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Optimum Currency Areas in the Sub Sahara Region

Examining eligibility of the East African Community for a Monetary Union

Being a Thesis submitted for the Degree of Doctor of Philosophy in the University of Hull

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DEDICATION

To my Mom "Lwiza Ngole Joseph" (1957 – 2010),

May the road rise up to meet you

May the wind always be at your back

May the sun shine warm upon your face,

and rains fall softly upon your fields.

And until we meet again,

May the lord hold you in the palms of his hands.

To my dad, my hero, Dr Charles William Nyamrunda, for all the support and love throughout my studies, I thank you for making my dream come reality. Also to my family members my belle-mère Aunt Regina, my brothers Joseph, Celestine, Humphrey, Frank and my three beautiful sisters Lucy, Getrude and Belinda. Thank you all for the love, encouragement and prayers that kept me motivated to work on this thesis.

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Table 1 Abbreviations

EAC	East African Community
COMESA	Common Market for Eastern and Southern Africa
LDCs	Least Developing Countries
OCA	Optimal Currency Area
SADEC	Southern Africa Development Community
ECOWAS	Economic Community of West African States
ECCAS	Economic Community of Central African States
OER	Official exchange rate
NODA	Net Official Development Assistance
NOF	Net Official Flow
OAR	Official Aid received
LCU	Local Currency Unit
SACU	South African Customs Union
TSH	Tanzanian Shilling
USH	Ugandan Shilling
KSH	Kenyan Shilling
REC	Regional Economic Communities
SAP	Structural Adjustment Policies

ABSTRACT

This study assesses the impact of fiscal policy and structural harmonisation (common market) of the East African Community (EAC) on the flow of goods and services, market responses, the flow of FDIs in the region and the volatility levels of the exchange rates across the region. The gravity model based on panel equations and other necessary time series procedures are widely used by this study due to their power to produce robust empirical findings. To estimate the gravity equation, we apply FE, RE, POLS and GMM so as to gather more information and empirical results for policy analysis. In addition, we apply all necessary suggested procedures for panel equations so as to compare and contrast which methods are producing more consistent and efficient parameters that can be used to define our findings. In chapter three, we introduce restrictions in the VAR system to estimate the structural responses of the block's economies to external shocks. Under that process, the restrictions helps to isolate short run structural responses from long run responses. Under this procedure, all time series requirements are considered.

The fourth chapter measures the volatility levels of the exchange rates and their respective speed of adjustment by using the GARCH procedures. Through this process, the researcher is able to conclude by comparing the volatilities of the exchange rates throughout the region. In general we find that the EAC is an optimal currency area backed up by a significant and growing trade flow within the block. Also we find that unique country's variables have some influences on the flow of capital and labour in the economies. In addition, the flow of FDI is growing in response to the adjusted trade policies throughout the region and hence favouring growth in the cross section. On external shocks, we find that EAC countries respond symmetrically to external shocks implying that it is safe to introduce a standard unit of measurement throughout the region.

CHAPTER ONE

INTRODUCTION

1.0: Trade unions in sub Sahara region

High competition in the world market has forced many countries to form regional integration with the aim of increasing their share in the world market. Economist believes economies form a block to gain from "comparative advantages" through an expanded domestic market, efficient production and allocation of resources. On the other hand, political scientists mention that regional integration promotes democracy, human rights, peace and security. Economic integration in Africa goes way back to when the South African Customs Union (SACU) in 1910 and the East African Community (EAC) in 1919 were established during the era of colonial international trade. The aim of these trade agreements was to easy business and exchange throughout the continent and to interact with the rest of the world. Since then, there have been a number of Regional Economic Communities in Africa especially in the 1980s and 1990s, whereby a number of regional communities have been formed, including SADC, COMESA, EAC, ECOWAS, AMU/MUA, SACU, CEN-SAD, WAMZ and ECCAS. All of these regions are under the African Union (AU) treaty called the "African Economic Community Treaty" signed in 1991 by the members of AU as the stage towards an African common market/currency union. Due to geographical, historical and political reasons, at least each African country is a member of two or more regional agreements. For instance, Tanzania is a founding member of EAC and SADC, Kenya is a member of EAC, COMESA, and Rwanda is a member of EAC, ECCAS, COMESA and is an applicant member of SADEC. (Gedaa, 2007).

Therefore, the formation of strong regional integrations has been a driving force towards African union and EAC is been mentioned by commentators such as UN organs as one of the most promising and serious regions in sub Sahara region as it has completed the early stages of integration within a decade as compared to other giant and old blocks. For instance in 2006, the EAC heads of states agreed to fast-track the formation of the East African Federation by the year 2016 and there has been some developments on the fast track agenda due to the signing of the "East African Common

Market Protocol" on the 20th of November 2009, while expecting a fixed exchange rate (currency union) within 2014 – 2015 government year. It is crucial to note that, the "theory of economic integration" warns regional integration can either create or divert trade depending on the economic arrangements of the block members (Carrere, 2004). As reported by many studies, developing countries especially in the SSA produce similar or identical commodities (primary agricultural products) which make their intra-trade difficult and hence making trade creation difficult in the continent. One of the main aims of this study is to apply multiple econometric techniques so as to investigate the short run and long run behaviours of different macro economic variables throughout the region

The East African Community (EAC) has been a regional integration for more than a decade, combining five developing countries in Eastern Africa (Rwanda, Kenya, Uganda, Tanzania and Burundi). According to (Blacksell, 1994; Coleman, 2002; Hitiris, 1991; McDonald, 1994, 1999) a powerful and successful regional group must follow the key phases of integration (also known as types of preferential trading arrangements) before adapting full regional integration. The EAC region since it was launched in 2000 has followed all the major steps necessary for a full economic union. Those steps are briefly explained below.

(i) Free Trade Area (FTA*)*: this is regarded as the first stage of economic integration and defined as an agreement between countries to remove all barriers to trade in goods. Trade within these agreed countries becomes free (less/reduced restrictions). If not carefully managed, this stage is associated with high degree of trade diversion especially when market information is not perfectly distributed throughout the extended market. Under this type of agreement, given imperfect information, traders may import goods into the country with lower tariffs on external imports and exporters will buy goods from the cheaper country within the block hence creating trade diversion and disequilibrium between the member states.

(ii) A Custom Union (CU): Unlike the first stage, this stage aims to eliminate trade diversion and trade creation problems in the region by applying common external tariffs. This is also regarded as one of the major stages of economic integration which gives a sign whether countries should go on to adapt policies for the higher

level of integration or not. At this stage it is said the interdependence of economies increases by generating positive and negative externalities in terms of spill-over effect and feedback from the examination of the economic policy from one country to the other participating countries. Therefore this stage has many negative and positive results to member economies when attempting to maximise the gains or minimise the losses from the union. Members can decide to adapt all union policies that can lift them into economic integration or they can decide not to adapt non-union policies and retrace their steps back to the free trade area (FTA) stage. Therefore, at this stage not every country is likely to benefit but the losses and gains due to imports and exports given the prevailing tariff structures are reduced. It has also been mentioned that, under this stage, since the mobility of capital and labour is still limited, there are likely to be capital diversions to the areas where the cost of capital is lower. Therefore this stage is simply FTA plus external tariffs.

(iii) A Common Market (CM): also referred to as a single market, this stage takes over by allowing free trade within member countries, common external tariffs and free mobility of factors of production. The intended case study (EAC) is currently on this stage. This stage is therefore CU (stage two) plus free mobility of capital and labour throughout the extended market. However, the total freedom of capital and labour is a achieved in the long run, it takes time.

(iv) Economic Union (EU): Member countries at this stage harmonise both economic and social policies to ensure free movement within the block. In addition to that, macroeconomic policies are then reviewed by all member states to ensure they are not limiting or distorting the flow of trade. Under this stage, the participating countries start to share some social aspects such as national holidays, same national anthem, same education schemes and other social related aspects (Therefore this stage is stage three plus common macro and social policies).

(v) Economic and Monetary Union (EMU): this is the highest form of integration whereby member countries have a single market plus a common monetary policy and sharing a common currency/fixed exchange rate. Very few regions in the world have reached this stage due to the fact that; at this stage a country

surrenders its monetary power (central bank) to the union. Therefore it is the combination of Economic Union and Monetary harmonisation.

(vi) Political Federation and complete economic integration: many modern studies in the field of economic integration identify this as the final stage instead of the EMU stage. At this stage members' economies and monetary and fiscal policies are harmonised and controlled by centralised regional committees. This is where the federal government if formed for example the USA. The United Kingdom also can be listed into this category. The target of the East Africa Community is to reach this stage by 2015.

The first two stages are subjected to trade creation and only few countries of the integrating block are likely to gain more. Since each stage requires some amount of years to adjust the policies, the East African Community has reshuffled number of policies especially fiscal policies while trying to reach the target of having a single currency and federation in the near future. Apart from minimising the risks of trade diversion, the CM stage has started to allow free movements of resources within the participating EAC members (comparative advantages). Given the time scale since the EAC adopted the CM criterions, it is not easy for one to recognise any degree of diversions in the region and there are no documented evidences suggesting any problems of that nature. However, if for one reason or another, diversions continue even in the presence of a single market, then it is suggested by the theory to offer tariff reductions on the basis of the most favoured nations (Hitiris, 1991; McDonald, 1994). That is, if one country offers the highest tariff level, then the same rate should be allowed to all other members, otherwise trade diversion will occur and in long run the union falls (McDonald, 1999). Therefore, all regional groupings mainly aims at attaining the final stages/agreements so as to eliminate all transaction costs that may be impacting the free flow of capital and labour in the extended market. However, depending on the commitment and level of convergences and dependences, it is always difficult to reach that objective.

The recent European Union economic problems (2011 – currently late 2012) have produced numerous debates on how individual countries rescues themselves from the continuing economic shocks especially in their financial sector. That also suggests a precise measure that determines/isolates countries that will form an optimum currency area have to be adopted before admitting countries in a monetary union. In the awake of

any market externality, all participating members are collectively responsible to ensure an appropriate measure is undertaken to ensure the shocks are corrected throughout the region. Therefore, as will be explained in the later chapters, the key hypothesis of the endogenous optimal currency areas requires the degree of business cycles synchronization across its member states to be significantly higher before the Currency Union treaty is reached and before the implementations the date/timescale for the full integration is set. Other criterion includes the fact that the volume of intra-trade within the block to be higher and significantly increasing as the barriers to internal and external trade are minimised and harmonised respectively.

Therefore to answer some of the key questions being raised above, our analysing applies some econometric models in chapter two and four to measure the volume of intra trade and the flow of FDI's in the region. The two analyses are aimed at determining whether by eliminating internal trade policies and tariffs encourages more intra trade and foreign investments (FDI) in the region or the other way around? The two points are assumed to be amongst the modern determinants of optimum currency areas especially in the least developing blocks. On the other hand, in chapter three we apply Vector Autoregressive models to estimate the market response to structural shocks in the economies. As noted by (Carmignani, 2005), the level of synchronisation between members in the trade union must be carefully determined in order to estimate the validity and optimality of the economies applying for a full economic integration.

In chapter five, we study the behaviours of the exchange rates in terms of volatility and long run adjustments of the exchange rates of each country in the EAC. Therefore a detailed GARCH procedure is followed to meet the aims of chapter five. In addition, the importance of the exchange rate towards single currency union has been the motivating point behind the investigation/examination of the behaviours of the exchange rate. Like other currency regional blocks, the EAC progress towards the realisation of strategies for shillings (currency) unifications will/requires massive policy adjustments especially in the monetary policy. Most of the required reforms of the currency policies are reached in the long-run as countries tries to be more cautious and takes their time to adjust the key determining variables of the financial sector. Many recent studies have used the Maastricht Convergence criteria of the European Union as the tools or pre-conditions to currency unification while assessing the status of a block. The Maastricht

convergence criterion consists of five points used to assess the status of different macro economic variables of the applying countries. These criteria are briefly explained below:

- Ensuring *price (inflation) stability* in each participating member whereby small economies have to maintain a lower and sustainable price performance and an average rate of inflation (CPI) that cannot exceed the inflation rate of the highly performing economies in terms of price stability by more than 1.5%. This criterion is also known as the *"Maastricht CPI inflation rate criterion"*.

- Ensuring a *stable and lower interest rate* across the block's banks for more than a year before currency unification. Like the inflation rate criterion, the Maastricht rule on interest rate requires each member of the block to maintain, in the long run, an average nominal interest rate that is below the average nominal interest rate of the large economies in terms of stable (prices) inflation by more than 2%. This is the *"Maastricht nominal interest rate criterion* which basically encourages stability of the banking sectors of the member countries in the common market"*.

- Ensuring and controlling the *exchange rates* of the member countries with higher exchange rate fluctuations for at least two years before adapting a single currency/fixed exchange rate. The Maastricht treaty suggested the fluctuation margins of the exchange rate to be ±15% around the central exchange rate parity of the entire block. This criterion is also termed as the *"Maastricht Exchange rate criterion* which, again, helps to encourage stability in the banking sectors and the monetary policy setting of the block members.*"

- Members of the economic integration should also reduce their *budget deficit and public debt* and then reduce foreign aid (this is crucial for least developing economies which relies on foreign aids by large percentages), which technically reduces intra- importation and thus leading to possibility of creating a trade diversion problem. Further to that requirement of lowering public debt, except in special circumstances, the Maastricht treaty suggests integrating economies to ensure budget deficit is less than 3% of their GDP while the public debt is also less than 60% of GDP. This criteria is also known as *"Maastricht budget deficit and public debt criteria"*

- The last but not least criterion suggested by the Maastricht treaty is to ensure *measurable and visible fluctuations* of the entire macro economic variables especially inflation and exchange rate which highly influences an optimal value of any currency. The EAC block, however, may take longer to adopt these

criterions as at least 30% of the total block GDP is financed through foreign aid and soft loans while to reduce the government spending may take some years. In addition, given the status of the economies, lowering budgeting deficit and public debt may worsen the situations in the key economic sectors especially agriculture. There are many positive and negative arguments can be drawn from this criterion

However, the critics of the criterions listed by the Maastricht treaty have claimed that the conditions are not such powerful to influence a proper convergence of the macro variables of the countries forming a trade block. Convergence can be defined as a process of unifying small economy's macroeconomic variables (institutions) to catch up (fast economic growth) with the forefront economies in the block. Critics mentions both economic, political, social and structural reasons which are rarely specified by the Maastricht model, as to be combined and carefully integrated so as to achieve convergences of the posed variables. That also means that to achieve full macro economic integration, it involves ensuring technology and economic infrastructures are well unified, the currency value is becoming stable across the region and the volume/speed of intra-trade is growing over time.

The structures of the EAC economies are encouraging an in-depth analysis due to some divergences of the key macro variables (as will be shown in the descriptive figures), as well as the differences on the stages of economic and social development of the members on the list. For instance deep poverty, high urban migration, high population growth rates, high unemployment rates, low FDI flows, low savings, higher dependence on foreign aid and poor practices of democracy; are some of the variables that are encouraging an in-depth examination of different variables of the member states. Therefore, the Maastricht criteria are simply guidance for price and fiscal stability of the proposed block and they cannot be used solely as alternate measures of an optimum currency area. Rather, the Maastricht criterions help the settings of the way monetary policy should be structured in the EAC block and they are also used to assess any future member or applicant of the trade union. In addition, the Maastricht criterions are used as among the priorities of the new extended market and they are also used as stabilisation tools in the event of any negative shocks. Also, from the Maastricht conditions we observe that monetary variables are key adjustment tools and they play a significant role during the process of unifying and fixing the exchange rate in an extended market.

1.1: A Monetary Union

The concept of monetary integration has been explained and investigated from different points of view whereby, as briefly explained in the preface, a monetary union is integration that participating members in a block impose a common exchange rate/single currency throughout the region. That also implies a currency union can have one or more currencies whereby inter-regional exchange rates can be permanently fixed throughout the block but are different/flexible to the rest of the world or the inter-region and exchange rates to the rest of the world can be permanently fixed throughout the region[1]. The theory suggests that, by the time the market decides to adopt a single currency, labour and capital markets are expected to be fully integrated with free capital flows, free movement of labour force and people in general, and centralised decision making agencies which include a one common Central Bank which makes the ultimate and day to day decisions that run the monetary policy of the block.

