equilibrium relationship among the variables (cointegration) in equation 3.11. This implies that there is a long-run relationship among the variables included in estimated model.

Table 4.3: Results of Cointegration relationship

	Critical Values	
Computed F-statistic	**95% Lower Bound**	**95% Upper Bound**
11.9417**	2.8717	4.5000

Note: ** means that the null hypothesis of no long-run equilibrium (no cointegration) is rejected at 5% level of significance **Source**: Author‟s own construction

4.4 Long-run Relationship

We have established in the previous section that a long-run (cointegration) relationship exists among the variables included in equation 3.11. Given this, we proceed to estimate the long-run and short-run coefficients in order to achieve the first two objectives of the study. The results are presented in Table 4.4.

The first objective was set to provide an empirical test of the Marshall-Lerner condition and the J-curve effect. Empirically, in other to ascertain the presence of the MarshallLerner condition, there are necessary and sufficient conditions that must be met. These include, i) the long-run coefficient of the exchange rate variable should be positive and statistically significant and ii) the value of the coefficient, which measures the elasticity, should be more than one (see for example Bahamani-Oskooee, 2001; Duasa, 2007; Petrovic and Gligoric, 2010; Tran and Dinh 2014). In the same vain, the empirical conditions needed to ascertain the existence of the J-curve effect are that i) the coefficient of the exchange rate variable should first be negative and statistically significant in the short-run and ii) the long-run coefficient, measuring the elasticity should be positive, greater than one and statistically significant (see for example Singh, 2004; Petrovic and Gligoric, 2010; Tutueanu, 2015). The Marshall-Lerner condition as earlier discussed is a long-run phenomenon hence can only be tested from the long-run results whereas to test the J-curve effect both the long-run and short-run results are required.

The results show that, in the long-run there is a positive relationship between exchange rate and the trade balance. This satisfies the a-prior expectation of the coefficient of the exchange rate variable. It shows that a one percent increase in the exchange rate (i.e. a depreciation) improves the trade balance in the long-run. Specifically, a unit increase in the exchange rate will improve trade balance by 0.10 units in the long-run. Though the result obtained shows a positive relationship between the exchange rate and the trade balance, the insignificance of the variable obtained in the long-run result suggests the absence of the Marshall-Lerner condition. In the same vain, since the long-run coefficient of the exchange rate variable though positive is insignificant, it can be concluded that there is absence of the J-curve pattern. In both cases neither conditions of the long-run are satisfied. This is not surprising because, Ghana‟s export sector is mainly dominated by agricultural products with a large percentage being raw materials and semi-processed products such as cocoa paste, canned tuna, cocoa butter and natural rubber sheets, while its imports are highly dominated by capital intensive goods as well as finished goods such as petroleum products, machines and equipments (ISSER, 2012). In addition, as Saruni, (2007) notes, for many developing countries like Ghana where exports are substandard on the international market, currency depreciation is not a possible solution for improving trade balance because unlike developed and industrialized countries that have inelastic demand for their export products, developing countries such as Ghana are faced with elastic demand on their export products. This may be attributed to the fact that export products are of low quality, and also because they are only agro-based products which have high perishability risk. Therefore currency depreciation might not necessarily cause an improvement in the country‟s trade balance if exports are elastic and imports are inelastic.

Table 4.4: Estimated Long-run coefficients

ARDL (1, 1, 2, 2, 2, 2, 2, 1) selected based on SBC		Dependent Variable: *LnTb*		
Regressor	**Coefficient**	**Standard Error**	**T-Ratio**	**Probability**
C	10.3967	1.9249	5.4013	0.001
LnrE	0.10136	0.10695	0.94773	0.371
LnHCEX	-2.4679	0.30031	-8.2177	0.000
LnGCEX	-0.76980	0.13340	-5.7705	0.000
LnMS	-0.019547	0.0073005	-2.6775	0.028
LnY^*	0.54205	0.17695	3.0634	0.016
AG	0.012080	0.029162	1.7449	0.119
LnDP	-0.067849	1.9249	-2.3266	0.048

Source: Author‟s own construction

Again another reason that might contribute to the positive and insignificant result obtained is that though the domestic currency (Ghana Cedi) has persistently depreciated against major trading currencies such as the Dollar, the Euro and the Pound over the years, there are still relatively high volumes of foreign goods on the domestic market. This may be attributed to various reasons including; i) most domestic producers use foreign goods as primary inputs in their production processes; and ii) most consumers have relatively high preference for foreign goods than domestic ones. For instance, in Ghana preference for foreign rice is relatively high than the preference for locally produced rice mainly because the domestic produce does not meet the Ghanaian consumers‟ standard. The situation is not different if several other commodities are considered. Hence, with the prevailing factors, depreciation in the domestic currency as against various major foreign currencies may not necessarily improve the trade balance. Danquah (2008) also confirms that Ghana‟s trade balance is not responsive to changes in exchange rate in the long-run hence contradicting the effects of currency depreciation. Saruni, (2007), Duasa (2007) and Sarbapiya (2012) confirm the

absence of the Marshall-Lerner condition in the case of Tanzania, Malaysia and India respectively. Similarly, Tran and Dinh (2014) also found the absence of the

Marshall-Lerner condition in some selected Asian countries. Rose and Yellen (1989), Singh (2004), Sulaiman and Abdul-Rahim (2014) and Tutueanu (2015) also confirm the absence of the J-curve effect in USA and India respectively.

The second objective was set to determine the impact of other macroeconomic variables including, household consumption expenditure, government consumption expenditure, money supply, foreign income, domestic prices and agricultural growth rate. To achieve this, the aforementioned variables were included in equation 3.11.

The coefficient of household consumption expenditure has a negative and statistically significant relationship with the trade balance in the long-run confirming the a-prior expectation. That is, in the long-run a one percent increase in household consumption expenditure causes deterioration in the country‟s trade balance. Specifically, a unit increase in individuals‟ consumption expenditure causes approximately 2.47 unit deterioration in Ghana‟s trade balance at 1% level of significance. The negative relationship between the country‟s trade balance and household consumption expenditure is not surprising because consumption of goods comprises of both domestic and foreign products, hence an increase in the consumption expenditure of local residents‟ increases the demand for both domestic and foreign goods. Again, the result is strongly supported by the fact that Ghanaians have a high taste and preference for foreign goods and as such most goods found on the Ghanaian

consumer shelf mainly constitutes foreign goods. Foreign products including cars, secondhand goods, petroleum product, electronic equipment and so forth dominate the domestic market. This is so because such goods are not produced locally and hence their high demand is offset by importations from foreign countries. In addition, though few of such goods are produced locally, their volumes and quality are unable to meet consumers‟ preferred demand, thereby causing a lot of substitution of the locally produced goods hence worsening the country‟s trade balance position. Saruni (2007) and Shawa and Shen (2013) each find similar results in Tanzania. Mohammad (2010) and Sarbapiya (2012) also find similar results in Pakistan and India respectively.