The EAC region in our case study is still having many challenges that are limiting the free flow of people and capital in the region. As will be illustrated by the later chapters, challenges such as technology, poor infrastructures, market volatilities, languages and different standards of social services are influencing a slower speed of integration in many trade unions that are within the least developing group especially sub Sahara. Past experiences including the recent euro-zone have clearly shown that intermediate exchange rate regimes which are pegged to other currencies are very vulnerable to external shocks and speculative attacks.

In addition, as the currencies are pegged and start to be more integrated to the global markets, the pegged currencies become more exposed to large and very volatile capital flows, hence making some of the participating currencies more volatile and even depreciating their values in the world market. Since at the stages of integration the central banks independently make decisions, there is a danger that some of the intermediate institutions in the block may panic, hence making it difficult to intervene

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[1] If the region maintains individual and independent central banks, the currency union is categorised a*s* a *Pseudo exchange rate union*. On the other hand a complete currency union involves a centralised banking system and the participating members following a common exchange rate and monetary policy Sorgenfrei, C. (2011), "*Optimum Currency Areas, A Monetary Union for Southern Africa,*" Hamburg, Diplomica Verlag GmbH.

collectively in the market to correct any disturbances. The EAC strategies is to ensure all the member countries are abandoning their local exchange rates and therefore adopt a uniform rate that will be administered by the proposed Central Bank of the East African community. That also means, the block's Central Bank will monitor the entire monetary system of the region hence reducing the risks of member countries devaluating or undertaking any adjustments that aims at collecting their local shocks.

1.1.1: Costs and Benefits of Monetary Integration

(Alesina, 2002) defined the costs and benefits of a monetary union from a perspective that, what are the benefits and costs of one country adopting an exchange rate of another country. The advantages or disadvantages of a common currency union are based on the economic implications and results derived from fixing exchange rates within a group of countries. One of the obvious costs of a monetary union is that countries lose their monetary policy as an adjustment tool as the entire monetary policy becomes centralised to solve all imbalances in the entire market. It is more dangerous especially when each country still maintains its own exchange rate to the rest of the world (Flexible external exchange rate) since any change in the aggregate demand between the participating countries cannot be easily adjusted. The nominal exchange rate is always powerful in collecting any external imbalances of an economy. Therefore, given the loss of authority to control the exchange rate, countries suffers to control shocks in the major economic indicators especially employment and inflation. However, as will be discussed latter in this chapter, the founding paper of "Optimum Currency areas" by (Mundell, 1961), it was noted that the disadvantages of a monetary union do not originate from the system of the exchange rate rather they (disadvantages) originate from the optimal domain of the block.

In addition, (Sorgenfrei, 2011) noted that a small group of countries (such as the EAC) can encounter more problems in the integration process[2] as each member tends to have different economic settings. And for the case of the EAC, the economic settings are totally different due to historical and political factors each country has encountered in the past. Also, as evidenced during the euro crisis, small economies suffer more in the event of external shocks since most of the adjustment tools tend to be highly integrated and depend on the most advanced (rich) economies in the block. Large economies, on

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[2]Very small regions are in fact unable to provide a national currency efficiently as a public good, and thus it is not a good option to adopt a single currency in a trade union with lower income members. Ibid.

the other hand, can experience some long run negative impacts especially on employment and inflation, since to some part they depend on small economies that have few options in the awake of any economic shock.

On the other hand, one of the benefits of a monetary union is the reduction of the transaction costs. This advantage is extensively explained in the second and fourth chapter as we measure the volume of trade within the trade union whereby several other determinants of transaction costs are included in the equation. Allowing different exchange rates within a trade union increases the transaction costs even if all barriers of trade within a group of economies are eliminated. Therefore, by fixing the exchange rate throughout the region, transaction costs are reduced to favour the value of goods and services to be traded in the market. Also, the monetary union increases the speed and flexibility of the movement of goods and capital which are the main reasons for integrating markets. Flexibility of the market encourages efficiency, more varieties in the market and the exploitation of economic potentials available in the region.

Therefore, at the common currency stage, members of a block are expected to eliminate all fees and margins that households and business firms have to pay to banks and other financial facilitators as commission and intermediation costs. Also by imposing a single currency, the need for countries to hold foreign reserves (foreign currencies) for international transactions is reduced (cancelled out) since the free movement of goods and services throughout the region helps to reduce the imbalances in the balance of payments of the participating economies. For instance, in the EAC, the balance of payments is highly imbalanced and by combining the monetary policy, imports will drop, hence encouraging productivity in the region and long run reduced balance of payment deficit.

Price transparency and reduced price discriminations are other benefits of a currency union and the deepened integrations of the markets in a trade union. Given the primary aim of expanding the market and productivity, monetary unions stimulate and promote pure market competition. As will be investigated using the panel time series procedures in the later empirical chapters, the literature suggests that general prices of the unified markets converge (cointegrate) towards long run equilibrium after the adjustment of the policies have taken place. This is possible given the perfect competition assumptions of availability of market information and the free movement of capital and labour. Therefore, in the long run the market players cannot discriminate prices in the region

hence the society benefits from lowered prices and increased varieties while the participating governments benefits from an expanded tax base. Therefore, under the category of reduced transaction costs as the benefit of a monetary union, there are many other benefits; some are not easily quantifiable, for example security, peace and democracy.

The second bundle of advantages of a monetary union is related to the reduction of risks that may originate from unexpected disturbances and the movements of the exchange rate and other macro-economic variables. Investments tend to flow to economies that are less volatile and respond quickly to economic shocks; therefore, a joint monetary policy is always expected to solve this problem unless the block is not *optimal* for a single currency. At micro level, however, there is a positively significant correlation between large nominal exchange rate fluctuations and average profits, especially when the market is large enough in such a way that exportation is just an option to firms. This argument may not necessarily be true, especially when the market is marked by higher exchange rate volatilities. Therefore, unifying the exchange rate ensures long-run stability and less volatility[3] of the exchange rate in the region hence promoting stability to the major macro indicators. That also encourages more investments (FDI) hence reducing exports, balance of payment problems, unemployment rate and probably reduce (inflation) price of goods and services.

Another advantage of a monetary union is the low and stable inflation rates that benefits countries especially when they are known to be countries with higher inflation rates. Most of the countries in the sub-Sahara region have a history of high inflation resulting from different factors, including higher importation, poor (expensive) means of production, poor power supply and lack of skilled labour force. By integrating and unifying their currencies, the theory expects that the monetary credibility will improve throughout the EAC region and hence favour stability of the key economic adjustments tools. Despite all these mentioned advantages so far, the idea of introducing a single currency in a region such as sub Sahara is undermined and pressured by the fiscal implication, especially on the role of inflation (price levels). For instance, a country with high debt burdens applies inflation as a tool of reducing the debt burden by

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[3] It is worth noting that in order to ensure that the fixed exchange rate is less volatile all the time, the participating members have to ensure that prices and wages are adjusting equally across countries.

reducing the interest obligations, hence reducing the budget deficit. This has been on the list of the key obstacles behind the hesitation of SSA countries to commit to higher stages of economic integration, including fixing an exchange rate throughout the region. In addition, by adopting a single currency, countries in a block are expected to attract higher international attention, especially in the World money markets which supports the development of small financial sectors. By unifying the monetary system, local banks are likely to benefit from an expanded banking sector and an expanded window to the World market. Since the unified currency becomes an international reserve in central banks of the rest of world, local banks and other agents can easily access credit from international banks so as to reduce deficits in the economy. However, the theory and previous studies insist that when the integrating economies are initially too small to attract foreign investors, there is a danger that they can attract more attacks on their economies, and they may trigger a financial crisis (collapse of the banking sector) in the group.

On the other hand, as introduced in the first paragraph of this sub chapter, there are few costs of a monetary union including the loss of independent monetary (monetary sovereignty) and some fiscal instruments (taxes). That also means a country loses the freedom to correct economic disturbances as all adjustments have to be undertaken collectively by all the member states of the monetary union. All countries in the world are working harder to ensure there is growth and stability especially on the main macro indicators especially employment, inflation, exchange rates and national output. Countries lose the sovereignty to adjust their policy in order to favour unemployment or higher inflation since the newly expanded market makes decision collectively. For example, many African countries devaluated their currencies to a certain point in late 1980s aiming at stimulating exports and promoting FDI inflow. Therefore in the future, EAC countries will not be able to devalue or appreciate their currencies to promote long run plans for their economies. In general, the critics of deeper integration suggest that countries may experience welfare losses through the key indicators of the economy (employment, inflation and output).

Furthermore, small economies can also experience loss of some revenue (taxes) in the short run to comply with the regional tax system which includes the elimination of taxes to member states. EAC countries, for instance, have very limited sources of tax revenues and by adapting a new tax codes, some countries may experience some shocks on financing the day to day government expenditures. In addition, the integration

process to reach the highest stages is a long-term and expensive process as it requires administration and training of personnel to manage different organs of the union. Another important expense of a monetary union originates from switching prices throughout the region, since producers and consumers have to adapt to the new price setting standards of the currency union.

Also, countries lose control over foreign currency reserves as they become partially owned by the union Central Bank. The last but not least cost of a monetary union, as previously noted, is the negative outcomes that countries can adopt from another member(s) who have problems in terms of public debt and large budget deficits, since fiscal deficit triggers inflation, thus affecting other variables such as interest rate and exchange rate. In return, investors may lose confidence in the market hence affecting the long-run growth and flow of trade and investment in the region. Therefore, as noted by (Mundell, 1961), a successful (optimal) monetary union requires countries to have both structural and financial convergences and national debts are harmonised throughout the region so as to escape the spread of any negative shocks from any of the participating members.

1.1.2: Optimum currency areas

In the famous article about the idea of optimum currency areas, (Mundell, 1961)[4] explicitly defined an Optimal Currency Area (OCA) as a domain whereby exchange rates are fixed[5] (same unit of account) within an extended market that includes multiple economies in a trade union. Also added, an optimal currency area is a trade union that meets certain conditions that can minimise the risks of forming a currency regime which limits the flexibility in employment, money supply and general prices (inflation). Mundell mainly investigated isolating the EU countries that could satisfy the conditions for joining the Euro-zone and hence forming a successful currency union. Therefore, the conditions or the key assumptions, for a successful optimal currency region (which will be discussed extensively below) include;

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[4] Mundell, (1961) introduced an OCA as an optimal geographical domain of unified currency, or of several currencies, whose exchange rates are irrevocable pegged and might be unified. To define an OCA there are several properties that have been listed by a number of literatures, especially labour mobility, wages and price flexibility, diversification in production and the degree of fiscal integration. By sharing the above properties, a currency union/trade union is regarded as an optimal currency area.

[5] A region with one or more currencies where the intra-regional exchange rates are fixed but different and flexible to the rest of the world is also termed a currency (area) union.

(i) Free labour mobility across the block, whereby not only inducing few conditions to enable labour force to freely move within the region, but also to ensure that visas, working permits, workers rights and general human rights are standardised and properly maintained across the region. In addition, factors such as traditional and cultural barriers, education and religion are also supposed to be uniformly maintained and accepted by the legal frameworks of the participating member countries in such a way that the region becomes a free market for the society and the business to operate without direct or indirect limitations.

(ii) The removal and reform of variables and policies that can lead to expansion of the market within and to the rest of the world. Policies that relates to capital, wages and prices of goods and services are suggested to be reformed/adjusted so as promote the market forces of demand and supply which can lead to efficiency distribution of capital, labour, goods, services and the mobility of skilled labour force. This criterion can be termed as ensuring there is a significant degree of market openness. The degree of openness of an economy is a function of many other variables which, when combined they determine the status of different variables in a trade union. For instance, many literatures reviewed by this study have measured the degree of intra-trade and trade to the rest of the world using panel statistical techniques. The critics of the market openness as the key indicators of an optimum currency area have listed level of technology, infrastructures and industrialisation as the key determinant of the openness of the market rather than standardised trade policies.

(iii)The third criterion is to ensure there is a risk-sharing system that would help (fiscal transfer mechanism) countries that have been affected by the first two harmonisation steps of trade agreements (listed in the preface). At the preliminary stages of monetary union some countries' growth is affected as some try to converge and grow faster to catch-up with the richest markets in the block. Mechanisms such as tax redistribution, subsidies and directing investments towards the least developed areas within the block

(iv)And finally, most literature (including Mundell earlier papers) suggests that, in a successful optimal currency area, members of the trade union have similar

business cycles. The entire block must respond symmetrically to both internal and external shocks.

Therefore, since the introduction of the Mundell's OCA conditions, there have been thousands of studies conducted to examine various economic regions if they possess the conditions for a successful exchange rate regime (OCA) including (Mundell, 1962; Mundell, 1963). The US and the EU fixed exchange rate regimes, obviously, have been the most mentioned by many researchers from the beginning of the Mundell ideas due to their large world market share, rich in information (data) and their importance to knowledge and research in the entire area of economics and development. As noted above, modern researchers have investigated the behaviours of different macro economic variables of regions of their case studies, hence asking whether they possess the qualities that give a green light to a group of countries to fix their exchange rate. In this study, we tend not to differ with the previous researches as we investigate the status of different economic indicators with regards to Maastricht and Mundell's criterion for an optimum currency regime. Therefore, we measure the degree of openness, status of the macro variables, the compensation mechanism (if they have any in the EAC), mobility of labour, capital, goods and services and the business cycles in the EAC, and how variables in each country respond in the short run and in the long run to structural shocks..

In the modern world economy, whereby each economy is trying to maximise all available market opportunities, it has been difficult for many economic unions to have an effective and efficient system/model of a single currency (fixed exchange rates). Some regional blocks that managed to have a single currency such as the euro, WAMZ and USA have experienced massive structural problems that led to some austerity measures to be applied to some members of the union to rescue the entire region. For instance, despite meeting quickly the convergence criterion, some countries in the euro currency zone (Greece, Spain, Ireland, and Portugal) have experienced (2010-2012) massive financial difficulties due to lack of an effective adjustment instrument of the region and lack of intensive economic commitment of euro member countries. One of the lesson to learn from the Euro crises is the fact that "*Stabilisation tools*" are necessary to be addressed from the early stages of integration so as to ensure there is a good mechanism to use in the awake of negative external shocks (such as the world economic crises of 2007 – 2012)

Some of the causes and solutions for a financial crisis in a block such as the euro zone economic problems were widely discussed by early studies such as (Mundell, 1957, 1960, 1961, 1962; Mundell, 1963). For instance, countries need to include speculative demands into the equation so as to ensure there is a dynamic stability in the world price system. Also, some necessary changes that will eliminate normal disturbances to dynamic equilibrium and shifts between export and import competing countries are required in the members' central banks. Also it is suggested that, the risks created by the new exchange rate should be covered by forward markets at reasonable costs rather than be covered by other members. For example some of the euro members such as Ireland had to borrow outside (IMF) the European central Bank in order to rescue their then failing economy. That was controversial given the suggestion that all disequilibrium's have to collectively correct.

Also, contrary to what the literature suggests, the euro problems have mostly affected small economies such as Greece, instead of the large economies such as Germany and France whose manufacturing largely depends on the markets of small economies such as Greece. From the econometrics point of view, some of the suggestions of (Mundell, 1961) are very week to apply and measure in least developing economies such as the EAC group. For instance, there are many factors (some are unique) in each country that determines the four most important OCA criteria that measures a successful/stronger fixed exchange rate regime. Those factors, in each country, are determined by the political and social history of each member.

Therefore, one has to be extra careful to investigate the Mundell criterion especially in countries such as in the sub-Sahara region that have instabilities both politically and economically, while the economic history of the region increases the uniqueness of some variables that influence a stable and fruitful economic integration. In addition, poor technology, higher interest rate, poor skills and infrastructures in general limit availability of capital labour enough to accommodate the extended markets, hence making the stabilisation policies unpopular in least developing countries. The flexibilities of inflation, wages, unemployment, balance of payment is also unachievable in least developing countries since those (inflation, wages, etc.) variables are in opposite shape as suggested by the advocates for regionalisation. In addition, most of the macro variables are highly influenced by the world demand and supply while, some are internally determined by the political situation in each country.