Regarding the long-run coefficient of government consumption expenditure, the result shows a negative and significant relationship between government consumption expenditure and the trade balance. This implies that a one percent increase in government consumption expenditure leads to deterioration in the trade balance by approximately 0.77 units at one percent significance level in the long-run. This is consistent with a-prior expectations. Government consumption expenditure constitutes two-folds; expenditure is either on domestic goods or foreign goods. Hence an increase in government consumption expenditure may either be diverted to domestic goods or foreign goods. Again, expenditures by the government can either be diverted into productive ventures such as investing in productive sectors in order to promote exports or non-productive areas such as the purchase of luxury cars, military goods, machines and equipment, mostly not produced domestically. Therefore, deterioration in trade balance may imply that, government spends more in non-productive sectors than diverting funds into productive ventures. This might be the case considering

the fact that a chunk of government consumption expenditure is diverted to the provision of inputs for public goods including road construction, health care, education and agriculture. Since these inputs for such public goods are not produced domestically, the country relies on foreign substitutes. Nienga (2010), Shawa and Shen (2013) and Kayhan et al (2013) confirm similar results in Kenya, Tanzania and Turkey respectively.

Money supply has a negative and significant relationship with the trade balance in the longrun. This result is consistent with the a-prior expectations. The result shows that an increase in money supply causes a decline in the trade balance. More, specifically in the long-run a unit increase in the money supply causes deterioration in the trade balance by approximately 0.02units. The result obtained is consistent with the prediction of the monetary approach to balance of payment discussed in section 2.2. Again, the negative and significant result obtained is not surprising since over the years money supply has continually expanded at a measured pace (Bank of Ghana, 2014). Though in some specific years (for instance in the year 1992) within the sample period, the government of Ghana embarked on tight monetary policies to check some key macroeconomic variables, it has also implemented various expansionary monetary policies within the period (for instance in the year 2000) which lead to a rise in the monetary base of the economy. Elhiraika et al. (2003) notes, that money supply in Ghana increased from 17.6% to 25.4% to 48.0% between the year 1998, 1999 and 2000. Data from the World Bank (2015) also shows that money supply has gradually increased in recent times. Specifically, in 2012, 2013, 2014 and 2015 money supply increased from 25.1% to 30.2% to 33.1% to 36.8% respectively. An increase in money supply by the monetary authority through influences of interest rate by the financial

sector, open market operations and occasionally changes in reserve requirements, relatively to demand for money, causes an increase in individuals‟ money balances. Individuals with excess money balance turn to increase consumption expenditures comprising of both domestic and foreign goods. Considering the fact that local market is dominated by foreign products which meets the standard, taste and preference of the local demand, foreign products are highly demanded relative to the domestic ones, hence deteriorating the trade balance of the country. Duasa (2007), Nienga (2010) and Walliullah (2010) confirm similar results in Malaysia, Kenya and Pakistan respectively.

In addition, the long-run coefficient of foreign income achieves the a-prior expected sign to trade balance. The result shows that there exist a positive and significant relationship between trade balance and foreign income. A one percent increase in foreign income leads to rise in Ghana‟s trade balance in the long-run. Specifically, a one percent increase in income of Ghana‟s major trading partners leads to a 0.54% improvement in trade balance at 5% level of significance. This implies that an increase in foreign income increases the quantity of exports goods demanded by the country‟s major trading partners. The result may be attributed to the fact that the government in recent times has adopted strategies to improve upon major export sectors such as the cocoa and mineral sector. In a report by "News-Ghana" presented by Tawaiah (2015) state that from 2005 to 2011 Ghana was

ranked the worlds‟ 2nd largest exporter of cocoa and in 2010 exports of cocoa products to one of its major trading partners precisely the United States of America increased tremendously from 32 million USD to 86 million USD, most likely because of the high quality of cocoa products produced in Ghana. Again, the introduction of non-traditional

exports such as handicraft, fruits and cereal to the Ghanaian export sector might also be a contributing factor to the positive significant relationship existing between the trade balance and the foreign income variable. UNTCAD (1999) also supports the assertion that, acceleration of the growth rate of industrialized countries improves upon the trade balance in most developing countries. Danquah (2008) also finds evidence of a positive significant relationship between foreign income and trade balance in the Ghanaian economy. Studies conducted by Mohammad (2010), Korap et al (2011), Sarbapiya (2012) and Shawa and Shen (2013) confirm similar results in Pakistan, Turkey, India and Tanzania respectively.

The coefficient of the agricultural growth rate indicated a positive relationship with the trade balance in the long-run. A unit increase in the growth rate of the agricultural sector causes an improvement in Ghana‟s trade balance by 0.012 units in the long-run. Though the sign of the coefficient confirms the a-prior expected sign, the result is not statistically significant. Logically, since Ghana is an agrarian economy with its export sector highly dominated by agricultural products, growth in the agricultural sector should result in a significant improvement in its trade balance. The insignificance results can be attributed to the fact that compared to other countries, the Ghana‟s agricultural sector is still at the verge of experiencing immense growth. In addition, the positive and insignificant results obtained might be because, unlike the advanced countries who indulge in agriculture, Ghana‟s agricultural sector lacks advanced technologies and in effect causes stagnation in it growth rate. Contrary to the results Thungsuwan and Thompson (2003), Konya and Singh (2009) and Varge (2015) found a positive and significant relationship between agricultural growth rate and trade balance in Thailand, Indian and Hungary respectively.

Finally, the long-run result indicates that the coefficient of domestic price is negative and significant at 5% error level. The results showed that a one percent increase in domestic prices causes 0.012 unit deterioration in the trade balance in the long-run. The results confirm the a-prior expectations of domestic prices. Again, over the years trends in the growth of Ghana‟s domestic prices (inflation) have been very volatile with most periods recording relatively high levels of growth in domestic prices. According to Doe (2012) the country has over the years wallowed in high levels of inflation as between 1986 and 2000, it recorded an end of the year inflation rate of 24.6% and 40.5%. In recent times, the situation is not different as inflation rate has been in the upward trend. Specifically in 2011,2012,2013,2014 and 2015 the country recorded a year-on-year inflation rate of 8.7%, 9.2%, 11.6%, 15.5% and 17.70% respectively (World Bank, 2015). In addition, this result is not surprising because due to high cost of production in the economy coupled with upward adjustments of petroleum products, the prices of most of the locally produced goods are relatively higher as compared to the prices of foreign imported goods. For instance due to the high cost of locally produced textiles many Ghanaian‟s prefer to buy foreign textiles which are relatively cheaper. Specifically, in recent times, GTP sells at approximately GH¢70.00 for half piece whilst imported Chinese textile sells at approximately GH¢20.00 for half piece (Ghana News Agency, 2016). All other things being equal, taking only prices into account, a rational consumer will purchase the imported Chinese textile. In the same vain, the prices of most Ghanaian products as compared to imported foreign goods are relatively high and this in effect causes a high demand for import goods, thereby increasing imports hence deteriorating the county‟s trade balance. Mohammad, (2010), Sarbapiya (2012), Shawa and Shen (2013), confirms similar results in Pakistan, India and Tanzania respectively.

4.5 Short-run Relationship

The previous section has analysed the long-run (cointegration) relationship among the variables included in equation 3.11. In this section, and in order to achieve the first two objectives, focuses on the short-run relationship among variables included in equation 3.11. To achieve this equation 3.16 (the error correction model) was estimated. The results are presented in Table 4.5.