In general discussion, factors such as high population growth rate and slow industrialisation have complemented higher unemployment rates and lower wages in SSA markets, while imported goods (especially oil) are significantly determining higher inflation in developing economies. All these reasons are behind on why most of the economic blocks in Africa have failed posses the OCA and Maastricht conditions despite being there for the past thirty (30) years for example SADEC[6], COMESA[7], ECCAS[8], IGAD[9], CEN-SAD[10], UMA[11], ECOWAS[12], and EAC[13]. At this point, one can notice that Mundell did not suggest more precise and accurate model that could be used to asses OCA's in a trade union that consists of small economies. Instead, many studies (including this) have been examining different economic variables using different techniques, hence creating some linkages and recommendations on whether a group of countries constitute an OCA.

Therefore, given its sensitivity and how it is formed, the OCA idea has drawn interest to many researchers and some have added other requirements for an OCA, including diversification of production, homogeneous preferences, political/social solidarity and political stability. The OCA idea is now widely discussed in business, social and political sciences given the sensitivities of the criterion for a successful exchange rate regime. For instance, (Buys, 2010) examined the contribution of infrastructures on the poor economic integration and trade expansion in the SSA region whereby one of the key points they raised is the importance of upgrading road infrastructures in the remote areas where major economic activities are carried on every day basis. They specifically insisted the need to link villages with paved roads so as to increase the supply of goods from areas that have plenty of supply to the areas that have less supply (perfectly operating markets with abundant information/communications).

Many regions and countries, however, start by linking their major trading cities (business cities) with paved roads so as to ensure that convergence is reached as fast as possible hence a successful full integration of the region. Also apart from the key points suggested by Mundell, which seems to be weak and controversial to apply in LDC's,

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[6] Southern Africa Development Community (SADEC, 1980)
[7] Common Market for Eastern and Southern Africa (COMESA, 1993)
[8] Economic Community of Central African States (ECCAS, 1983)
[9] Intergovernmental Authority on Development (IGAD, 1986)
[10] Community of Sahel-Saharan States (CEN-SAD, 1998)
[11] Arab Maghreb Union (UMA, 1989)
[12] Economic Community of West African States (ECOWAS, 1975)
[13] East African Community (EAC, 2000)

poor infrastructures (which some literature regards as openness of the market) play a significant role in economic growth and faster convergence of an economic union. Poor infrastructures increase the costs of production on the intra-traded goods and services which sometimes can be higher than the imports from the rest of the world. Infrastructures and poor technology in total makes many least developing countries lose a massive percentage of gain from locally available potentials.

Therefore, to overcome Mundell's weaknesses, one has to introduce infrastructures and technology indicators to measure whether there is a fair movement of capital and people (labour) across the group. Furthermore, this study regards some countries as *"newly formed/found nations"* which have even more challenges than the already existing nations. Newly found countries are those countries that have been into war and political instabilities for decades and they recently decided to end the war so as to reconstruct their nations. Countries such as Rwanda, Burundi, Uganda, Sudan, South Sudan, Eritrea and Ethiopia are still very new countries given the above definition, hence assessing whether they can be moulded into a group that can form an optimal currency area, one has to be even more precise and careful in order to produce relevant results.

Therefore, Mundell's ideas on a successful currency union did not consider many factors which this study includes some of those omitted criteria so as to produce more relevant findings for policy formulation. To this end we can argue that assessing an OCA can be conducted in any economy with any shape, but it depends on which economic variables are investigated and how the hypotheses are set for interpreting of the findings. In addition, there is no precise measuring tool (model) for an OCA criterion but one can examine each by using different econometric procedures/techniques that can help to explain the results with regards to the hypothesis setting. For instance, a number of studies have used different econometric methodologies to investigate some blocks in least developing economies, so see if they posses optimal currency criteria. Both time series, panel and cross-section methodologies have proven to produce powerful results that can be used to interpret the status of OCA in a given block, while introducing variables that capture the current status of the economies and history of the given economy.

Once again it is worth remembering that there are many motivations that drive countries to form an exchange rate regime after common market agreements, one being to reduce/eliminate transaction costs within the cross section. However, including this

study, there have been no precise models to measure what exactly are the transaction/trade costs that can be eliminated by a fixed exchange rate rather some price (inflation) divergences that can be one of the indicators of the transaction costs with a trade union. Many recent papers in the area of regional economics are drawing conclusions from estimations of the degree of market responses to business cycles and the volume/speed of intra-trade within the proposed trade zone. The gravity (which is also used by this study) has been widely used by recent literatures to measure the volume, speed of trade and attractiveness of the region to international trade after harmonisation of trade restrictions.

Initially, on the other hand, the gravity model was introduced by (Tinbergen, 1962) followed by (Anderson, 1979; Krugman, 1997; Pagoulatos, 1975; Pöyhönen, 1963; Toh, 1982) whereby; the key bilateral trade determinants that were not included by (Mundell, 1957, 1960, 1961) are easily specified and interpreted. The most important assumptions made by the above studies is that the distance between trading countries is an important determinant of trade between a pair of countries. Distance is explained by language, geography, culture, borders, infrastructures and the level of technology. While on the other hand, the size of the participating economies (measured by the size of GDP and population) also encourages more trade into the block. Since then, the gravity model has also become prominent in examining the trade relations between countries and industries.

There have been thousands of studies conducted by applying the gravity whereby, given its flexibility, more variables have been able to be included while assessing openness of an economy, speed and volume of flow of goods and services between a pair of countries. For instance the studies by (Balassa, 1966; Balassa, 1987; Bergstrand, 1985; Anderson, 1979; Stone, 1995) added the GDP per capita, product differentiation per country of origin, geographical distance between union members and so forth. As will be defined in the later chapters, the gravity model is a panel equation that allows including different indicators that explain the size of the market and the distance between participating members, hence measure the volume and speed of trading within the block. The gravity model comes with an advantage of isolating countries' specific determinants of distance (transport costs) and the size of the economies.

The gravity equation also provides very insightful results which can be used for long run forecasting of the behaviours of the key integrating variables, since in the short run

many of the stabilisation policies are difficult to implement. That is due to the fact that, in the short run, labour and capital are not mobile enough with regard to the requirements of a currency union. The limited mobility in the short run, in LDC's especially, is supported by poor technology, at the early stage (short term) of the deeper integration and that limits investors to take advantages of the expanded market within a short period since the currency union is launched. Therefore, the above listed literatures have widely used the gravity panel equation whereby the key variables that were investigated included. GDP, income per capita, population, distance (miles/kilometres) between one country and the other, landlocked status, language, labour force quality, common border sharing between members, political stability, ex-colonial ties, number of trade agreements that each country is involved in, apart from the one being investigated (EAC).

Recent studies such as (Philippidis, 2006) have modified the gravity model by first calculating the tariff equivalent in all trade partners and hence predicted the volume of trade between Morocco and the EU zone. Their results, however, were interpreted and produced similar results as the ones portrayed in the earlier studies. On the other hand, instead of estimating the volume of trade, some studies have drawn conclusion on optimum currency areas by estimating the degree of symmetric responses of the economies by estimating the Vector autoregressive (VAR) parameters. To be more precise, recent advancements have introduced the Vector Error Correction Model (VECM) which basically is a special form of VAR specifically estimating series with a unit root and residuals that are cointegrating.

Some commentators have applied the Structural VAR (SVAR) which allows restrictions to be imposed so as to estimate the short run and long run responses of the variables to external shocks. Initially (Bayoumi, 1992, 1994a; Blanchard, 1989) investigated an OCA by estimating the aggregate demand (AD) and supply (AD) whereby the key assumptions are AD has a negative slope reflecting that the higher the prices the lower the quantity demanded in the market, other variables being equal both in the long run and in the short run. On the other hand AS have a positive slope implying higher prices stimulates supply, other things being equal. Then, as shown by figure 1.1 the long run aggregate supply (LRAS) is vertical due to the fact that in the LR real wages adjust according to the changes in the price levels of the market. The short run aggregate

supply (SRAS) is upwards (positively) sloping, portraying higher prices that encourage suppliers to attempt to sell more of their stock, other factors being equal.

Figure 1.1 Demand Shock
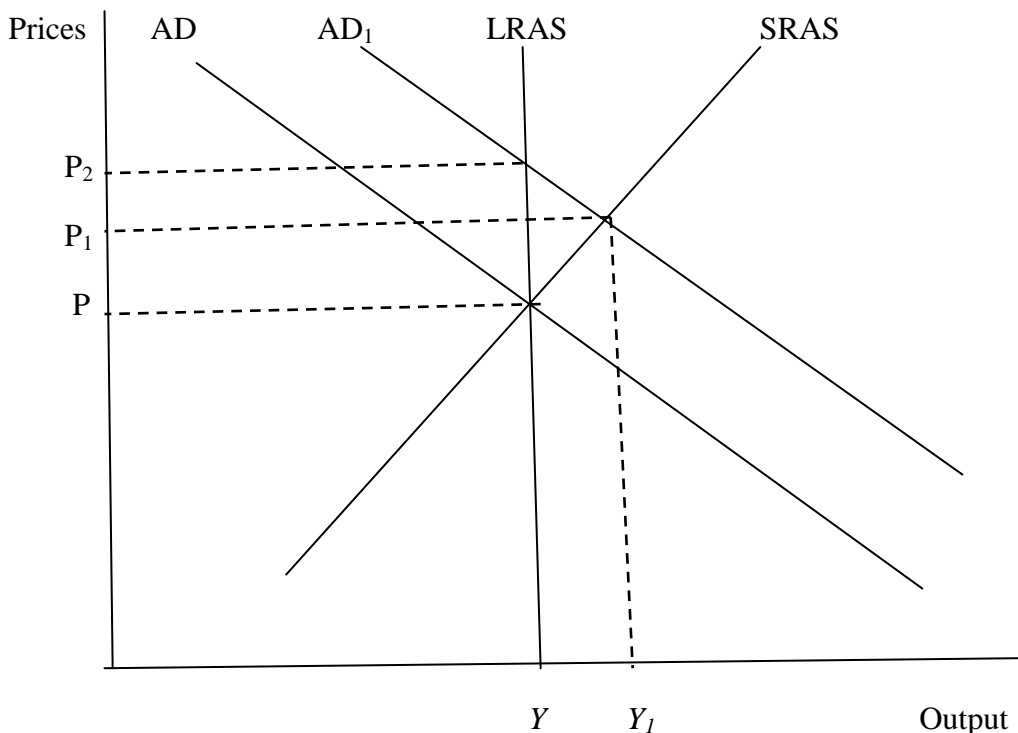
The key assumption from the basic demand and supply behaviour is that, in the event of a positive demand shock in the economy, the AD shift to AD_1 leading to an increase in output from Y to Y_1 and prices from P to P_1 and hence a new short run equilibrium point is formed. In the long run, given fixed factors of production and increasing prices which compensate for increasing costs of factor of production, suppliers are expected to produce at the market required point Y (the original equilibrium point). Therefore, from a positive demand shock we expect short term increases in output and prices while in the long term the supply curve becomes vertical, slowly returning to the initial equilibrium point with increasing prices in the market.

On the other hand, from the supply shock figure 1.2, let us assume there are developments (adjustments) in technology and skills (education) of labour; the efficiency and capacity of suppliers to produce more will increase leading to a supply shock. In the short run, supply curve shifts (increases) from SRAS to $SRAS_1$ leading to a decline in prices to P_1 that leads to an increases in output in the market to Y_1 and prices are going to decline to point P_1. In the long run, the LRAS is also expected to permanently shift from LRAS to $LRAS_1$ due to development in the factors of

production. In addition, in the long run, development in the factors of production will force the costs of production (wages, profits, rent) to fall, leading to a decline of the general prices to a new market equilibrium point (AD=LRAS$_1$) at price P$_2$. Therefore, the difference between the AS and AD shocks is that the supply shocks lead to permanent changes in the economy while demand shocks are temporal (short term) changes; also supply shocks reduce prices while demand shocks increase market prices.

Figure 1.2 Supply Shock
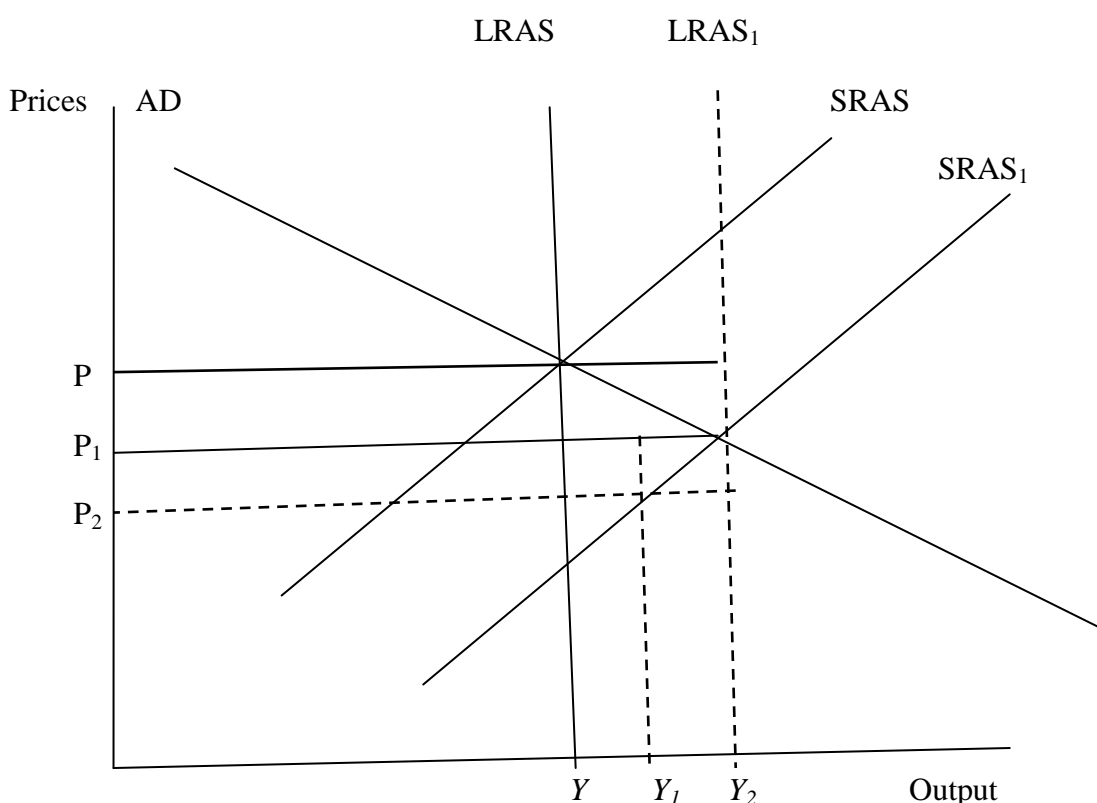
From that point of view, in the (Bayoumi, 1992, 1994a) study, the impact of a shock are estimated by decomposing permanent and temporary shocks to a variable through a VAR process. The entire process is specified and discussed in detail later in chapter three.

1.2: Limitations against faster macroeconomic convergence SSA economic blocks.

Most of Africa's markets, as noted in the introduction, face many impediments that are affecting the succession of regionalisation throughout the SSA region. Most of these

obstacles are economically and politically driven, hence making it even more difficult to reach the intended objective of having a single market throughout the continent. Political instabilities, civil wars, poor infrastructures, huge divergences of the shape of the economies, lack of priorities and commitments to long-run policy plans are some of the key obstacles through which some of them will be investigated by this study so as to highlight their contributions to slower progress of regional integrations in the SSA block. For the case of EAC, political leaders have shown a strong interest and commitment to agreeing on advocating for higher stages of regionalisation despite the harmonisation process have been a bit slower especially on the key macro indicators. Also on the other hand, the initiative to link all major cities with paved road has been successful within the past ten years whereby a paved tarmac road connecting Dar es Salaam, Nairobi and Kampala have been completed within the past decade. The challenge, however, remains on linking the rural areas where the majorities of the EAC population lives and operate their day to day economic activities.

Experts on Africa economies argue that it is dangerous and not viable to encourage regionalisation between economies with lower growth, insignificant production and manufacturing. There is no evidence that, however, integrating small economies limits the economies with a lower growth rate but there is much evidence that regionalisation and international agreements have encouraged growth in countries such as China, Malaysia, Brazil and India. It is also fair to mention that for many years the entire sub-Sahara region was much closed and some countries remain locked by poor infrastructures, long lasting civil wars, political instabilities, and poor technology which limit the fair flow of trade, information and services. And that can back the argument that regionalisation is attainable in small economies if there is a commitment to funding infrastructures and other determinants of openness.