From economic intuition, the error correction term (ECT_{-1}) in the ECM measures the speed at which an endogenous variable adjusts to shocks in an explanatory variable in order to converge to its long run equilibrium. As shown in Table 4.5, the estimated ECT_{-1} coefficient is negative and statistically significant at one percent error level. The negative and significant coefficient of the ECT_{-1} confirms the cointegration results discussed in section 4.3. The ECT_{-1} explains the extent to which exchange rate, household consumption expenditure, government consumption expenditure, foreign income, money supply, domestic prices and agricultural growth rate returns to the equilibrium long-run after a short-run shock. The result shows a high speed of adjustment of convergence to the long run equilibrium every year after a short run shock. In other words, equilibrium in the long run will adjust by approximately 82% every year after any shock observed in the short run.

The short run result shows a statistically significant negative coefficient of exchange rate to the trade balance. Specifically, a unit increase in exchange rate in the short run leads to 0.38 unit deterioration in Ghana‟s trade balance at 1 % significance level. The results imply that

an increase in the exchange rate leads to a deterioration of the trade balance in the short-run. The short-run result satisfies the first condition of the J-curve effect as earlier stated. Though the result shows an initial deterioration of the trade balance as the first condition needed to confirm the theory of the J-curve effect, the long-run result earlier discussed however, shows that the J-curve effect is not fully supported in the case of Ghana. Hence the absence of the J-curve effect can be concluded. Rose and Yellen (1989), Singh (2004) , Sulaiman and Abdul-Rahim (2014) and Tutueanu (2015) confirm the absence of the J-curve effect results in United States of America, India, Thailand and Romania respectively.

Table 4.5: Estimates of Short-run Error Correction Representation

ARDL (1, 1, 2, 2, 2, 2, 2, 1) selected based on SBC		**Dependent Variable:** *LnTb*		
Regressor	**Coefficient**	**Standard Error**	**T-Ratio**	**Probability**
C	8.5225	1.7437	4.8876	0.001
$\Delta LnrE$	-0.38358	0.11298	-3.3951	0.004
$\Delta LnHCEX$	-1.3052	0.21787	-5.9907	0.000
$\Delta LnHCEX_{-1}$	0.35609	0.18311	1.9447	0.071
$\Delta LnGCEX$	-0.54078	0.076757	-7.0453	0.000
$\Delta LnGCEX_{-1}$	-0.13831	0.10965	-1.2614	0.226
$\Delta LnMS$	-0.0071633	0.0027518	-2.6031	0.020
$\Delta LnMS_{-1}$	0.0058395	0.0038468	1.5180	0.150
ΔLnY^*	-0.041446	0.12641	0.32788	0.748
ΔLnY^*_{-1}	-0.19516	0.10461	-1.8656	0.082
ΔAG	-0.0012276	0.0024472	-0.50162	0.623
$\Delta LnAG_{-1}$	-0.0075552	0.0021525	-3.5100	0.003
$\Delta LnDP$	0.12058	0.13305	0.90627	0.379
ECM_{-1}	-0.81973	0.11311	-7.2470	0.000
R^2	0.97771			

$\bar{R}_2$	0.92198
F-Statistics	26.9922
DW-Statistic	2.2884

Source: Author"s own construction

The result shows that the short-run coefficient of household consumption expenditure is negative and statistical significance. This is consistent with the long run results discussed in the previous section. A unit increase in household consumption expenditure leads to a 1.31 unit deterioration in trade balance in the short run at 1% error level. However, the "lagged" coefficient of household consumption expenditure causes an improvement in the country"s trade balance in the short run. A one unit increase in the "lagged" household consumption expenditure variable ($\square LnHCEX_{\square 1}$) causes a 0.36 improvement in Ghana trade balance in the short run. This result is maybe due of the inherent human behaviour of not adjusting quickly to changes in consumption. $\square LnHCEX_{\square 1}$ is however insignificant. Saruni (2007),

Mohammad (2010) and Sarbapiya (2012) confirm similar results in Tanzania, Pakistan and India respectively.

Again, government consumption expenditure was found to have a negative and significant relationship with trade balance in the short-run. As government consumption expenditure increases it causes the trade balance to reduce by 0.54 units. This result is significant at 1% error level. In this case, the short-run result is consistent with that of the long-run. The result might be attributed to the fact that a chunk of government expenditure is been diverted to

non-productive sectors rather than productive sectors such as investment on the export sector. Though the coefficient of the "lagged" government consumption expenditure variable ($\Delta LnGCEX_{t-1}$) also has a negative effect with trade balance, it is not significant.

Onafowora and Owoye (2006), Nienga (2010) and Kayhan et al (2013) confirm similar results in Nigeria, Kenya and Turkey respectively.

The coefficient of money supply is negative and statistically significant to the trade balance in the short-run. Specifically, a unit increase in money supply causes Ghana"s trade balance to fall by 0.007 units in the short run at 5% significance level. This result is similar to the long run results and also satisfies the monetary approach to balance of payment. The result implies that an increase in money supply tends to increase the real money balances of individuals (consumers) and as such their consumption paths which can either be on domestic goods and foreign goods. With the relatively high preference for foreign goods, causes a decline in the trade balance position of the country. On the contrary, the "lagged" coefficient of money supply ($\Delta LnMS_{t-1}$)showed a positive but insignificant relationship with the trade balance. Duasa (2007), Nienga (2010) and Waliullah et al (2010) confirm similar results in Malaysia, Pakistan and Kenya respectively.

The short-run coefficient of foreign income showed a negative relationship with trade balance. Thus an increase in foreign income results in a fall in the trade balance. Clearly stated, a unit increase in foreign income causes a decline in the trade balance by 0.04 units

in the short-run. The coefficient of the "lagged" foreign income variable($\square LnY_{\square}^{*}{}_{1}$) also has a negative relationship with trade balance in the short run. Thus, a unit increase in $\square LnY_{\square}^{*}{}_{1}$

causes Ghana"s trade balance to decline by approximately 0.20units in the short-run. However in all cases the coefficients of foreign income are statistically equal to zero (i.e. insignificant). The short-run result obtained may be because there could be other factors affecting the export demand of Ghana" trading partners such as the quality of the export product rather than their income levels. This implies that in the short-run though increases in the incomes of Ghana"s trading partners will not necessarily cause and increase in their demand for export goods and hence trade balance. Waliullah et al (2010) and Mohammad (2010) each confirm similar results in Pakistan. Korap et al (2011) also confirms this result in Turkey.

In terms of the coefficient of agricultural growth rate, it is negatively related to trade balance in the short run. A unit increase in agricultural growth rate leads to 0.0012 unit deterioration in Ghana"s trade balance in the short run but however statistically insignificant. The "lagged" effect of agricultural growth rate causes a decline in Ghana"s trade balance in the short-run. Thus, a unit increase in the coefficient of the "lagged" agricultural growth variable causes 0.007 unit deterioration in the country"s trade balance in the short run at 1% significance level. This implies that a delay in the agricultural production, hence its growth rate will cause Ghana"s trade balance to deteriorate in the short run. In other words, a decline in output of the agricultural export sector will decrease the volumes of exports relative to

imports, and hence cause a decline in the country‟s trade balance. Vohra (2006) confirms similar results in some less-developed countries.

Finally, domestic prices had a positive effect on the trade balance. This implies that a unit increase in domestic prices leads to a 0.121 unit improvement in trade balance in the shortrun. This result will be due to the fact that citizens take time to adjust to changes in domestic price levels. However in the Ghanaian context this relationship is statistically insignificant as clearly shown in Table 4.5. Mohammad (2010) confirms similar results in Pakistan.

4.6 Diagnostic and Stability Test

In order to test the statistical adequacy of the model the study conducts diagnostic and stability tests. The results presented in Table 4.6 shows that there is no evidence of serial correlation or heteroskedasticity in the model. The LM version serial correlation test result gives a co-efficient of 1.6526 and a probability value of 0.199 hence the null hypothesis of non-existence of serial correlation is not rejected against the alternative hypothesis of existence of serial correlation. Again, the LM version heteroskedasticity test gives a coefficient value of 2.1727 and a probability value of 0.140, hence the non-rejection of the null hypothesis of no serial correlation. The probability values of the functional form and normality tests are 1.147 and 0.897 respectively, hence statistically insignificant. This therefore implies that the model does not exhibit any functional or normality problems.

Table 4.6 Results of Diagnostics and Stability test

TEST STATISTICS	RESULTS
SERIAL CORRELATION	1.6526 (0.199)
FUNCTIONAL FORM	2.0996 (1.147)
NORMALITY	0.21771 (0.897)
HETEROSKEDASTICITY	2.1727 (0.140)
CUSUM	STABLE
CUSUMQ	STABLE

Source: Author‟s own construction
Note: In parentheses are probability values

In addition, in order to determine if the estimated regression equations are stable throughout the sample period, plots of the CUSUM and CUSUMQ tests as proposed by Brown et al (1975) and suggested by Pesaran et al (2001) within the ARDL framework are performed. The CUSUM and CUSUMQ residuals line within the 5% critical value bounds (see section 5 of the Appendix) implying stability in the model. Hence it can be concluded that the regression equation is stable throughout the sample period considered.

4.7 Dynamic Simulations: Variance Decompositions and Impulse Response Results In order to achieve the third objective, we study the VDF and IRF. To do this we examine the forecast error variance in one variable explained by its own innovations (shocks) or innovations in other variables, and trace the directional response of one variable to a one standard-deviation in shocks in other variables. The study conducts the generalized VDF and generalized IRF within an unrestricted VAR model as proposed by Koop et al (1996) and Pesaran and Shin (1998). Discussions on the VDF are first presented after which

discussions on IRF are also presented.

From an estimated VAR model and in order to convey a sense of dynamics, Table 4.7 presents the VDF of the variables included in equation 3.11 in a ten year horizon. From a quick look at the results presented in Table 4.7, it is evident that within the ten year horizon, the forecast error variance of trade balance is as a result of its own shocks. In the first horizon, the result shows that, 76.24% of its forecast error variance is attributed to its own shocks. However, by period 2 through to period 7, innovations contributed 63.83%,

56.88%, 56.09%, 54.85%, 54.23% and 53.40% respectively to its forecast error variance. By eighth, ninth and tenth horizon the innovations from trade balance contributed 52.49%, 52.15% and 51.95% respectively to its forecast error variance. This implies that within the sample period, changes in Ghana‟s trade balance were highly as a result of shocks in exports and imports of goods and services.

In terms of innovations in the explanatory variables, innovations in household consumption expenditure contributed more to the forecast error variance of trade balance as compared to the other variables over the horizon. In the same vain innovations in exchange rate, foreign income, money supply, domestic prices, government consumption expenditure and agricultural growth rate contributed sequentially to the forecast error variance of trade balance over the specified time horizon.

Table 4.7 Variance Decomposition Results

Variance Decomposition of LnTb								
% of Forecast Variances Explained by Innovations in								
Horizon	**LnTb**	**LnrE**	**LnY** *	**LnHcex**	**LnGcex**	**LnDP**	**LnMs**	**Ag**
1	76.235	17.031	3.0291	36.388	5.5371	9.6684	12.733	6.6597
2	63.834	23.617	14.837	34.747	7.6467	7.8533	10.610	5.3424
3	56.884	21.108	13.665	31.093	7.2188	10.459	11.242	5.8061
4	56.094	20.799	13.371	30.598	7.0681	10.595	11.084	5.9823
5	54.845	22.049	14.423	29.803	6.7390	11.268	10.507	6.1640
6	54.269	22.645	14.884	30.492	6.8683	11.035	10.289	6.0185
7	53.402	23.780	15.976	31.154	6.8580	10.580	9.9309	5.8876
8	52.493	23.963	16.177	30.680	6.7279	10.826	9.7961	5.8215
9	52.151	23.826	16.113	30.638	6.7433	10.866	9.9108	5.7842
10	51.950	23.754	16.020	31.198	6.0926	10.737	10.305	5.6826

Source: Author‟s own construction

The results show that first period innovations in household consumption expenditure contributed 36.39% of the forecast error variance of trade balance. The explanatory power

of household consumption expenditure however decreased over increasing time horizons. Specifically, from the second through to the fifth horizon, the contributions of innovations in household consumption expenditure to the forecast error variance of trade balance gradually fell to 34.75%, to 31.09%, to 30.60% and to 29.80% respectively. Again, by the sixth and seventh horizon, innovations slightly increased to 30.43% and 31.15% respectively. Though there was a slight decline in innovations during the eighth and ninth periods, thus 30.68% and 30.64% respectively, in the tenth period the contributions of innovations in household consumption expenditure increased to 31.20%. This implies that in terms of the explanatory variables included in the study, household consumption expenditure was a major contributor to trends in Ghana‟s trade balance over the sample period.

Though in period 1, innovations in the exchange rate contributed only 17.03%, compared to the other variables, over the sample period it was the second highest contributor to the forecast error variance of trade balance. Its innovations contributed 23.61% to the forecast error variance of trade balance by the second horizon. However in period 3, period 4, period 5 and period 6, the contributions of innovations in exchange rate were 21.11%, 20.80%, 22.02% and 22.65% respectively. By the seventh horizon through to the tenth horizon, shocks in exchange rate contributed 23.78%, 23.96%. 23.83% and 23.75%

respectively to the forecast error variance of trade balance.

Again, though innovations in foreign income contributed only 3.03% in the first period, its contributions to the forecast error variance increased to 14.84% by the second horizon. By

the third and fourth horizons, contributions of its innovations to the forecast error variance of trade balance fell to 13.66% and 13.37% respectively. Its contributions gradually increased to14.42%, 14.88%, 15.98% and16.18% by the fifth through to the eight horizons.

In the ninth period, the contributions of innovations in foreign income to the forecast error variance of trade balance slightly declined to 16.11% by the ninth period and further declined to 16.02% by the tenth period.

Shocks in money supply contributed 12.73% to the forecast error variance of $LnTb$ in the first period and gradually declined to 10.61% by the second period. In the third and fourth horizons, innovations in money supply contributed 11.24% and 11.08% respectively. By the fifth through to the eight periods, the contributions of its innovations gradually fell to 10.51% to 10.29% to 9.93% to 9.77%. During the ninth and tenth periods, the contributions of innovations in money supply slightly increased to 9.91% to 10.31%.