Some countries that have recently shown significant economic progress, such as Ethiopia, Kenya and Tanzania also remain limited to external markets due to poor financial markets, corruption (limiting investments and openness) and domination of the world market by very few rich countries have had many impacts to growth and openness of the continent. Trade within Africa and to the rest of world has remained to grow at very lower rates throughout the SSA region for more than two decades. Therefore, the convergence and the Mundell's criterion for a successful full regional integration cannot be attained easily and neither one should use them as the only measure for countries that can form a stronger currency union. To achieve fast

convergences in EAC for instance, some joint projects have been initiated and funded by the member countries aiming at promoting openness and investments in the economies.

Many studies conducted in developing countries, especially in the SSA region, fail to compile a more powerful finding with more direct and significant results due to absence of historic information/data that can enhance more practical policies in the SSA context. Lack of significant historical data in developing countries is the key problem which makes forecasting and long-run estimations difficult, as the result many studies end up simulating some of their sources and reducing inconsistent results for policy formulation. In addition, poor technology, poor infrastructure and poor institutional arrangements make it even more difficult for researchers to conduct more studies in African economies.

Among tasks assigned to the EAC commission was, and is, is to introduce an internationally recognised method of compiling cross-border data classifications and standards that would promote efficiency, consistency, comparability and the entire idea of research and development. As part of the harmonisation phase therefore, countries are now suppose to improve the quality of keeping records and they have to abide to some standards so as to enable easier measurements for the performance of the block. The data recording quality of some areas, especially central banks, government revenue departments, stock markets and commercial banks have been significantly improving in recent years, hence promoting more research in different areas while addressing development agendas. The researcher of this study has witnessed major improvement between when he started conducting this study (2009) to the writing period (2012).

 To ensure that key economic variables are monitored properly, international organisations, especially the IMF and the World Banks, have been playing a significant role in ensuring the internationally-recognised guidelines are followed by the EAC major institutions. Therefore the WB and IMF have been providing multiple series of trainings through workshops and seminar to different economic monitoring organisations such as central banks and planning commissions. In addition, the two institutions have been requiring countries to follow the two international recording standards namely "the Special Data Dissemination Standards (SDDS)" and "General

Data Dissemination Systems (GDDS)[14"] . Through these two standards, the management and monitoring of the macroeconomic variables have been more open in the group of least developing countries while the quality of data have also improved.

Last but not least, divergences of some key indicators of economic growth and development within the SSA region are also a reason for a slower convergence, hence blocks failing to climb to a full economic integration. For example, there are big differences between countries in terms of size of the market measured by GDP, income per person, population, value of total trade and quantity of exports per year. For instance, Tanzania has four times the population of Rwanda but on the other hand, Rwanda's income per person is higher than that in Tanzania. In addition, there is a significant divergence on the economic sectors arrangements; for instance Tanzania largely generates it tax revenues from the mining sector while Rwanda generates from agriculture and the service sectors. Also, there is a strong divergence in the level of democracy and the entire political system of the countries in the entire SSA region.

There are some countries which, as we mentioned before, are newly-found as they have spent most of the past three decades fighting civil wars and suffering political unrests, thus currently they are undergoing political and economical rebuilding process which makes them economically different from other countries which have no such history. Civil wars and political instabilities are at the minimum point in the East Central Africa for the past five years and the international movements are pushing towards ending civil wars especially in Congo DR and some other parts of the SSA region. All these macro, structural and political divergences between countries forming different regional blocks across the SSA region make it more difficult to reach Mundell's OCA criteria. Therefore, due to the above listed factors, the flexibility of capital, labour, goods and services in the entire SSA region is limited hence reducing the target to achieve convergences in the region as fast as the theory of OCA suggests.

1.3: The EAC Quick facts

The East African Community (formed in 1997)[15] is a trade union of five countries in the central east of Africa, including Tanzania, Kenya, Uganda, Rwanda and Burundi. The

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[14] As shown by IMF's country reports, adherence to the IMF Data Quality Assessment Framework have started to ensure countries are recording and collecting information with integrity, statistical/scientific robust, accessible, accurate and reliable for in-depth examinations.

history of integration of the EAC countries goes way back to 1919 as it was introduced as a group of countries used as a source of agriculture raw materials during the colonialism era. During that era, a centralised bank for the East African countries was also established to finance different production activities in the region. Then, after becoming independent in the early 1960s, the EAC countries did not want to lose the market potentials that were available in the region and therefore in 1967 the new independent East Africa Community was formed but lasted only ten years (1967-1977). Factors led to the collapse have been very well documented as political, social and economic disagreements between member states that led to the spectacular fall of the trade union. Then in 1991, under the former Organisation of African Union (OAU), now African Union (AU), all African independent countries signed the "African Economic Community Treaty (AEC)" which highlighted the vision of a single African market.

To reach that aim, the AU suggested the formation of eight main regional pillars which are under the flag of AEC. Those pillars include SADC, COMESA, EAC, ECOWAS, AMU/MUA, CEN-SAD, WAMZ, and ECCAS (Gedaa, 2007). Currently, EAC is been mentioned as one of the most relevant regional groups in Africa due to the commitment and fast implementation of the requirements for the primary phases of regional integration. As also explained earlier, many countries in the sub Sahara region are forced to join multiple trade unions due to geographical, historical and economic reasons. Despite the willing to join multiple trade agreements, most of the trade unions in the SSA have failed to move into higher levels of regionalisation. Unlike the other regions in SSA, EAC became a common market on July 1st, 2010 after all countries reached the designed milestones on policy adjustments as required by the manifesto of the union.

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[15] The EAC was firstly formed in 1967 but collapsed in 1977 due to ideological differences of the participating members by then, whereby Uganda was under Idi Amin who had his own ideologies; Tanzania was under Julius Nyerere who believed in Pan African Socialism while Kenya was under Jomo Kenyata who was seriously adopting capitalism and free market ideologies. Trade in general started to fall, labour and capital movement started to decline as well and finally 1977 the former EAC collapsed spectacularly and officially was dissolved in 1983 Gunning, J. W. (2002), "Trade Blocks: Relevant for Africa?" *Journal of African economies, Oxford University,* Vol. 10, No.311 – 355..

Initially the EAC common market intended[16] to adopt a single currency (fixed exchange rate) by the year 2013 after harmonising the important policies that support the convergence criteria suggested by the founding literature of optimal currency areas. Many trade unions in developing countries are failing to adopt a single currency due to low trade gains from intra-trade, higher volatility in the banking sector and the fear of developing central banks to lose monetary sovereignty of their countries. The founding studies in this area suggest that there are two form of currency union, one being adopting a common currency (full monetary integration) with a centralised central bank. The other form is adopting a fixed exchange rate of the participating members while allowing each member to have their own exchange rate to non-group members (rest of the world). Given the different undergoing changes in the central banks of the EAC region, the EAC signed agreements indicates that the target is to form a full currency union.

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[16] Among the long-term objectives of the Community is to establish a monetary union (Mkenda, 2001) Article 94 of the Treaty states that EAC members will co-operate in monetary and financial matters and maintain the convertibility of their currencies as a basis for the establishment of a monetary union. Further, Article 97 states that "there shall be a unit of account of the Community to be known as the East African Currency Unit (*EACU)* Mkenda, B. K. (2001), " Is East Africa an Optimum Currency Area?" Vol. Working Papers in Economics, Department of Economics, , Goteborg University., No.no 41: pp. .

Table 2 EAC Economic structures (snapshot)

	Tanzania	Kenya	Uganda	Rwanda	Burundi
Gross savings (% of GDP)	12	13	10	15	9
Manufacturing, value added (% of GDP)	10	13	12	4	3
Trade (% of GDP)	48	62	48	36	25
Merchandise trade (% of GDP)	43	46	51	39	36
Trade in services (% of GDP)	18	17	14	21	22
Agriculture, value added (% of GDP)	40	28	38	29	45
GDP growth (annual %)	6	2	7	5	3
Industry, value added (% of GDP)[17]	16	20	30	13	12
Social Indicators					
Urban population (% total)	26	22	13	19	11
Rural population (% total)	74	78	87	81	89
Domestic credit to private sector (% of GDP)	16	30	14	26	21
Domestic credit provided by Banks (% of GDP)	17	40	11	8	35
Expense (% of GDP)	19	21	15	12	12
Internal and External Balance					
External debt stocks (% of GNI)	30	25	16	15	125
FDI, net inflows (% of GDP)	3	0	4	2	1
FDI, net outflows (% of GDP)	0	0	0	0	1
Imports of goods and services (% of GDP)	38	36	33	27	24

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[17] The value added by the industry sector to the economies productivity is quite small due to low technology and limited capital employed by this sector Gunning, J. W. (2002), "Trade Blocks: Relevant for Africa?" *Journal of African economies, Oxford University,* Vol. 10, No.311 – 355..

From the above table, the structure of the production and social indicators of the five members is quiet similar. The agriculture sector, as noted before, employs more than 60% of the total population of the EAC, making the sum of more than 80% of the total population depend on that sector. In some reports of international organisations such as those of the World Bank, UNCOMTRADE, UNCTAD and WTO it is noticed that the agriculture sector contributes between 50% and 60% to the total exports of the EAC states as displayed by the above table 2 (UNCTAD, 2009). The above table 2 also is portraying EAC member countries Tanzania, Uganda and Rwanda to have higher GDP growth rate as per years 2009 as compared to the rest of the members. Through different discussion in the later chapters, the recent main sectors that are contributing more to GDP are also isolated especially in the big economies.

In development economics, it is noted that the manufacturing sector is the hub for rapid economic growth and economic development. However, as shown in the above table, the manufacturing sector of the EAC economies is playing a very rare role on the contribution to the GDP of each state. For example the manufacturing sector of Kenya and Tanzania, who are considered as large markets in the EAC, is contributing 13% and 12% respectively to their GDP. That can be one of the reasons behind the stuck and slower economic growth for the past two decades. The founding theories introduced by Adam Smith suggests that by encouraging regionalisation and market expansions, the manufacturing sector will grow faster in the long run to accommodate the expanded market.

Furthermore, from the above descriptive facts, the social structure and external balances of the EAC countries are quiet similar and adjusting along almost same path. Moreover, from the above descriptive figures (table 2) one can conclude that, it is evident that the five countries are competing to produce similar goods for export (primary goods). Also, all the countries are fairly open to trade[18] and therefore further deregulations and introduction of tools to ensure stable growing intra-trade are still required in the EAC

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[18] Structural changes in Tanzania started when Nyerere (Pan Africanist) voluntarily handed over power to Ali Hassan Mwinyi in 1985, and the slow reform towards a market economy started to mid-1995, when a lot of public companies were privatised to stimulate market competitions. Uganda, on the other hand, went through a brief period of flirtation with socialism under Obote, and then was under the brutal and totally chaotic dictatorship of Idi Amin. Amin was toppled in 1979 with the help of Tanzania. From 1986, Uganda under Museveni started economic reforms as well, under the help of the IMF and WB. Kenya, under Jomo Kenyatta and later Daniel Arap Moi , has been a market-oriented economy even before the structural adjustment policies were introduced in the African region Mkenda, B. K. (2001), " Is East Africa an Optimum Currency Area?" Vol. Working Papers in Economics, Department of Economics, , Goteborg University., No.no 41: pp.

block so as to foster more benefits of low transaction costs, and hence eliminates all risks that may result from adopting a single currency/fixed exchange rate. Finally from the above table we can show evidence that there is a solid need for EAC states to ensure strong macroeconomic policies in order to prevent externalities that can be induced by poor performing economies in the trade union. Most of the members, for instance, have an average inflation rate below 10%, very low domestic credit to private sector, higher imports of goods and services, and higher external debt stocks; all of these propose that there might be some significant costs and economic risks to the union if policies and variables are not carefully adjusted, especially in long run.

1.4   The income convergence of the block.

Given the obstacles towards faster convergence (sub chapter 1.2), traditionally convergence is estimated by comparing and contrasting the income (per capita) of the participating countries. This measure helps to identify whether small economies within the block are eventually catching up with the big economies with a sustainable path of income growth. It is worth noting that, income convergence cannot be used as an ultimate measure to provide key conclusions rather it draws the picture of the existing and future growth path(Abreu, 2005; Islam, 2003). Also studies by (Sala-I-Martin, 1995; Sala-I-Martin, 1996, 2002) noted that analysing the economic convergence using the per capita income gives a direction and indication on whether the policy adjustments have been successful to promote long-run integration of the block. To measure the income convergence of the West African countries, (Tirelli, 2010) followed the following procedure to estimate the income convergence;

$$\Delta \ln Y_{i,t,T} = \beta_0 - \beta \left(\ln Y_{i,t} - \ln Y_i^* \right) \tag{1.1}$$

Where $\Delta Y_{i,t,T}$ is the log difference of country GDP per capita over the period t-T, Y_i^* is the per capita income in the country's steady state. If the block members are characterised by the same steady state $Y_i - Y^*$ and finally the convergence is examined as follows;

$$\Delta \ln Y_{i,t,T} = \varphi - \hat{\beta} \ln Y_{i,t} + \varepsilon_{i,t} \tag{1.2}$$

Where $\varphi = \beta_0 + \beta linY^*$ and when $\overset{\wedge}{\beta} > 0$ then (Tirelli, 2010) suggests that the growth is inversely related to the initial levels of income and thus the small economies in the block are growing faster than big economies in the integration process. In addition, at that point the steady state of the per capita income is adjusting to another steady state of the block. Furthermore, if each country in the data set has different steady states, then the examination should be based on the conditional convergence of the per capita income and the estimation procedure has to follow as shown below:

$$\Delta \ln Y_{i,t,T} = \hat{\beta}_0 - \hat{\beta} \ln Y_{i,t,T} + \delta X_{i,t} + \varepsilon_{i,t} \qquad (1.3)$$

Where $X_{i,t}$ is the vector variable proxying each country's specific steady state which includes the investment rates in labour and capital as well as the depreciation rates of the participating economies. Other factors that determine a country's steady state include taxes and government spending, trade openness in terms of tariffs, black market premium and price distortion. Also, the political indicators (wars, coups, democracy index), latitude of each country, landlocked dummies, level of infrastructure healthcare indicators and life expectancy , constitute the steady state of an economy. Therefore, measuring the differences in the levels of income in the participating economies in a block provides powerful results that can be used for explain the convergence status of the countries in the block. As noted by the literature, the easier way to narrow/eliminate the income gap within the block is initially to allow/empower small economies to grow faster (high economic growth) than the initially large/rich countries.

However, as noted above, this is not enough and sufficient measure to observe/analyse convergence and addition variables can provide rich results. Therefore, further to the above model, (Tirelli, 2010) expanded the idea using time series procedures to estimate the long-run parameters of the variables of the block. Using unit root procedures, two series converge when their stochastic trend (stationarity) is the same implying the GDP (income) of the pair of countries is adjusting towards a station process (long-run equilibrium). Therefore from the same econometric procedure, we expand the idea by applying the following model:

$$\left(\ln Y_{i,t,} - \ln Y_{i,B} \right) = \varphi \left(\ln Y_{i,t-1} - \ln Y_{B,t-i} \right) + \varepsilon_t \qquad (1.4)$$

Y_B Captures the income benchmark between the pair countries, traditionally convergence amounts to a stochastic trend test on $\left(\ln Y_{i,t,} - \ln Y_{i,B} \right)$ while $\varphi = 1$.

Therefore (Abreu, 2005; Islam, 2003; Sala-i-Martin, 2002; Tirelli, 2010) studies identified that the data-sets rejected absolute convergence as specified by equation (1.1) and (1.2) instead the test of conditional convergence reported a convergence of the variables at different conditions. In addition they found the GDP (the level of income) as the most significant variable, while the conditional convergence procedure signified to be the robust empirical procedure in their data set.