In addition, innovations in domestic prices contributed 9.67% and 7.85% to the forecast error variance of trade balance in period 1 and period 2. Innovations further increased to 10.46%, to 10.60%, to 11.27%, by the third, fourth and fifth horizons respectively. However by the sixth horizon, innovations slightly declined to 11.03% and further declined to 10.58% by the seventh period. In the eighth and ninth periods, the contributions of innovations in domestic price to the forecast error variance gradually increased to 10.83% and 10.87% respectively. Contributions of innovations slightly fell to 10.74% by the tenth period.

Innovations from government consumption expenditure contributed very little to the forecast error variance of trade balance as compared to other variables included in the model. In the first period, its innovations contributed 5.54% to the forecast error variance of trade balance. There was a gradual increase by the second period, as the contribution of innovations to the forecast error variance of trade balance was 7.65%. However, there was a gradually decline in period 3,4 and 5 as innovations in government consumption expenditure contributed 7.22%, 7.07% and 6.74% to the forecast error variance of trade balance. During the sixth horizon the contributions of innovation slightly increased to 6.87% but declined to 6.85% to 6.72% by the seventh and eighth periods. Though during the ninth period, innovation in government consumption expenditure contributed 6.74% to the forecast error variance of trade balance, by the tenth period, the contribution of its innovation declined to 6.09%.

In the same vain, shocks in agricultural growth rate contributed little to the forecast error variance of trade balance. From the results, it is evident that its innovations contributed 6.66% in the first period and slightly decreased to 5.34% by the second period. In the third, fourth and fifth periods, its innovations contributed 5.80%, 5.98% and 6.16% respectively. However in the sixth through to the tenth period, the contributions of innovations gradually decreased to 6.02% to 5.89% to 5.82% to 5.78% to5.68%. Similar to government consumption expenditure, innovations from agricultural growth rate had little effect on changes in Ghana‟s trade balance over the sample period.

From the above explanations, it is clear that the VDF substantiate the significant role played by household consumption expenditure, exchange rate, foreign income, money supply, domestic prices, government consumption expenditure and agricultural growth rate in accounting for fluctuations in forecast error variance of Ghana‟s trade balance over the time horizon within the sample period considered. In terms of explanatory power, innovations in government consumption expenditure and agricultural growth rate explained very little of the forecast error variance of trade balance as compared to other variables. The implication is that government consumption expenditure and agricultural growth rate contributed very little to trends in Ghana‟s trade balance over the sample period. Nevertheless the portion of trade balance variations accounted for by most of the explanatory variables increased continuously over the time horizon of which the percentage of forecast error variance in trade balance is highly accounted for by innovations in household consumption expenditure as it maintains the highest percentage than the other variables. This also implies that changes in the country‟s trade balance are highly attributed to shocks from household consumption expenditure.

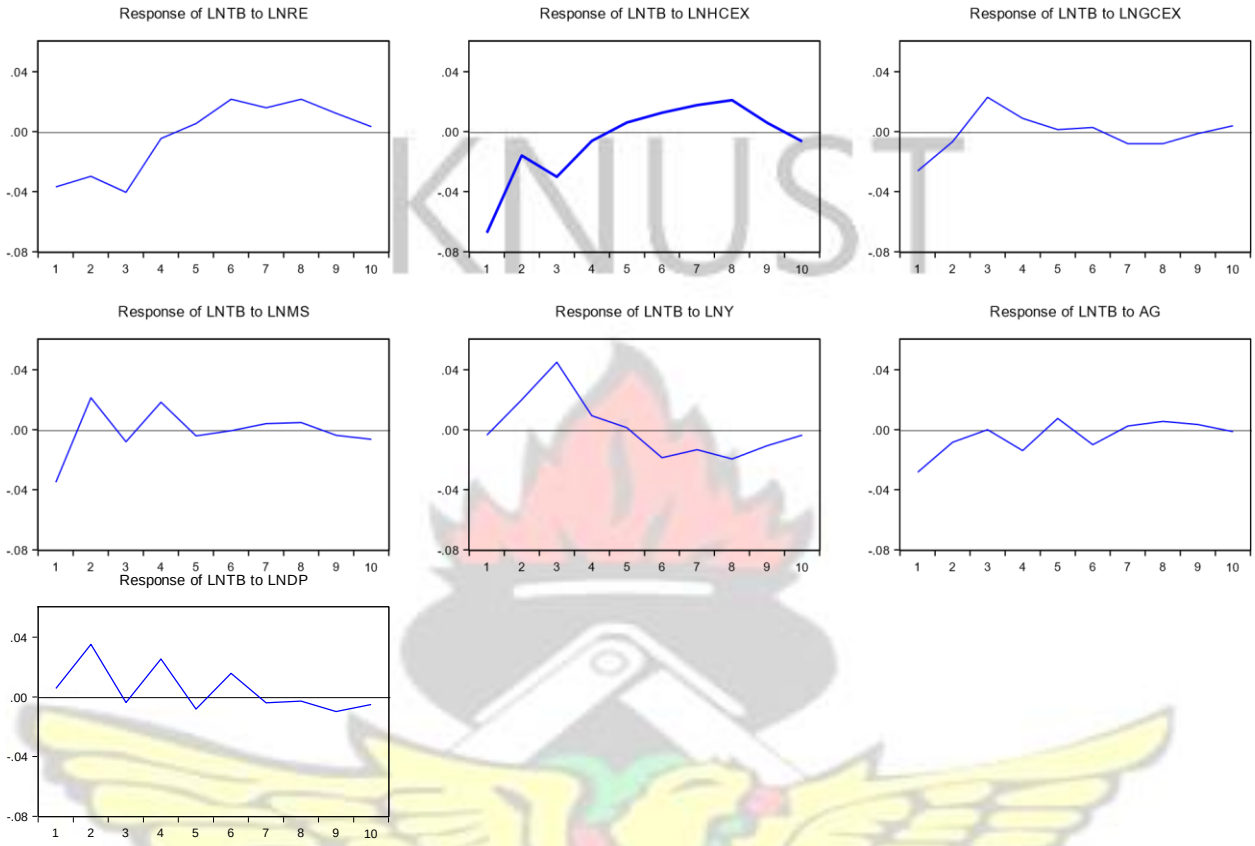
Furthermore the results of the IRF are presented. Figure 4.2 show plots of the generalized IRF of trade balance with respect to innovations in exchange rate, household consumption expenditure, government consumption expenditure, money supply, foreign income, agricultural growth rate and domestic prices as proposed by Pesaran and Shin (1998) and Koop et al (1996) within a ten year horizon. This approach reveals insight into the dynamic relationships between the variables as it portrays the response of a variable to an unexpected shock in another variable over a specified time horizon. The horizontal axis in each graph

shows the number of quarters after the impulse has been initialized while the vertical axis shows the responses of the appropriate variable.

As evident in the first plane of Figure 4.1, innovations from exchange rate caused a rise in trade balance from period 1 to period 2 but in period 3 there was a drop in the response of trade balance to shocks in exchange rate. However by period 4 to 6, exchange rate innovations caused a gradual rise in the trade balance. By period 7, trade balance slightly declined in response to shocks in exchange rate but slightly rose again by period 8. In the latter periods, thus period 9 and period ten trade balance gradually declined in response to innovations in exchange rate. This might explain why in the long-run the impact of exchange rate, though positive was insignificant and a clear indication why the J-curve

effect is not fully satisfied statistically.