In their findings they also noted the issue on which variables are the key determinants of country-specific steady state, which are also preventing an absolute convergence of the trade block. Therefore, in their final results, they included other variables that were suspected to have a significant impact on convergences in the block. Those variables included the quality of the government in terms of good governance and policies that ensure the market is continuing to open and create more growth opportunities. Also, they noted human capital to have less impact on growth of an extended market as compared with physical capital. Some measures of health, especially life expectancy were significantly correlated to the output growth as well as the link between investments and other agencies of the economies.

It is worth noting that, institutions play an important role on driving economies towards convergence. The absence of efficient institutions (poor performance) in most African markets results from lower incentives that can be generated from the market. Literatures have listed regulatory institutions, social insurance institutions, property rights, conflicts management institutions and the institutions for macro-economic stabilisation as important towards encouraging rapid growth. These factors are expected to enhance innovation and creativity through property rights and the protection of products in each participating economy throughout the block. In addition, these institutions ought to control/balance market failures that results from frauds, corruption and any other anti-competitive behaviours in the market. The regulation of the firms' behaviours in the entire sub-Saharan region is quite disappointing, despite the fact that they are the most desperate economies in the world in terms of growth and development.

On the other hand, from a different point of view, worldwide known development economists, especially scholars such as (Collier, 2007; Easterly, 2006; Sachs, 2005; Moyo, 2009) argue that poor growth, slowest intra-regional trade and economic instability in the sub-Sahara is due to implementation of wrong policies rather than poor performance of institutions. That has raised another debate on what exactly should

economies sharpen in order to encourage more growth and development. The current debate on the development of the SSA region has also listed endless crisis, high market volatility and slow growth as the major areas that researchers need to concentrate. It is also worth mentioning price distortion, trade restricting policies, overvalued exchange rates, excess money supply and inefficient public expenditures (which have been subjected to expenditures on luxuries) as variables that have been blamed by international forums on economic development of Africa.

Also, to meet political tensions, politicians and decision makers in this region tend to make plans/decisions which are for short run outcomes rather than long-term results. Therefore, to measure the degree of convergence of income in the EAC zone we apply simple time-series empirical analyses as specified from equation (1.1) to equation (1.4) above, whereby the effects of policies and institutions on the process of convergence are estimated. While analysing the impacts of policies on institutions,(Acemoglu, 2002, 2001) noticed that there is an issue of joint endogeneity in the set of explanatory variables as institutions were found to be ineffective when policies are ineffective as well. They went further to mention that the past colonial institutional framework, which is still followed by most of institutions in developing countries, was not modelled for development or growth.

That implies even when policies are significant, institutions may still be ineffective to stimulate development and growth since the institutional arrangement were set to suit non long-term colonial settlers. Further in their analysis (Acemoglu, 2002, 2001), found the autonomous impact of policies is minimised when the performance/efficiency of the institutions is improved. Their findings and analysis are relevant and useful for this study, since they investigated members of ECOWAS which has failed to meet the convergence criterion despite being on free trade agreements for more than two decades. On the other hand, other studies that have investigated the failure to meet convergence criteria in least developing countries have taken another approach by focusing on the specific aspect of institutions. For instance (Shleifer, 2004) examined whether adopting multiparty/democracy is a pre-requisite for fast economic growth. This point was also raised by the 1980s IMF and World Bank structural adjustment policies introduced to developing countries as one of the key points towards economic development. Regarding developing countries, their study noticed that human capital accumulation in the economy should be the pre-requisite for democracy and then faster growth and development will follow as an outcome.

Finally, they concluded with interesting suggestions on the importance of strong policies, upgrading political institutions and maintaining political stability are the key ingredients of faster convergence in the struggling poor economies. Their case study based on the divergence of economic growth between North and South Korea, which were one economy before they separated in the mid of the 20th century. They also noted the China of Mao Tse-tung which focused and implemented its policies for long lasting growth of the economy which has become one of the strongest and largest economies in the world since the early years of the 21st century. Therefore, the key point to note from (Shleifer, 2004) is that, ensuring quality of institutions motivates the implementation of polices that are friendly to long-run economic growth. Also, he did not find democracy and other government constraint to be significant as found by other studies named above.

One can note from their findings that there is no empirical evidence that dictatorship or single-party systems have led to poor growth and development in the SSA region, particularly implying emphasising democracy/institutional reforms should not be the priority of international organisations engaged into development of the region. (Acemoglu, 2002, 2001; Shleifer, 2004) agree that institutions must be designed to focus on the specific institutions and their effectiveness in ensuring security in the economy in terms of property right, macroeconomic stabilisation and conflict resolutions The status and the degree of growth of an economy should determine the design and setting of the institutions that will foster fast economic growth. Sensitivity of economic settings should be on the available local opportunities and constraints in analysing why developing markets fail to attain convergences. As will be discussed in the next chapters, while encouraging long-run reforms that will lead to convergence of the EAC economies, emphasis should be on the institutional reforms and their specifications.

1.4.1: Results on Income convergence in the EAC

As part of an introduction, this section intended to investigate the stochastic trend (unit root) of income (GDP per capita) in the EAC block so as to comment on the long run behaviours of the income of the extended market. Equation (1.4) is the key step to be followed whereby the Augmented Dickey Fuller (ADF) test based with a mean equal to zero and the error term is independently and identically distributed as shown below;

$$Y_t = Y_0 + \sum_{i=1}^{t} u_i + a_o t \qquad (1.5)$$

Whereby $a_o t$ captures the deterministic trend while $Y_0 + \sum_{i=1}^{t} u_i$ estimates the stochastic trend of model (1.5). Unlike the Dickey Fuller (DF) test, ADF test uses similar procedures but drops all structural autocorrelation impacts in the time series. To make it more interesting, we examine the ADF test for the government spending and inflation of the five EAC countries. This helps to estimate whether the level of spending and income is converging throughout the block. The same applies to inflation as it is argued that in order to ensure a steady economic growth in the block, it is important to maintain the same levels of prices of goods and services in the unified market. This also helps to deny or validate whether there are preliminary indications that there are trade creation and trade diversion problems. The preliminary results are presented by table 3 in the next page.

Table 3 Augmented Dickey Fuller Unit Root test

	t-Stat	P-Value	Coefficient	R^2
GDP per capita				
Burundi	-5.48	0.000	-0.794***	0.39
Kenya	-5.15	0.000	-0.716***	0.36
Rwanda	-7.79	0.000	-1.127***	0.56
Tanzania	-1.74	0.403	-0.319	0.48
Uganda	-5.36	0.000	-0.758***	0.38
Government Expenditures				
Burundi	-5.69	0.000	-0.925***	0.43
Kenya	-4.97	0.000	-0.847***	0.39
Rwanda	-5.55	0.000	-0.815***	0.40
Tanzania	-2.96	0.057	-0.719**	0.34
Uganda	-4.79	0.000	-0.843***	0.41
Inflation				
Burundi	-8.16	0.000	-1.912***	0.72
Kenya	-6.79	0.000	-1.546***	0.61
Rwanda	-2.66	0.091	-2.699*	0.30
Tanzania	-7.33	0.000	-1.143***	0.57
Uganda	-3.77	0.009	-1.566**	0.59

Whereby *, **, *** imply significance at 10%, 5% and 1% respectively.

Therefore, from table 3 above we reject the null hypothesis that a unit root exists at the three degrees of freedom. Also, the coefficients of the ADF test reject the null hypothesis by portraying significant outcomes that there is no unit root in most of the member countries and thus generally, the variables are stationary. Also, the group (panel unit root) indicated significant t –statistics hence leading to the suggestion that indeed the five EAC countries are converging towards income equilibrium. With the exception of Tanzania, the results portrayed non unit root at 10% as compared to the rest of the block members which were significant at 1%. In future chapters, other SSA non EAC members are also included so as to estimate the degree of convergences throughout the continent. Through that process we are able to identify and isolate countries that are converging at a oath that they can be invited into the union. The t-statistics are indicating that Rwanda and Burundi, who are the smallest economies, are converging faster than the big three. Tanzania and Kenya are considered as the large economies and indeed they are growing slower than the rest of the region. Moreover, government expenditures are also strongly converging and equally adjusting except Tanzania's government expenditures which are found to be significant at 5% and 10% degrees of freedom as compared to the rest of the block members, which are significant at 1% degrees of freedom.

Further, we examined the degree of convergence on the price levels across the region where, as shown in the above table 4, we find that consumer prices are equally adjusting (converging) towards equilibrium throughout the region. Again Rwanda and Burundi's coefficients portrayed lower significance (5% and 10%) when compared to other block members, which ranked at 1% degrees of freedom. That also means price divergences across the region will decline in the long run and may perish so as to ensure constant prices throughout the region. The lower prices (inflation) divergence also suggest how robust it is for this block to introduce a single currency that will reduce transaction costs and hence growth of the entire block. Price fluctuations and divergence can be explained by many factors, however, in which some are unique in each economy for example poor rain seasons, world prices fluctuations, oil prices fluctuations and political unrest.

In addition, at this point each country is entitled to undertake internal measures to adjust any disequilibrium in the market without affecting or influencing changes in other participating members. One of points raised by the previous studies is questioning whether constant prices across the trade block are a pre-requisite for higher integration

or a result of strong convergence and the proper running of the trade block. As the literatures on time series suggest, alternatively convergence can be measured by conducting a cointegration test, which explains the long-run equilibrium relationship between variables in a unified market. We fail to do so; however, since the single equation cointegration test of Engle-Granger and Phillips-Ouliaris suggests the p-values may be inaccurate when the estimated data set has less than thirty six (36) observations after adjustments.

Therefore, we stick to the traditional measure of the stochastic trends to estimate the long-run adjustments (convergence). In other platforms such as (Dobson, 2006; Dobson, 2010; Dobson, 2002; Dobson, 2003), it has been broadly discussed that it is not optimal for EAC countries to form a currency union due to macroeconomic divergences. As part of the introduction, income particularly is found to be converging despite the structural differences across the region and the long run adjustments are significant constant. The idea of neighbouring countries traditional (automatic) convergence may seem to be controversial when it comes to small developing countries but, the simple approach applied by this chapter gives a picture that sharing the same border and producing a similar trend of products encourages fast growth especially in the most vulnerable parts of the participating economies.

CHAPTER TWO

Measuring the trade effects of the EAC agreement

2.0 The gravity model

Many recent studies have cited the gravity model as an efficient analytical tool for measuring bilateral trade by noting that the volume of trade between any two markets i, j (T_{ij}), is a function of the market's size, distance and trade attractions between the trading partners. The key assumptions of the gravity equation is that distance, transportation costs, poor technology, poor communications means, transaction costs (which is sometimes supplemented by the common borders) and other structural factors have a negative correlation to the flow of capital and labour (common market) in a pair of countries. In the case of the EAC block, the distance between the five countries is quietly small but the costs of transportation are higher due to poor infrastructures, higher oil prices and poor insurance systems that could encourage more investments into the transport and communication indicators. These factors have also been listed by the study of (Mundell, 1960) who noted that transport costs are much higher in less developed markets (entire SSA region) even for a short distance due to poor local infrastructures, especially in the remote areas where majority of the society are located and participating in agriculture as the main source of employment.

Furthermore, there is a positive relationship between a country being land-unlocked in terms of lacking access to sea transport and the costs of production. For instance, three (Uganda, Rwanda and Burundi) out of five EAC countries are landlocked and they depend on the harbour services of Tanzania and Kenya ports. That is theoretically, the costs of goods and services in those countries are higher as they incur other extra costs before reaching the final markets. In addition, the theory suggests that exports from landlocked countries are higher than exports from an unlocked country; and the opposite is true, other factors being equal. Therefore, the gravity model to be used in this chapters (and chapter four), will includes all structural and macro variables that influences the trade flow within a specified group of countries.

 "The gravity model comes from the Newton's law of universal gravitation (1687). In 1961, Jan Tinbergen – in his paper "Shaping the World Economy suggesting for an International Economic Policy" - modelled the international trade flows by using a functional form that is a generalization of the Newton's one (A.Sissoko, 2004)".

Therefore, as noted above, we use two different data sets by following the gravity specifications of (Ajayi, 2003; Capannelli, 2009; Carrere, 2004; Collier, 2008; Gedaa, 2007; Hoffmaister, 1999; Keck, 2007; Philippidis, 2006; Porojan, 2001; Sissoko, 2004), whereby some variables were ignored by most of the reviewed studies; especially unique variables for the EAC block, such as political instability and related variables are introduced in our model. When (Tinbergen, 1962) first introduced the gravity model of international trade, many critics regarded the gravity equation as suspect as it lacked critical theoretical background to support its validity on analysing panel data sets. However, the model has gained significant success in estimating the equations, especially those with the assumptions that the products being traded within the block are differentiated by place of production (assuming that production is operated with an increasing return to scale).

Some of the studies that have tried to re-examine the validity of the gravity model such as (Hoffmaister, 1999), have noted that the gravity model[19] becomes more consistent when the Heckscher-Ohlin framework is expanded to include transport costs and other modern factors that can determine the volume of trade within a pair of countries. In a nutshell to the forewords of the gravity equation, therefore, most of the variables that are to be included in our two models have also been applied by previous studies and they have proved to be relevant and significant to explain questions such as the key question of this study (is the EAC optimal for a currency union?). For instance, one of the interesting points raised by the study of (Philippidis, 2006) is the impact of unobserved (indirect) transport costs between the block members on the volume of trade, such as technical standards of members, red tape procedures, licensing laws, and health and safety costs. In addition, they also induced some dummy variables to capture some of the specific trade (market) barriers between the two trading partners, such as the dummies for language and border distances of the block.

Despite the fact that data for many variables is not available, we note them down for future studies while some of them are captured by specified dummy variables. Finally, one can notice that the gravity model allows the addition of any variables that may have some impact on the "size of the market and the distance between" countries in the trade

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[19] The gravity model has gone from being a theoretical orphan to being the favoured child of all main theories of international trade Hoffmaister, W. a. C., D.T (1999), "North-South Trade; is Africa Unusual? International Monetary fund, Washington DC,." *Journal of African economies, Oxford University,* Vol. 8, No.228 - 256..

union. Therefore, as noted above, our first attempt is to examine the volume of trade whereby the bilateral imports between the five countries is used as the depended variables. The data for this first analysis are gathered from UN-COMTRADE data base for individual countries.

2.1 Model Specifications

Traditionally, literature suggests the gravity equation to be modelled as follows;

$$M_{ij} = \beta_0 + \beta_1(Y_iY_J) + \beta_2(N_{ij}) + \beta_3(PCincome_i PCincome_j) + \beta_4 CT_{ij} + \beta_5(OMS_i OMS_j)$$
$$+ \left[\beta_i \sum + \beta_j \sum Z_J \right]$$

(2.1)

Where M denotes bilateral imports between country i and j (one country against the rest of the EAC members), Y is income/size of each economy measured by GDP which is expected to be positive to imply the higher the income of the block members the higher the volume of trade throughout the region. PCincome is the per capita income for each block member, which is also expected to produce a positive coefficient with similar implications to GDP. N is the total population for each member also as another determinant of the size of the economy. CT captures the costs of transport within the trade union and it is expected to produce a negative coefficient to imply the higher the transport costs between members, the lower the volume of trade. OMS is capturing other macro-structural variables that are discussed as the key determinants for the volume of trade within a group of countries. Included are factors such as political stability/civil wars, level of corruption, time consumed/required to start a business in each economy. These factors are expected to produce results that will help to isolate the determinants of international trade in each country.

Therefore, to this point, it is clear that in equation (2.1), the size of the market as the key aspect of the foundation of the model (as explained by (Tinbergen, 1962) is captured by, $\beta_1(Y_iY_J) + \beta_2(N_{ij}) + \beta_3(PCincome_i PCincome_j)$ while the rest explains other structural related variables, especially the determinants of costs of transport in the region. There are many factors that can be listed as measures for the size of the market. However, GDP, per-capita income and population are expected to produce more valid results, since some of these variables, GDP particularly, are a combination of other key variables of the economy such as government, household spending, private investments and trade balance.

EAC economies, like other developing markets, have similar supply conditions and different factor endowments and limitations as portrayed by the settings of the key sectors of production in the region. Thus, the gravity results and the specified variables are expected to answer or to give some insights on whether it is optimal to adopt a single currency throughout the region. Furthermore, the primary theory of regional integration notice that if there are wide gap/differences on the settings of the factor endowments in the trade union, there is likely to be trade creation impacts. Further to that, the theory suggests that; in the long run countries within a trade union are expected to specialise in production and the differences in the demand patterns of the extended market will encourage and favour more trade creation. And thus the trade diversion problems are escaped or reduced.