Figure 4.1 Impulse Response Results



Source: Author"s own construction

In the second plane of Figure 4.1 innovations in household consumption expenditure caused a rise in trade balance position from period 1 to period 2. Though by period 3, its innovations caused a slight decline in the trade balance, by period 4 to period 8 trade balance gradually improved but at a slower pace. In period 9 and 10 innovations from household consumption expenditure caused a decline in the trade balance.

The response of trade balance to shocks in government consumption expenditure is shown in the third plane of Figure 4.1. From period 1 to period 3, innovations in government consumption expenditure caused a rise in the trade balance position. From period 4 to period 5 the trade balance slightly declined, further rose slightly by period 6 and slightly declined

again by period 7. By period 8 to period 10, innovations in government consumption expenditure caused a rise in the trade balance position.

The fourth plane in Figure 4.1 shows the response of trade balance to innovations in money supply. From period 1 to period 2, innovations caused an improvement in the trade balance position but from period 2 to period 3 there was a fall in trade balance. By period 4, innovations caused a rise in trade balance and further caused a fall by period 5. Trade balance however, slightly improved from period 6 to period 8. In the latter periods, thus period 9 and 10, innovations further caused a decline in the trade balance position. From period 6 to period 10 responses of trade balance resulting from innovations in money supply was very little compared to responses occurring in period 1 to period 5.

Innovations in foreign income caused a rise in the trade balance position during period 1 and period 3 (see plane 5 in Figure 4.1). Its innovations further caused a fall in the trade balance from period 4 to period 6. There was a slight rise in trade balance in period 7 and slightly fell in period 8. From period 9 to period 10 there was a slight improvement in the trade balance position.

The sixth plane in Figure 4.1 shows the response of trade balance to innovations in agricultural growth rate. From period 1 to period 3, its innovations caused a rise in the trade balance position but by period 4, trade balance slightly declined and further rose by period 5. Though by period 6 there was a fall in trade balance due to innovations in agricultural growth rate, from period 7 to period 9 there was a slight improvement in the trade balance.

In the tenth period, the response of trade balance to shocks in agricultural growth rate was almost zero. It is evident in the sixth plane of Figure 4.1 that, from period 7 to period 10 the responses of the trade balance to innovations in agricultural growth rate was lesser that the responses occurring from period 1 to period 6.

Finally, the response of trade balance to innovations in domestic prices is shown in seventh plane of Figure 4.1. From period 1 to period 2, innovations in domestic prices caused a rise in the trade balance, from period 2 to period 3 there was a fall in the trade balance position, from period 3 to period 4 the trade balance position rose again, further fell between period 4 and period 5. Responses in the trade balance rose between period 5 and period 6 and further declined from period 6 to period 7. There was a slight improvement in the trade balance in response to shocks in domestic prices by period 8. By period 9 and period 10, trade balance fell and slightly rose again.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of the major findings. It further provides recommendations based on the findings and finally gives a conclusion on the entire research.

5.2 Summary

This study analysed the determinants of trade balance in post-liberalisation Ghana. The ARDL bound test to cointegration was used for the estimation. Further, the VDF and IRF were used to test for the response of trade balance to innovations in exchange rate, household consumption expenditure, government consumption expenditure, money supply, foreign income, agricultural growth rate and domestic prices. Major findings of the study are presented below.

The long-and short run results obtained from the study showed the absence of both the Marshall-Lerner condition and the J-curve effect in Ghana. Specifically, in the long-run exchange rate had a positive but insignificant relationship with trade balance, whilst in the short run its impact was negative and significant.

The results further indicated that, increasing levels of household consumption expenditure leads to a fall in Ghana‟s trade balance both in the long and the short-run. In other words, the study showed that as individuals consume more their consumption expenditures on both

domestic and imported (foreign) goods increases and since most goods on the Ghanaian consumer shelves are imported, it causes deterioration in the country‟s trade balance.

Again, the results show that an increase in government consumption expenditure leads to deterioration in the country‟s trade balance in the long-and short run. Specifically, as government consumption expenditure increases, it causes an increase in total government expenditure relative to domestic output causing a fall in the trade balance of the country.

The results obtained showed that increasing trends in money supply causes a fall in the country‟s trade balance in the long-run. In other words, as the monetary base of the economy increases relative to money demand, it causes an increase in individuals‟ money balance, causes an increase in imports and hence deteriorates the country‟s trade balance. This is in line with the monetary approach to balance of payments. However, in the shortrun the "lagged" effect of money supply on trade balance was found to be positive though

insignificant.

In addition, the long-run results showed that an increase in income levels of Ghana‟s trading partners‟ leads to an improvement in the country‟s trade balance position. In recent times there have been substantial improvements in the quality and type of export goods on the international market, hence as foreign income increases it leads to high demand of the country‟s export goods. On the contrary, the short-run results showed a negative but insignificant relationship between foreign income and trade balance.

Furthermore, the results obtained showed that an increase in the growth rate of the agricultural sector will lead to an improvement in a country‟s trade balance but however insignificant in the Ghanaian context. Due to the fact that Ghana is an agrarian economy with its export sector dominated by agricultural products, it makes sense for the growth in the agricultural sector to cause an improvement in the country‟s trade balance position. Though the long-run coefficient was positive it was statistically equal to zero (insignificant). On the contrary in the short-run agriculture growth rate was found to have a negative but insignificant effect on the trade balance. The "lagged" effect of the agricultural growth rate variable was found to have a negative and significant effect on the trade balance.

The coefficient of domestic prices in the long-run was found to be negative with the trade balance. Due to high production costs coupled with upward adjustment in petroleum products domestic prices of goods are relatively high compared to prices of imported goods thereby causing high demand of foreign goods relative to domestic goods. On the contrary, the short-run results showed that domestic prices had a positive effect on the country‟s trade balance. The short-run result was however insignificant.

Finally from the estimated VAR model, the result of the VDF showed that the forecast error variance of trade balance is highly attributed by its own shocks. In terms of explanatory power, innovations in household consumption expenditure highly contributed to the forecast error variance of trade balance as compared to the other independent variables. However innovations from government consumption expenditure and agricultural growth rate

contributed very little to the forecast error variance of the trade balance. In addition, the IRF confirms the absence of the J-curve effect in the Ghanaian context as earlier indicated in the long and short-run results. The IRF further showed that innovations in agricultural growth rate had very little effect on trade balance.

5.3 Conclusion

The research set out to analyse the determinants of trade balance in post-liberalisation Ghana. In order to achieve this, the study tests for the presence or absence of the MarshallLerner condition and the J-curve effect. It further examines the impact of other macroeconomic variables on the country‟s trade balance. Finally the study analyses the dynamic simulations of the variables included in the estimations. In other words, it investigates how innovations in the explanatory variables and own shocks contribute to the forecast error variance of the trade balance and also traces the directional response of the trade balance to a one standard-deviation in own shocks or shocks in explanatory variables. The study employed the ARDL bounds test to cointegration as its estimation strategy. It also employs the VDF and IRF to analyse the dynamic simulations of the variables.

The study finds evidence of both long-run relationship and short-run dynamics among the variables understudy, thus trade balance, exchange rate, household consumption expenditure, government consumption expenditure, money supply, foreign income, agricultural growth rate and domestic prices. It found the absence of the Marshall-Lerner condition and J-curve effect in Ghana. Again, the VDF showed that household consumption expenditure contributed highly to the forecast error variance of trade balance.

The absence of the J-curve effect was further confirmed by the IRF.

5.4 Recommendations

The previous section has presented the summary of major findings of the study. Based on the findings the following recommendations are made for policy purposes;

Ghana in the post-liberalisation era is still faced with negative trade imbalances. Given this, urgent measures need to be considered in order to help improve upon it to hasten growth and development in the economy. From the results obtained it can be noted that, depreciation in the Ghana cedi is not an appropriate step to help improve upon the country‟s trade balance position. In strong economies like the industrialized countries, market forces can operate on their own to produce self-correcting forces in case of any currency depreciation hence control the trade balance. Unlike these industrialized countries, for developing countries like Ghana, self-correcting measures cannot work in terms of controlling the trade balance. Therefore, in relation to this, the most appropriate step to control the country‟s trade balance is to combine liberalisation with proper exchange rate management measures. Other measures of currency stabilization could be adopted to improve the trade balance as a stable exchange rate would enable producers of tradable goods make long-term investment plans.

Policies to divert household consumption expenditures to domestic goods can also be adopted through the promotion of various made-in Ghana goods. In the same vain, import substitution policies for major import goods such as cars, petroleum products and electronic equipments can also be adopted. For instance, recently a well-renowned Ghanaian, Apostle

Kwadwo Safo Kantanka popularly known as “African-Star” has manufactured cars which have been approved, if the government of Ghana grants the “African-Star” production team contracts to provide cars to government institution including, senior-high schools (SHS), tertiary institutions, hospitals among many others instead of the old-system of purchasing imported cars, it can help reduce the high dependence on importation and hence improve the country‟s trade balance position. The government can also enter into a “hire-purchase” agreement for its workers with the production team, as this will help reduce individuals‟ expenditure paths on foreign cars. Again contracts to provide cars to all government officials can be granted to the “African-

Star” production team to help reduce high dependence on foreign cars. This may help reduce government and household expenditure paths and as such reduce imports relatively.

In effect, these will not only aid improve upon the country‟s trade balance position but will also touch on some key macro-economic variables such as unemployment and in effect aid in growth and development of the country. In addition, policies to improve upon the standards of domestic products should be implemented in order to meet the standard, taste and preference of the Ghanaian consumer, and those abroad.

Again, chunk of government consumption expenditure should mainly be diverted into productive and investment ventures such as the export sector to aid increase volumes of exports rather than spending in non-productive sectors that don‟t generate any income. Government policies aimed at establishing companies (either solely owned or publicprivate

partnerships) purposely for the production of export-oriented goods in other to meet export demand can be enforced.

Policies aimed at stabilizing money supply in the economy should be adopted. Monetary policy authorities can adopt contractionary monetary policies rather than expansionary ones as this will help control the real money balances of individuals and hence their expenditure patterns to further help improve the country‟s trade balance position.

Considering the fact that the export sector is mainly dominated by agricultural products, policies to improve upon the growth rate in the agricultural sector can be enforced. Policy makers can invest in newly improved agro-technologies and agro-machines to aid farmers increase production, hence output volumes. Again, various technologies on how to process major agricultural products into finished goods before exports can be considered as this will help diversify the country‟s export goods.

Finally, government can also embark on policies that would create an enabling environment for businesses in the country to produce at a relatively lower cost.

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APPENDICES

A. Summary Statistics

Variable	Observations	Mean	Std. Deviations	Minimum	Maximum
LnTb	31	-0.369393	0.108693	-0.586638	-0.194527
LnrE	31	4.865081	0.448848	4.241411	6.331030
*LnY**	31	3.123215	0.321 177	2.469227	3.529539
LnHcex	31	4.385671	0.085715	4.072380	4.484023
LnGcex	31	2.452886	0.213295	1.982292	3.039173

LnMs	31	5.379953	3.981726	1.286511	9.664084
LnDp	31	2.556171	1.834548	-0.696664	5.030357
Ag	31	0.0006453	4.814472	-8.444860	5.824123

B. Estimation Output

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Autoregressive Distributed Lag Estimates
ARDL(1,1,2,2,2,2,1) selected based on Schwarz Bayesian Criterion

Dependent variable is LNTB
29 observations used for estimation from 1986 to 2014

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
LNTB(-1)	.18027	.11311	1.5937[.150]
LNRE	-.38358	.11298	-3.3951[.009]
LNRE(-1)	.46667	.075988	6.1413[.000]
LNHCEX	-1.3052	.21787	-5.9907[.000]
LNHCEX(-1)	-.36168	.28681	-1.2611[.243]
LNHCEX(-2)	-.35609	.18311	-1.9447[.088]
LNGCEX	-.54078	.076757	-7.0453[.000]
LNGCEX(-1)	-.22856	.12295	-1.8589[.100]
LNGCEX(-2)	.13831	.10965	1.2614[.243]
LNMS	-.0071633	.0027518	-2.6031[.031]
LNMS(-1)	-.0030208	.0026932	-1.1216[.295]
LNMS(-2)	-.0058395	.0038468	-1.5180[.167]
LNY	-.041446	.12641	-.32788[.751]
LNY(-1)	.29063	.13384	2.1714[.062]
LNY(-2)	.19516	.10461	1.8656[.099]
AG	-.0012276	.0024472	-.50162[.629]
AG(-1)	.0035743	.0023078	1.5488[.160]
AG(-2)	.0075552	.0021525	3.5100[.008]
LNDP	.12058	.13305	.90627[.391]
LNDP(-1)	-.17620	.12658	-1.3920[.201]
CON	8.5225	1.7437	4.8876[.001]

R-Squared	.97599	R-Bar-Squared	.91597
S.E. of Regression	.031521	F-Stat. F(20,8)	16.2616[.000]
Mean of Dependent Variable	-.37641	S.D. of Dependent Variable	.10874
Residual Sum of Squares	.0079485	Equation Log-likelihood	77.7807
Akaike Info. Criterion	56.7807	Schwarz Bayesian Criterion	42.4241
DW-statistic	2.2884	Durbin's h-statistic	-.97930[.327]

Testing for existence of a level relationship among the variables in the ARDL model

F-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
11.9417	2.8717	4.5000	2.3757	3.7788

W-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
95.5333	22.9734	36.0002	19.0053	30.2308

If the statistic lies between the bounds, the test is inconclusive. If it is above the upper bound, the null hypothesis of no level effect is rejected. If it is below the lower bound, the null hypothesis of no level effect can't be rejected. The critical value bounds are computed by stochastic simulations using 20000 replications.