To extend this discussion, IMF's direction of trade statistics for 2009 report indicates that, in EAC, Uganda and Burundi are more productive in the agriculture sector, while Rwanda and Tanzania are reported to be more productive in the fuel and mining sectors. Kenya is the most productive in the manufacturing sector due to its dominance in the industrial sector throughout the region. That means as structural differences decline in the long-run, there are lots of potentials for the EAC countries to create even more trade opportunities given the differences in factor endowments and the productivity of the key sectors of the economies in each of the participating member economies. In addition, as briefly explained above, all other infrastructure/distance/costs of transport indicators are captured by the summation variable $\beta_j \sum Z_J$ in equation (2.1) including variables such as availability of telephones per one thousands (1,000) people, technologies applied by mobile telephone companies, distances of the paved roads of the country, and so on).

It is worth of a note that the economic and political history of the EAC region is well documented, and this analysis is including all the variables with both direct and indirect impact to the intra flow of goods, services, capital and labour. For instance, as noted above, some of the EAC members, especially Rwanda's, Burundi's and Uganda, have been wounded by civil wars that lasted from the mid 1980s to early 2000s and thus their economic growth and openness to the world market ought to be reduced as compared to Kenya and Tanzania who have not been into civil wars apart from general election political unrests. Further to that, in the early years after independence especially in the 1970's and 1980's, coups d'état, dictatorships and single party policies have limited the growth of these economies, due to limited exports and foreign investments from the rest

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of the world. All these variables can be applied and included in the gravity model, as it allows[20] including as many indicators as possible that can enable the capture of many results that can be interpreted to answer the key questions of the study.

Also from model (2.1) above, some literatures have suggested the costs of transport to be broken down in terms of plans, funding and the ability of the indicators to services the entire region. They (literature) insist that each country, before full integration, has its own priorities and has its own funding mechanisms of the infrastructures which determined transport costs. For future literature, we emphasise the fact that structural factors, especially those with significant correlation with the costs of transport in an economy, to be specified clearly, since they are different in each member of the proposed EAC market. Factors such as the accessibility of road infrastructures, technology, access to sea transport, number of flights landing in each country and the number of countries each country is sharing border with have to separated, as they are naturally different in each country. This does not only help the evaluation and interpretations, but also helps to escape some biases study like this are likely to encounter while interpreting the results.

The study of (Hoffmaister, 1999), which is based on cross-sectional analytics, included the standard deviation of the exchange rate per year to capture the impact of exchange rate volatility and how transaction costs caused by a differentiated exchange rate reduces the flow of trade in an economic union. We omitted to include the exchange rate variable in this analysis due to lack of accurate daily data for the past forty to fifty years, despite the fact that their results (Hoffmaister, 1999) portrayed a significant correlation between the standard deviation and the flow of imports. Again we failed to follow that study instead the entire chapter bases on panel data analytics given the fact that inclusion of data with inaccurate time lag can mislead the entire study. I. That is, the advantage of our equation specification is the fact that panel data procedures allows us to estimate how the variables in the settings are adjusting with their own lags. Therefore, from equation (2.1) we expand variable ($\beta_3 CT_{ij}$) by introducing the following equation (2.2), explaining the determinants of the costs of transport as specified below:

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[20] We also estimate equations including variables capturing geographical and language features for countries, the commodity composition of exports and a measure of trade policies in developing countries ibid.

$$CT = \alpha_0 + \alpha_1(Oil_{ij}) + \alpha_2(Dist_{ij}) - \alpha_3(boarder_{ij}) + \alpha_4(Language_{ij}) - \alpha_5(Telecommunications_{ij})$$
$$- \alpha_6 Internetacces_{ij} + \alpha_7 Locked_{ij} + \varepsilon_{ij}$$

$$(2.2)$$

Where CT is the cost of transport in each member state while α is a parameter capturing the velocities of each variable and the intercept of the costs of transport. One of the key determinants of the costs of transport in any economy is the price of oil and it tends to affect all factors and agents of production in case there are some shocks on the demand and supply of oil. Given the explanatory power of availability of oil on the costs of transport, we were not able to obtain an indicator on the amount of oil consumed per day/month/year by each country. The oil prices we thought to be not a good indicator as it is pre determined by the world market. Therefore, we employed oil rent as an indicator for the oil consumed in each country per year instead of oil prices. Also the available data on oil prices covers ten years for three countries only hence concluding that they may mislead the entire arrangement of the gravity equation. Therefore, we use oil rents which differ in each country depending on the amount of oil consumed in each country per year, that is, the higher the oil consumed the higher the oil rents paid in the country per year. We expect oil rents to have a positive coefficient implying that higher oil rents mean higher supply of oil in the economy. That leads to lower costs of transport hence higher volume of trade within an extended market.

Also, some literatures which used a small group of markets which are more closely located such as the USA states, measure the actual average distance between one country and the rest of the block members (variable $Dist_{ij}$ in equation 2.1). The gravity model expect the actual distance to be positive correlated to the costs of transport implying the longer the distance the higher the costs of transport, and hence the lower the volume of trade other things being equal. In this analysis, however, we argue that technology and the levels of the indicators of infrastructures and communications reduces distances. That also means indicators of transport and communications are more significant indicators of costs of transport than distance. Therefore we preferred not to use distance in our data set not only it was not such significant, but also the computed distance was creating some problems while estimating the results.

on the other hand, the variable ($boarder_{ij}$) measures how many countries each member is sharing border with within the EAC region. As briefly explained earlier, literatures have suggested that a country that shares (surrounded) common border with most of the

member is expected to experience higher volume of trade as compared to a country that shares same border with few members of the trade union. Literature insists that by sharing common border, distance and costs of transport are reduced hence favouring more trade flows with a set of countries and therefore, α_3 is expected to be negative. Some noted studies have included this variable by ranking the number of borders shared by each country in a cross section. For example in our case, Tanzania shares borders with all the participating countries (borders=4) while Burundi shares with two members (borders=2), Kenya two members (borders = 2), Uganda three members (borders = 3) and Rwanda shares with three EAC countries (Borders = 3). However, like the variables $Dist_{ij}$ this might not a case rather infrastructures and technology are the most important indicators of costs of transport.

Also, the variable ($Language_{ij}$) is listed as one of the factors that can reduce costs of transport as a result of communications costs incurred during transactions. Also, differences in the official national language reduce the flow of the labour force across the common market. In the EU area, for instance, the free flow of labour is limited by language due to the fact that at least each country in Europe speaks their own official language, which limits the application of the theory an economic union which requires the labour force to be freely moving from one country to the others with abundant opportunities. This is almost the case in the EAC zone, despite the fact that majority of the EAC society speaks Kiswahili but the official national languages are different across the region. In Africa, the difference in language is associated with the colonial history of each country. Whereas countries such as Kenya, Tanzania and Uganda speak English as their first or second official national language due to the fact that they are ex-colonies of the British Empire, Rwanda and Burundi speak French as their national language despite being Belgium's ex-colonies.

Therefore, transaction and transport costs increase when trade partner countries speak different languages and we expect α_4 to be positive to portray the positive correlation between language and the costs of production. Thus, a member country that uses a national language that is spoken by the majority of the society in the block is expected to have higher volume of trade and vice versa. Also given that English is the most spoken language in the world, we expect the market openness to be wider in English speaking countries and less in none English speakers. Furthermore, variables such as $Telecommunications_{ij}$ and $Internetacces_{ij}$ have been widely used to capture the impact

of the level of infrastructures on flow of trade between trading partners. Recent studies have suggested that SSA is the fastest growing market for technological products such as internet and mobile phone. In addition, the investments in fibre optic by some countries in SSA, EAC countries particularly, have lead to the forecast that by the year 2025, majority of the society will have access to internet and other modern communication products. That is expected to minimise the costs of transport and fostering faster growth and convergences in the entire SSA region. Their coefficients α_5 and α_6 are expected to be negative to imply the higher the number of people with access to telecommunications and internet, the lower the costs of transport, other factors being equal.

Other studies have employed indicators for telecommunications and internet such as the number of mobile phones per 100 people, access to internet per 1,000 people, number of personal computers per 1,000 people and digital against analogy systems of transformation. In this study we employ the number of landline telecoms and the number of people with access to Internet services per year for each country. Our final variable in equation (2.2) captures the impact of a country being locked with no access to sea transport $Locked_{ij}$. As introduced above, in landlocked economies, the price of both exports and imports are higher than in a country with access to sea transport. Three out of five EAC countries do not have access to sea transport and that is one of the key motivations to the integration of the EAC economies so as to encourage productivity and industrialisation in the region by eliminating other extra costs of the final products (imports or exports). From this final point, we expect Kenya and Tanzania (access to sea transport) to have higher volume of trade flow than the rest of the block members, other factors being equal.

2.1.1 Data and Econometric Procedures

Data used by this phase is annual data from the World Bank world development indicators and UN-COMTRADE. Total Merchandise Imports for each country from different sub-Saharan countries are used as dependent variables to capture the volume of imports of each country from the selected African countries and from the rest of the world. Total imports is used as the dependent variables in the first phase which we measure the intra trade volume of the EAC block. In the later sub sections of this chapter we use the merchandise imports as the dependent variables. Merchandise imports are more preferred because firstly, it has almost similar interpretation with

merchandise exports, since imports of country i is the export of country j who are included in the panel and also, the merchandise imports includes other additional costs that products have to incur before reaching the final consumer (CIF)[21]. For consistency and comparison reasons, main gravity results are computed from polled regression, fixed and random effect regressions (for both phases except the last phase) whereby the Hausman test is used to identify the most efficient and consistent analysis between fixed and random effect analysis (Hausman, 1981).

Unlike the random effect, the fixed effect analysis controls time invariant to individual countries by assuming that the impact of the time variable on certain explanatory variables in one country should not be correlated with the behaviour of another explanatory variable of another country within a cross section. Also, FE assumes that variables in each unit in a cross section have their unique behaviours and therefore, the error term and the constant (intercept) should not be correlated with the intercept of other member countries in the cross section. Therefore, if the Hausman test favours the fixed effect analysis, then this analysis will have to assume that some unidentified (error) variables within one country are correlated with some of the variables of other panel countries at a given time t. Therefore Fixed effect analysis does not consider time invariant variables, for instance, time-invariant of the country is perfect collinear with the country's dummies but Fixed effect analysis only shows the causes of changes within a country assuming that time-invariant characteristics have no impacts to the dependent variable because time is fixed in each cross section (Baltagi, 2001; Baltagi, 1990; Kreuter, 2009).

The null hypothesis (H_0) for the hausman test is the assumption that all years' coefficients are jointly equal to zero, therefore no time fixed-effects are needed. If the alternative is accepted, further time series procedures have to be followed to examine the long term behaviour of the selected panel variables. On the other hand, unlike fixed effect, random effect (RE) model analysis assumes that the variations within countries are random and are not correlated at all. That is, the differences between countries have some impacts on the dependent variable Y_t. Random effect includes the impact of time to the selected variables, unlike the FE which controls such variable using the intercept, while the error term (under RE) has no influence on the explanatory variables which are

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[21] CIF stands for Cost, Insurance and Flight

influenced by time-invariant variable. Therefore RE analysis allows specifying unique characteristics that may or may not have some impacts on the manipulated variables but, if such specified variables are not available, then the RE results will be biased due to omitted variables in the panel equation. Therefore in order to choose either RE or FE we use the Hausman specification test (Hausman, 1981)which is distributed as x^2 and is computed as follows:

$$H = (\beta_c - \beta_e)' (V_c - V_e)^{-1} (\beta_c - \beta_e)$$

(2.3)

Where β_c, is the coefficient vector from the consistent estimator, β_e is the coefficient vector from the efficient estimator, V_c is the covariance matrix of the consistent estimator and V_e is the covariance matrix of the efficient estimator.

Table 4 The Hausman Test Hypothesis

H$_0$; Random Effects	H$_1$; Fixed Effects
1. The Specified Panel equation is a Random Effects Model (Unique errors are correlated with controlled variables).	1. The Specified Panel equation is a Fixed Effects Model (Unique Errors are not correlated with controlled variables).
2. Prob>chi2 >0.05 (Random Effect)	2. Prob>chi2 < 0.05 (Fixed Effects)

Therefore, the Hausman test compares an estimator $\tilde{Q}_1$ that is known to be consistent with an estimator $\tilde{Q}_2$ that is efficient under this assumption being tested. The null hypothesis (H$_0$) is that the estimator $\tilde{Q}_2$ is efficient and consistent of the true parameters. Therefore, there are no systematic differences between the two estimators and if they exist, then one has to question the assumptions from which the efficient estimator is based. If the estimator is pweighted or if the data are clustered, then the assumption of efficiency is violated and that means the Hausman test cannot be applied.

For the second part of the analysis, given the nature of the data set, we estimate the GMM system as there are likely some biases caused by endogenous explanatory variables.

2.1.2 Unit root test and Cross sectional dependence of the panel.

Cointegration techniques have been widely applied by the modern empirical studies in estimating long time series. As will be discussed below, lack of power of the Dickey Fuller (DF) and the Augmented Dickey fuller test (ADF) has been the motive for the development of more powerful stationarity tests and cointegration tests for panel data. Basically, there have been two mainly suggested procedures, namely maximum-likelihood and residual based test for panel data. The Maximum Likelihood process has been developed by the (Jan, 2003; Kleibergen, 2003; Rolf Larsson, 2008; Michael K Andersson, 1999; Larsson, 1999; Larsson, 2001), while the residual based procedures were primarily introduced by the paper of (Kao, 1999; Pedroni, 1999, 2004). The procedure of (Kao, 1998) is an extension of the LM test which tests a null of cointegration for a moving average (MA) root while the (Kao, 1999) is an extension of DF and ADF, whereby four different DF procedures are introduced by using a sequential limit theory of (Phillips, 1999)which measures the asymptotic distribution of the four DF tests. On the other hand, the (Kleibergen, 2003) procedure estimates the homogeneous and heterogeneous cointegrating vectors within a MA framework. In addition the studies of (Larsson, 1999; Larsson, 2001) identified cointegrating vectors based on the cross sectional independence of the variables.

Many studies that were solving panel equations noted that, in order to report panel models, time series procedures have to be followed in order to measure the stochastic trends of the panel variables. Some literatures have noted that a unit root (stationary) test is a potential measure for long-run (cointegration) equilibrium relationships between variables. This is normally the first step while estimating a model with time series components and if the panel variables are stationary at level data, then the panel equation can be estimated by following the tradition approach of estimating an econometric equation (Greene, 2008; Baltagi, 2008; Levin, 1992). Therefore, given the weaknesses of the unit root estimation procedures, all three phases of this chapter employ the Levin, Lin & Chu test, the Im, Pesaran and Shin W-stat, the ADF - Fisher Chi-square, and the PP - Fisher Chi-square, as they are following almost similar steps while measuring unit root existence. However, most of the studies cited by this paper

have applied and recommended the Levin, Lin and Chu (LLC) test[22] as it assumes constant autoregressive parameters across the given countries (cross sections). On top of that, the LLC test assumes the intercept and trend coefficients in an individual regression error are flexible across countries and each individual country in the cross section has its specific mean and time trend allowing us to capture and identify the existence of convergences of the variables towards equilibriums. Basically, the LLC test is originally estimated as follows;

$$\Delta\rho_{ij,t} = c_{ij} + \gamma_j \rho_{ij,t-1} + \sum_{h-1}^{k(j)} \chi_{hj} \Delta\rho_{ij,t-h} + \varepsilon_{ij,t}$$

(2.4)

Whereby i, stands for country i, j is a panel variable in country i given time t while $\rho_{ij,t} = \ln(g_{ij,t} / \bar{g}_{jt})$ is defined as differential of the key variables of the panel that is GDP and indicators of costs of transport (distance) and $g_{ij,t}$ denotes the raw value j of country i. Δ is the operator of the first difference while the error term identically independently distributed is captured by ε . The selected number of lags $K(j)$ to be included in the LLC specification (2.4) are identified individually in each country. We estimate the level of convergences by estimating the value of γ_j whereby the null hypothesis is ($\gamma_j \geq 0$) the existence of common unit root (non-stationarity) and there is also an explosive divergence between the selected variables. On the other hand, a negative value of $\gamma_j (\gamma_j \leq 0)$ implies the selected variables are stationary and the panel variables are converging at a magnitude that determines the speed of convergence.