Diagnostic Tests

```
*****************************************************************************
*                    Test Statistics  *        LM Version       *          F Version
                                       *
*****************************************************************************
*                                      *                                    *
*                    A:Serial Correlation*CHSQ(1)  =   1.6526[.199]*F(1,7)       =
                     .42300[.536]*
*                                      *                                    *
*                    B:Functional Form   *CHSQ(1)  =   2.0996[.147]*F(1,7)       =
                     .54637[.484]*
*                                      *                                    *
*                    C:Normality         *CHSQ(2)  =   .21771[.897]*       Not applicable
                                       *
*                                      *                                    *
*                    D:Heteroscedasticity*CHSQ(1)  =   2.1727[.140]*F(1,27)      =
                     2.1867[.151]*
*****************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

c. Estimated Long-run Results

```
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            Estimated Long Run Coefficients using the ARDL Approach
       ARDL(1,1,2,2,2,2,2,1) selected based on Schwarz Bayesian Criterion
*****************************************************************************
*
 Dependent variable is LNTB
 29 observations used for estimation from 1986 to 2014
*****************************************************************************
*
 Regressor             Coefficient       Standard Error       T-Ratio[Prob]
 LNRE                      .10136             .10695          .94773[.371]
 LNHCEX                   -2.4679             .30031         -8.2177[.000]
 LNGCEX                    -.76980            .13340         -5.7705[.000]
 LNMS                     -.019547           .0073005         -2.6775[.028]
 LNY                       .54205             .17695          3.0634[.016]
 AG                       .012080           .0069227          1.7449[.119]
 LNDP                     -.067849            .029162         -2.3266[.048]
 CON                       10.3967             1.9249          5.4013[.001]
*****************************************************************************
*


Testing for existence of a level relationship among the variables in the ARDL model
*****************************************************************************
*
 F-statistic  95% Lower Bound  95% Upper Bound  90% Lower Bound  90% Upper Bound
   11.9417         2.8717          4.5000          2.3757          3.7788
 W-statistic  95% Lower Bound  95% Upper Bound  90% Lower Bound  90% Upper
Bound
   95.5333         22.9734         36.0002         19.0053         30.2308
*****************************************************************************
*
 If the statistic lies between the bounds, the test is inconclusive. If it is
above the upper bound, the null hypothesis of no level effect is rejected. If  it
is below the lower bound, the null hypothesis of no level effect can't be
rejected. The critical value bounds are computed by stochastic simulations  using
20000 replications.
```

D. Estimated Short-run Results

```
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        Error Correction Representation for the Selected ARDL Model
     ARDL(1,1,2,2,2,2,1) selected based on Schwarz Bayesian Criterion
*******************************************************************************
 Dependent variable is dLNTB
 29 observations used for estimation from 1986 to 2014
*******************************************************************************
 Regressor             Coefficient       Standard Error        T-Ratio[Prob]
dLNRE                    -.38358             .11298            -3.3951[.004]
dLNHCEX                  -1.3052             .21787            -5.9907[.000]
dLNHCEX1                  .35609             .18311             1.9447[.071]
dLNGCEX                  -.54078            .076757            -7.0453[.000]
dLNGCEX1                 -.13831             .10965            -1.2614[.226]
dLNMS                   -.0071633          .0027518            -2.6031[.020]
dLNMS1                   .0058395          .0038468             1.5180[.150]
dLNY                     -.041446             .12641            -.32788[.748]
dLNY1                    -.19516             .10461            -1.8656[.082]
dAG                     -.0012276          .0024472            -.50162[.623]
dAG1                    -.0075552          .0021525            -3.5100[.003]
dLNDP                     .12058             .13305             .90627[.379]
dC                        8.5225             1.7437            4.8876[.001]
ecm(-1)                  -.81973             .11311           -7.2470[.000]
*******************************************************************************
 R-Squared                      .97771   R-Bar-Squared                  .92198
S.E. of Regression             .031521  F-Stat.    F(13,15)    26.9922[.000]
 Mean of Dependent Variable   .7502E-3   S.D. of Dependent Variable     .11285
 Residual Sum of Squares      .0079485   Equation Log-likelihood       77.7807
 Akaike Info. Criterion        56.7807   Schwarz Bayesian Criterion    42.4241
 DW-statistic                   2.2884
*******************************************************************************
R-Squared and R-Bar-Squared measures refer to the dependent variable  dLNTB and
in cases where the error correction model is highly  restricted, these measures
could become negative.


Testing for existence of a level relationship among the variables in the ARDL model
*******************************************************************************
 F-statistic  95% Lower Bound  95% Upper Bound  90% Lower Bound  90% Upper Bound    11.9417
2.8717          4.5000          2.3757          3.7788


 W-statistic  95% Lower Bound  95% Upper Bound  90% Lower Bound  90% Upper Bound
   95.5333         22.9734         36.0002         19.0053         30.2308
*******************************************************************************
If the statistic lies between the bounds, the test is inconclusive. If it is
above the upper bound, the null hypothesis of no level effect is rejected. If  it
is below the lower bound, the null hypothesis of no level effect can't be
rejected. The critical value bounds are computed by stochastic simulations  using
20000 replications.
```
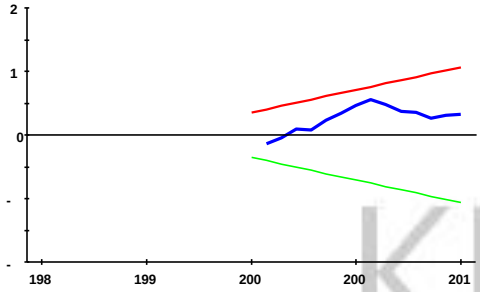
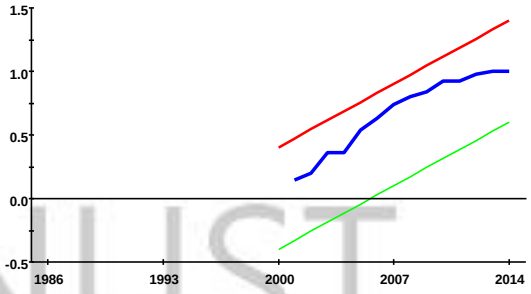

E. Plots of CUSUM and CUSUMQ

Plot of Cumulative Sum of Recursive Residuals

Plot of Cumulative Sum of Squares of Recursive Residuals



The straight lines represent critical bounds at 5% significance level



The straight lines represent critical bounds at 5% significance level

F. Variance Decomposition Functions

Generalised Forecast Error Variance Decomposition for variable LNTB
Unrestricted Vector Autoregressive Model

Based on 29 observations from 1986 to 2014. Order of VAR = 2
List of variables included in the unrestricted VAR:
LNTB LNRE LNY LNHCEX LNGCEX
LNDP LNMS AG
List of deterministic and/or exogenous variables:
C

Horizon	LNTB	LNRE	LNY	LNHCEX	LNGCEX	LNDP
0	1.0000	.14243	.0014054	.47639	.071869	.0032418
1	.76235	.17031	.031291	.36388	.055371	.096684
2	.63834	.23617	.14837	.34747	.076467	.078533
3	.56884	.21108	.13665	.31093	.072188	.10459
4	.56094	.20799	.13371	.30598	.070681	.10595
5	.54845	.22049	.14423	.29803	.067390	.11268
6	.54269	.22645	.14884	.30492	.068683	.11035
7	.53402	.23780	.15976	.31154	.068580	.10580
8	.52493	.23963	.16177	.30680	.067279	.10826
9	.52151	.23826	.16113	.30638	.067433	.10866
10	.51950	.23754	.16020	.31198	.069026	.10737

Horizon	LNMS	AG
0	.12863	.084630
1	.12733	.066597
2	.10610	.053424
3	.11242	.058061
4	.11084	.059823
5	.10507	.061640
6	.10289	.060185
7	.099309	.058876
8	.097961	.058215
9	.099108	.057842
10	.10305	.056826