This part applied E-views statistical software which produces results for four different tests but the LLC test results are more considered for explanations while the Im, Pesaran and Shin test, ADF and PP - Fisher Chi-square test are not only included to compare with the main results (LLC), but also are considered since the interpretation and uses of the LLC test results are almost similar to the other four measures except the Im, Pesaran and Shin test, which allows autoregressive parameters to differ across the

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[22] The Im Pesaran and Shin test starts with carrying out the Augumented Dickey Fuller (ADF) test for every variable over each country and the main extension of that procedure is to allow for heterogeneity in the value of γ_j under the alternative hypothesis Baltagi, B. (2008), "*Econometric Analysis of Panel Data,"* John Wiley & Sons, Levin, A., Lin, C.-F., (1992), "Unit root tests in panel data:asymptotic and "nite-sample

properties." *UC San Diego, Working Papers*, No.92-23.

cross sections. In addition, the ADF and PP - Fisher Chi-square test, like the IPS test, considers intercept and time trend while allowing fixed effects/individual trends.

2.1.3: Breusch-Pagan Lagrange Multiplier (BPLM) tests for cross sectional dependence.

The data set used at this phase has a larger time (T) dimension than the number of cross section (N) countries (T > N), and therefore the BPLM test is more desirable, since the need to measure the degree of cross-sectional dependence is still valuable. By definition, the BPLM is a Lagrange multiplier test based on OLS residuals used to estimate whether there are significant differences (heteroscedasticity) across countries. This test identifies the characteristics and links of the variances of the estimated RE residuals and the independent variables. According to (Baltagi, 2008; Greene, 2008; Levin, 1992), BP LM is estimated as follows;

$$LM = T\left[\sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \rho_{ij}^{\,2} \right] \tag{2.5}$$

Where ρ^2 is the sample estimates of the pair-wise correlation of the residuals, N is the cross sectional-dimension (countries) and T is time dimension while ρ is estimated by the following equation.

$$\rho_{ij} = \rho_{ji} = \frac{\sum_{t=1}^{T} \mu_{it}\mu_{jt}}{\left(\sum_{t-1}^{T} \mu_{it}^{\,2}\right)^{1/2} \left(\sum_{t-1}^{T} \mu_{jt}^{\,2}\right)^{1/2}} \tag{2.6}$$

H_0; Variance components for groups and time are all zero, that is, no significant difference across units. Therefore, in a nutshell, BPLM estimates the degree of correlation of cross section residuals and variance components.

2.2: Empirical results

Table 5 Results from the UN-COMTRADE dataset

Intra-imports	Fixed	Random	POLS
LnGDP	0.777**	0.777***	0.777**
	(0.27)	(0.269)	(0.269)
LnPopulation	1.722**	1.722**	1.722*
	(0.71)	(0.711)	(0.711)
Borders	-	0.376*	0.376*
		(0.263)	(0.263)
Landlocked	-	-2.85***	-2.849***
		(0.389)	(0.389)
Language	-	-1.96***	-1.963***
		(0.637)	(0.637)
Trade Agreements	-	-1.196*	-1.196*
		(0.666)	(0.666)
_cons	-6.904***	-4.68***	-4.682***
	(1.408)	(1.080)	(1.080)
R-squared	0.83	0.91	0.83
Adjusted R-squared	0.82	0.88	0.82
Observations:	75	75	75
Hausman test -	-	-	1.30
Prob>Chi^2			(0.005)

Standard errors in brackets.
*, **, *** denotes significance at the 10%, 5% and 1% respectively

From the Hausman estimator, the null hypothesis that there are not individual effects in the cross section is rejected and hence random effects models are the most consistent and efficient estimators for our data set. Also, the Hausman test results confirm that there are slight differences which are not systematic and hence the error terms in the cross section are heterogeneous. In general the null hypothesis that the selected variables do not explain the volume of imports is rejected by all the variables at different degrees of freedoms. Also, despite their weaknesses on estimating panel data, Pooled Ordinal Least squares produced very significant results as compared to FE models, which ignored dummy variables. However, further investigations on the heterogeneity were expected to produce more reliable and unbiased results. As mentioned by (Baltagi, 2008), OLS and RE coefficients are slightly similar, despite the fact that OLS are mostly biased due to the nature of the panel data (especially when there are time-varying explanatory variables in the data set).

Therefore, by comparing the three procedures, one may conclude that using Pooled OLS produces more suspect results as compared to the other methods as it ignores testing the relevance of other omitted variables. On the other hand, FE produces unbiased estimates but they are less efficient as they drop/ignore country's specific determinants captured by dummy variables (FE do not estimate time-invariant variables). RE on the other hand, produces unbiased and efficient outputs which according to the Hausman test, the unobservable cross section effects and the panel independent variables in the dataset are not correlated. National output (GDP) a population produced the expected positive value which responds to the Hechscher-Ohlin model that the bilateral trade flow (measured by intra-imports) between two/pair of countries is based on comparative advantage. In addition, they respond to the initial gravity modelling by (Tinbergen, 1962) which states that the bilateral flow of goods and services depends positively on the sizes of the economies (GDP and Population).

The Hechscher-Ohlin further noted the intra-industry dependence between a pair of countries whereby a small economy is expected to specialise in labour-intensive industries and wage costs are lower than in the large (rich) economy. Also, the results indicate that it is not an advantage for a small economy to participate in multiple trade unions as it may lead to a decrease in intra imports. From the results above, a country that participate in multiple trade unions (more than two trade unions) suffers a decrease in import by (-1.196) millions by participating in one trade agreement. That also discourages convergence and reduces the speed to towards deeper integration. In practice, however, avoiding multiple memberships may reduce/limit total trade flow for a country in Africa's sub-Saharan region, since each country is trying different means to stimulate growth and development. Also there are many motivations on why countries in Africa join multiple trade agreements including historical motivations, political, social and economical motivations. Furthermore, the results above indicate that language is one of the significant contributing factors behind lower intra-imports and growth within the EAC block.

Also countries with different national languages apart from English and Swahili are estimated to be losing (-1.96) in intra-imports to/from other members. Also, the determinants for distance (borders and landlocked) between countries also produced the expected signs. In addition, a country (0) that shares borders with at least three union members is expected to have less transport costs and hence a higher volume of intra-imports. The positive coefficient of variable "borders" is also part of the variables that

determines transport/distance costs which are deducted from the size of the market to obtain the speed and magnitude of trade. On the other hand, landlocked dummy variable indicated to have a string and significant elasticity (-2.83) indicating it is an important explanatory variable for intra volume of imports. Landlocked countries (0) have lower volume of trade as compared to the countries with access to sea transport (1) within the trade union.

To conclude this part, results indicates the volume of intra-imports within the EAC states from 1995 to 2010 has been significantly increasing as income continues (sizes of the economies) to grow, while the distance and transportation costs are continuing to decline due to improvements in infrastructures and technology indicators. The fiscal and monetary adjustment are also converging as the time changes (long–run) and they are even indicating to become more interdependent as compared to the early years of the trade union especially years below the year 2000. However, one can notice that the above analysis is not well complete due to its limited number of observations (time lag) which restricts in-depth statistical procedures to be carried out. In addition, the number of variables and the cross section are also limited, leading to limited investigation and interpretations on the cross-sectional dependence between countries and the selected cross-border variables. The reason to use this data set despite being limited, is the fact that intra-imports or intra-exports have been used widely by the previous literatures conducted in data rich countries and their results and interpretations have proven to be more useful for policy implications.

It is a common problem of luck of accurate historical data in developing countries which limits studies like this to explore more knowledge. The next part therefore tries to apply more variables with an acceptable number of observations (time lag) and the number of economies to be included. Quantitative information are gathered from the World Bank, IMF, COMESA, SADEC, EAC, and other certified online databases including Central Banks. The procedure consumed more time, especially on standardising the data set to be in the same units of measurements and hence estimate the final results. In addition, more specialised statistical procedures are followed and specified in the next part whereby the total merchandise imports are used as the dependent variables. Other variables such as total aid received per year, FDI and number of mobile phones in each member country are also included.

2.2.1: Trade volume merchandise imports in SSA Countries.

In this sub chapter, an extended gravity model with a more complex data set is applied to measure the trade volume by including more variables that determines the flow of goods, services and labour force to/from an economy. The previous gravity model covered only 75 observations which have provided the picture of the statistical requirements that the gravity model is suppose to follow. All panel statistical procedures of estimating the degree of cross sectional dependence of variables, the degree of time series convergence and the impact of time invariant determinants are widely exposed by this chapter, and the key conclusions about the validity and accuracy of the gravity model are expected to be drawn from this part. As mentioned above, we employ total merchandise imports for each country in the 46 selected SSA countries to measure the volume of imports from the rest of world.

Dummy variables are employed to isolate each country from trade blocks that are participating at a common market level to the normal trade agreement, which does not involve free movement of capital and labour within the region. That also implies, a dummy variable is used to isolate EAC countries from none EAC countries which are included in the panel. This helps to examine the role played by the EAC agreement on trade stimulation of the block and its role on the market openness of the entire SSA region. Indeed, each EAC and the entire SSA region have their unique determinants behind lower trade flow, lower growth, poverty and slower development in manufacturing/industry. Therefore, in this part we employ many world development indicators as listed by the World Bank and other international development institutions. The key criterion used to select the indicators is the availability of data with significant observations (time lag); we therefore introduce the following extended gravity equation which follows the traditional definition of the gravity model as specified by model 2.1:

$$MI_{ij} = \alpha_0 + \alpha_1 ME_{ijt} + \alpha_2 \sum Size_{it_t} - \alpha_3 \sum trnsport \cos ts_{ijt} + \alpha_4 \sum OfficialAi\,d_{ijty} + \alpha_5 \sum GovtExp_{it}$$
$$- \alpha_6 \sum ValueforMoney_{it} + \alpha_7 Foodprodn_{it} + \varepsilon_{ijt}$$

(2.7)

Where MI_{ij} is the total merchandise import of a country, which is defined as total goods purchased from other economies and consumed by each country in the cross section. ME_{ijt} Captures the merchandise exports from country j to country i at time t. Higher merchandise exports leads to lower merchandise imports and therefore we expect α_1 to

be negative. $\sum Size_t$ includes all the variables that determine the geographical size of the country, including the total hectares of arable land, square kilometres of the available agriculture land, rural population, total population. The first assumption is that the larger the size of a least-developing economy, the higher the volume of merchandise imports per year other things being equal. $\sum transport \cos ts$ is the summation of determinants of bilateral costs of transport, which also determines the distance between a pair of trading countries.

Some variables reduce the costs of transport while some can increase the costs of transport, transaction costs and hence endorsing the impacts of distance between regional members on the flow of bilateral trade transactions. Therefore, we include oil rents, number of telephone lines, electricity power production, electricity power consumption per year (kWh), landline telephone lines and landlocked countries (dummy) as determinants for the costs of transport, transactions and distance. Each of these variables, therefore, is expected to produce results depending on their impacts to the flow of goods as well as their relationship with the costs of transport. For example, the higher the number of telephone landlines, the lower the costs of transport, and transactions become easier and that motivates higher volume of trade flow.

Lack of data on oil indicators throughout the SSA region, has forces this part to use oil rents as well as an indicators of oil consumed in each country per year. Therefore, we set a hypothesis that the higher the oil rents, the more oil supplied (consumed) in an economy and vice versa. In addition, a country with enough oil supply (captured by rent) is expected to have fewer fluctuations in oil prices and lower (and stable) costs of transport throughout the year. Therefore, the parameter for oil rents is expected to be negative to imply the negative correlation between oil rents and costs of transport, and positively correlated with the flow of merchandise imports. On the other hand, as shown in the previous chapter, a landlocked country is expected to have higher costs of transport and their imports are expected to be even more expensive than economies that have access to the sea transport.

Recent reports on SSA development have noted that the "middle class" is significantly growing in most parts of the region. This has been driven the significant increase in the per capita growth and the entire region's economic growth. That has boosted small and medium enterprises and manufacturing is indicating to growth significantly for the past five years. One of the biggest challenges each country in the continent is facing is

sources of power and energy (electricity). As the economies continue to grow, the demand for electricity has been increasing every year. EAC region in general is also facing the same challenge of unavailability of reliable sources of electricity power. In our gravity equation, we assume that availability of reliable electricity reduced costs of transport and hence stimulate trade volume within a trade union. We capture the relationship between electricity and trade flow by including the yearly electricity power production and electricity power consumption per year (kWh) in the gravity model.

Moreover, international financial aids to African countries have played a significant role of promoting different development activities through different programmes. The past three decades witnessed an increasing number of countries depending on financial aids and soft loans provided by international institutions such as the World Bank, IMF and the UN organs. Under this chapter, we were able to gather some historical data on the amount of foreign aid each country has been receiving per year hence examined their impacts on the flow of trade within the region. Several writers (Collier, 2007, 2008; Easterly, 2006; Sachs, 2005) had contradicting views on how aid is helping the economic growth of Africa. We establish our hypothesis by following the argument by (Easterly, 2006; Moyo, 2009) that; for many years "aid" has discouraged growth of the local market/infant producers in sub-Saharan Africa in terms of intra trade flows and hence the merchandise imports and the deficit balance of trade have been growing as aid increases to the developing SSA. Therefore, we include the National Official Financial aid (NOF) from UN agencies and other international financial institutions given to each country into the gravity model so as to estimate the relations between "Foreign Aid" and the trade flow of the selected countries.

Despite having different objectives, we assume that aid inflow stimulates merchandise imports, rather than merchandise exports and therefore, the parameters of $\sum OfficialAi\,d_{ijty}$ are expected to be positive. In addition, these variables are expected to produce some very interesting results for long-run statistical projections and interpretations given the never-ending debate on the role of aid. Furthermore, government expenditures in developing countries are expected to stimulate more merchandise imports than exports due to the shape of the manufacturing and industrial sectors. To gain more knowledge, we include the gross national expenditure deflator, the gross national expenditure (current LCU), gross national expenditure (current US$), gross national expenditures (constant LCU) and the gross national expenditure (constant

2000 US$) since the method of estimating the expenditure is different. Therefore, the gravity model expects the parameters for the government expenditures to be positive implying the higher the government spending in a small economy, the higher the volume of merchandise imports into the specified country from the rest of the world. Also variable $\sum ValueforMoney$ is the combination of various determinants of supply and value of the currency (money) in each economy.

The official exchange rate and quasi money are assumed to be the determinants for the value of the local currency and the supply of money in the SSA economies and thus they play a significant role on the flow of goods and services in a trade union. Due to lack of the important monetary policy determinants, the two variables are expected to produce useful results for policy explanations with regard to if the monetary policy instruments are converging throughout the block. It is important we note that, developing countries are also characterised by their lower currency value which tends to fluctuate by responding to the world (external shocks) market. Lower currency value (according to the IMF & World Bank structural adjustment policies) discourages imports and hence promotes local productivity.

On the other hand, if the manufacturing/industry sector is in bad shape, then lower currency value leads to inflation and lower intra trade, and hence poverty and economic stagnation. The gravity equation expects the two variables to produce coefficients with different signs whereby the stronger the exchange rate (value of local currency CU/US), the lower the volume of merchandise imports, other factors remaining constant. This variable (official exchange rate) also helps to identify the impact of adopting a fixed exchange rate/single currency throughout the region. It is the aim of many SSA trade blocks to have a single currency or a fixed exchange rate to reduce transaction costs and hence extend the market of their local products but the values and fluctuations have been reducing the speed towards adapting a single currency. This objective can be reached if strong policies are adopted that will favour income convergences and other macroeconomic convergences in the future. In the EAC particularly, Kenya has the strongest exchange rate across the region and thus member countries may have to adopt Kenya's exchange rate as the block's exchange rate (single currency) to the rest of the world. Therefore, the official exchange rate for each country is expected to produce very relevant results to answer some of the key questions of this study.

On the other hand, the coefficient for the quasi money is expected to be positive, implying a positive relationship between merchandise imports and the amount of quasi money in an economy. Also we assume that if the amount of quasi money in circulation is too high, then it implies that the local market does not have long run capital for local production and thus at that point the economy depends on imports (higher merchandise imports). Also in this extended gravity equation, $Foodprodn_{it}$ is included to capture the food production in each country in the region at time t. Despite having hunger and long dry seasons of the year, capital imports remain at the top in the region. Few of the higher food importers in Africa in general are those countries that have been into political instabilities and civil wars for decades. Countries such as Sudan, Somalia, Congo DRC, Rwanda and Burundi have been recorded with hunger within the past five years mostly because of the political unrest in the region and partly due to long dry seasons throughout in a given year.

The regional governments and international humanitarian organisations have responded by importing food products from other parts of the world to stabilise the food deficit , while the long-term solutions remains in the hands of the local authorities. Recently, different strategies to eliminate hunger and reduce poverty in SSA have been tried by different institutions some are indicating to work some are failing. One of strategies indicating to work is the idea of specialising in production in the areas that each country is efficient than the others so as to gain from comparative advantages hence faster growth and development. In addition, such ideas are also advocating for eliminations/reduction of all subsidies in the sectors with less comparative advantages. Through this idea, one of the key questions of the study can be answered by identifying the areas that each country or region is more efficient than the other areas hence to foster faster convergence.

It is important to insist that the data set being used by this part is different from the one used in sub chapter 2.2.2 whereby in this chapter almost all SSA countries are included in the data while a dummy variable is used to isolate the membership of each country to the selected trade Unions in SSA. The variables included have been widely used by a variety of past studies and the results were very significant for policy interpretations. Once again, in the isolated EAC dataset, we carefully investigate the significance and efficiency of the annual official exchange rates and its impacts on the bilateral flow of goods and services The targets of the EAC commission it to establish a currency union between the years 2013 – 2015 depending on the speed of the macroeconomic

harmonisation process and the degree of convergence in the region. We test the robustness of the hypothesis and the model by carefully considering the short and long-term behaviours of the exchange rate by applying multiple time series procedures. First the stochastic trend (unit root), as specified by the previous UN-COMTRADE data set, is conducting to estimate the degree of convergence over time. A cointegration test is also conducted to estimate the equilibrium relationship of the variables in the long run. Also, to estimate the gravity equation, similar procedures as in the first phase are followed whereby the Hausman test and Breusch-Pagan Lagrange multiplier test are carefully conducted due to the size of the observations and the significance of interpreting the results of those tests.

Table 6 Descriptive Statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
Merchandise imports (current US$)	Overall	1513	5512.5	-604	100532	N = 2346
	Between		3598.4	46.478	23325	n = 6
	Within		4207.7	-20352	78720	T = 51
Merchandise exports (current US$)	Overall	1655	6076	0.77	81821	N = 2346
	Between		4025	7.661765	22453	n = 46
	Within		4589	-18813	67539	T = 51
Agricultural land (sq. km)	Overall	0.213	0.259	0.000	1.41	N = 2346
	Between		0.261	0.000	1.201	n =46
	Within		0.0256	-0.349	0.421	T =51
Arable land (hectares)	Overall	3.402	5.289	0.000	37.5	N = 2346
	Between		5.272	0.000	29.422	n =46
	Within		0.876	0.110	12.781	T =51
Telephone lines	Overall	0.111	0.465	-0.06	5.49	N =2346
	Between		0.396	0.000	2.682	n = 46
	Within		0.251	-1.921	2.919	T = 51
Surface area (sq. km)	Overall	0.523	0.581	0.000	2.51	N = 2346
	Between		0.583	0.000	2.461	n =46
	Within		0.072	-1.938	0.572	T =51
Rural population	Overall	7.469	11.445	0.03	78.79	N =2346
	Between		10.840	0.034	57.903	n = 46
	Within		3.998	-12.60	35.663	T = 51
Quasi money (current LCU)	Overall	96786.8	361272	-13755	5707989	N = 2346
	Between		144893	-1292.6	610612	n = 46
	Within		331619	-513839	5378796	T = 51
Population, total	Overall	10.455	17.174	0.04	158.26	N = 2346
	Between		15.726	0.067	90.69	n = 46
	Within		7.274	-35.085	78.025	T = 51
GDP (current US$)	Overall	6555.48	21953.46	-1169.8	363704	N = 2346
	Between		15835.7	180.304	101170	n = 46

	Within		15379.58	-87273	269089	T = 51
Oil rents (% of GDP)	Overall	-170920	1.51E+07	-3.59E+08	2.62E+08	N = 2346
	Between		834212.8	-4041690	13492.72	n = 46
	Within		1.51E+07	-3.55E+08	2.66E+08	T = 51
Official exchange rate (LCU per US$, period average)	Overall	288.85	836.584	0.000	20146	N = 2346
	Between		347.844	0.232	1673.51	n =46
	Within		762.534	-1378.4	19451.6	T = 51
Net official development assistance and official aid received (constant 2008 US$)	Overall	418.391	664.576	-1479.3	12914.5	N = 2346
	Between		360.068	-362.13	1363.49	n = 46
	Within		561.049	-832.37	12302.3	T = 51
Net official development assistance and official aid received (current US$)	Overall	263.019	543.301	-485.86	11427.9	N = 2346
	Between		221.074	-7.266	824.491	n = 46
	Within		497.337	-551.11	10907.9	T = 51
Gross national expenditure (current LCU)	Overall	137.167	611.954	-1767.7	9644.83	N = 2346
	Between		259.607	-94.68	1261.05	n = 46
	Within		555.453	-1862.8	8591.39	T = 51
Foreign direct investment, net inflows (BoP, current US$)	Overall	87.353	601.605	-22456	12999	N = 2346
	Between		85.506	-363.75	326.92	n = 46
	Within		595.628	-22005	12759.4	T = 51
Foreign direct investment, net inflows in reporting economy (DRS, current US$)	Overall	5742.32	22878.86	-104187	260500	N = 2346
	Between		19243.77	39.392	132515	n = 46
	Within		12689.19	-123033	133728	T = 51
Food production index (1999-2001 = 100)	Overall	8168.72	119639	-4009851	2506614	N = 2346
	Between		24911.47	-74309	130747	n = 46
	Within		117073	-3927373	2460115	T = 51
Electric power consumption (kWh)	Overall	892464	2310410	-8429123	1.98E+07	N = 2346
	Between		1515856	-7227.6	5812003	n = 46
	Within		1757603	-8948106	1.56E+07	T = 51
Gross savings (current LCU)	Overall	6147.77	20729.29	-17854	294699	N = 2346
	Between		15140.07	-12.193	97927.1	n = 46
	Within		14330.7	-91778	202919	T = 51
Landlocked	Overall	0.674429	0.469	0.000	1	N = 2319
	Between		0.474	0.000	1	n = 46
	Within		0.000	0.674	0.6744	T-bar =50.41

Table 7 Panel unit root test: t-test Summary, User-specified lags: 1. At 1st Difference

	Levin, Lin & Chu t*	Im, Pesaran and Shin W-stat	ADF - Fisher Chi-square	PP - Fisher Chi-square
Merchandise imports (current US$)	-7.826***	-19.23***	580.29***	922.35***
Merchandise exports (current US$)	-8.13***	-21.86***	674.28***	1238.22***
Agricultural land (sq. km)	45.96	-18.47***	564.16***	939.69***
Arable land (hectares)	43.9362	-15.13***	466.44***	923.78***
Telephone lines	796.256	-21.25***	531.88***	926.45***
Rural population	-12.46***	-17.88***	534.79***	992.70***
Quasi money (current LCU)	1.37*	-14.46***	473.75***	984.07***
Population, total	1649.93	-27.39***	592.63***	987.92***
GDP (current US$)	295.095	-16.59***	555.54***	994.98***
Oil rents (% of GDP)	39.1202	-16.4222	563.517	1044.93
OER (LCU/ US$, period average)	-22.02***	-31.08***	982.90***	1581.21***
NODA&OAR (constant 2008 US$)	36.2421	-16.77***	564.89***	1177.09***
NODA&OAR (current US$)	796.256	-21.25***	531.88***	926.45***
NOF from UN agencies, WFP (current US$)	-2.64***	-2.03***	217.79***	109.19*
NOF from UN agencies, UNTA (current US$)	54.35***	-3.33***	369.29***	597.58***
NOF from UN agencies, UNICEF (current US$)	-7.05***	-9.30***	346.84***	111.36***
NOF from UN agencies, UNHCR (current US$)	-14.38***	-17.74***	519.25***	1006.76***
NOF from UN agencies, UNFPA (current US$)	-1614.2***	-1170.8***	781.87***	1779.94***
NOF from UN agencies, UNDP (current US$)	25.64***	-19.13***	564.02***	900.99***
GNE deflator (base year varies by country)	-11.28***	-19.26***	584.33***	822.87***
Gross national expenditure (current LCU)	-7.72***	-33.22***	1056.01***	1607.3***
FDI, net inflows (BoP, current US$)	-3.47***	-28.46***	870.98***	1320.57***
FDI-NI in reporting economy (current USD)	-26.28***	-36.20***	1164.41***	1599.5***
Food production index (1999-2001 = 100)	25.64***	-19.13***	564.02***	900.99***
Electricity production (kWh)	-19.41***	-32.67***	1053.41***	1807.12***
Electric power consumption (kWh)	-17.02***	-26.77***	837.71***	1438.97***
Gross savings (current LCU)	-10.01***	-31.81***	847.89***	1246.7***
Gross national income (constant LCU)	-3.64***	-28.66***	906.60***	1385.77***
Gross national expenditure (current US$)	-22.65***	-27.03***	843.75***	1446.8***
Gross national expenditure (constant LCU)	-316.68***	-73.69***	916.57***	1217.03***
Gross national expenditure (constant 2000 US$)	-11.94***	-27.66***	904.86***	1171.89***
*, **, *** denotes significance at the 10%, 5% and 1% respectively				

The unit root tests results applied a user-specified lag of one to allow an optimal number of iterations that could identify the degree of convergence and long run adjustment of the time series variables in the panel. At the level data, we find quite few variables are equally adjusting in the long term but at the first and second difference, all the selected variables are significant at different degrees of freedom, also implying the existence of long-run equilibrium relationship of the selected variables. The null hypothesis of non-stationarity of the time series is rejected by most of the tests except the Levin, Lin & Chu t* which detects unit root existence in the number of telephone lines, agriculture land (sq. km), output (GDP), population and some of the official aid received per year by each country at both level and first difference. Therefore, since the group unit roots for most of our variables are non-stationary at level data, there is a danger of producing spurious gravity results. To escape this critique, the second difference of the variables is used to estimate the gravity equation, hence estimate the volume of trade.

Econometric procedures notice that by estimating the equation at first and second difference, some of the information in the equation is lost, but the interpretation and power of the remaining variables is still relevant, especially when the variables in the equation indicates to be converging. That also means, in the short run, the model is allowing the selected variables in the panel (region) to adjust differently/diverge while in the long-term the variables are converging towards equilibrium. In addition, most of the macroeconomic variables specified in the panel tend to be externally affected (respond to external shocks) especially in the short run, but due to policy harmonisation and adjustments, in the long run the stochastic processes will converge and adjust equally throughout the panel (block). Therefore, the four unit root procedures' results above have helped to establish the case that there is a cross section dependence[23] of structural and macro economic variables that determines volume of trade flow in SSA block through the effect of short run dynamics even though a unit root at level and first difference exists.

Having learned the stochastic trend of the selected macro variables specifically, the second step is to estimate our main model as specified by the three suggested models for panel data estimations, that is FE, RE and the POLS. As noted above, we use the second difference to estimate the results, since at level data the unit root exists and spurious

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[23] There might be some problems when using panel cointegration methods especially when the no cross-section restriction is violated Baltagi, B. (2008), "*Econometric Analysis of Panel Data,*" John Wiley & Sons, Baltagi, B. H. (2001), "*Econometric Analysis of Panel Data,*" (2nd edn.), Wiley, Chichester.

results can be produced if the equation is estimated at level data. For comparison purposes and to gain more knowledge on the impacts of time invariant to the three panel model, we include the results from the three models whereby the first column is for the FE model followed my RE and POLS. The results are estimated for the period of 1960 – 2010 for the 46 SSA countries. Some studies that have tried to estimate trade flow using panel and time series procedures specified different (disintegrated) data sets in order to differentiate some events that happened during a specified period of time (decade). For instance, the 1980s – 1990s decade of civil wars, macroeconomic structural adjustment policies and political instabilities in the SSA region are mentioned to be separating the growth path between decades.

Some studies differentiated their data set with regard to the world economic shocks of late 1990s and the 2007 – 2010 worlds' economic downturn and some studies have isolated with regard to the change in regime in the case study countries. SSA countries, generally, have had quite similar economic challenges which, in case we isolate the data set, there will not be many differences on the volume of trade per year throughout the region. For instance, despite all the economic challenges in SSA for the past 40 years, capital and labour mobility have been growing parallel with the improvements in infrastructures which facilitate the movement of goods and services across the market. Therefore, political and economic events that happened in specific periods are expected to produce very rare differences; instead infrastructures and other facilitating agencies have contributed to the lower growth in intra-trade. Therefore, disintegrating the data set may not lead to any significant differences on the expected results rather; it may produce even more controversial and inconsistent results.

As noted by the studies of (Arellano, 1991; Cinyabuguma, 2010)some researchers minimised critics on their estimation procedures by applying cross sectional procedures to estimate panel models, especially when they found the selected variables were highly persistent and nearly containing unit root properties at all levels. Their results, however, have been regarded as weak since they lose some crucial information on the variables that grow (adjust) per time. Alternatively, the two studies as well as (Gindling, 2009) suggested the implementation of the GMM system which helps to escape the problems of endogeininty of the dataset. As the first step of measuring the significance of implementing the GMM, (Chamberlain, 1983; Cinyabuguma, 2010) suggest to regress the dependent variable (merchandise imports) on its lagged value by controlling the

country FE and hence measure whether the dependent variable in country i may be correlated with the unobserved (error term) country specific effects. In our results, however, as spotted by the unit root test results above, there are no significant indications that the independent variables are highly correlated to other countries' error terms and thus the GMM system can produce results that are quite similar to those of the RE equation. or reference purposes, we estimate the GMM as well but first we introduce the results from the traditional approaches of estimating a panel equation. This helps (for future reference) to identify the weakness of each of the procedures.

Table 8: Gravity equation panel estimation results (Dependent variable Merchandise Imports (current US$) of 46 selected African Countries)

Merchandise imports (current US$)	FE		RE	
	Coef.	Std. Err.	Coef.	Std. Err.
Merchandise exports (current US$)	0.0743***	0.01	0.0826***	0.013
Agricultural land (sq. km)	2825.2**	1352.42	-58.25	238.023
Arable land (hectares)	-475.2***	52.57	-46.43***	13.166
Telephone lines	-1801.8***	210.51	-2115.4***	207.076
Surface area (sq. km)	-81.08	318.74	-247.1**	95.010
Rural population	247.84***	21.50	175.65***	14.184
Quasi money (current LCU)	-0.004***	0.00	-0.0002**	0.000
Population, total	-155.7***	13.78	-129.1***	10.530
GDP (current US$)	0.1259***	0.01	0.1206***	0.007
Oil rents (% of GDP)	-0.000	0.00	-4.9E-08	0.000
Official exchange rate (LCU per US$, period average)	0.0802**	0.03	0.0728**	0.033
Net official development assistance and official aid received (constant 2008 US$)	-0.611***	0.14	-0.0359	0.126
Net official development assistance and official aid received (current US$)	0.5198**	0.18	-0.254*	0.165
Gross national expenditure ((current US$)	1.1688***	0.06	1.0894***	0.063
Foreign direct investment, net inflows (BoP, current US$)	5.1584***	1.12	2.1014**	0.985
Foreign direct investment, net inflows in reporting economy (DRS, current US$)	0.0093**	0.00	0.0146***	0.004
Food production index (1999-2001 = 100)	0.0045**	0.00	0.0064**	0.002
Electric power consumption (kWh)	0.0001*	0.00	0.00003**	0.000
Gross savings ((current US$)	0.1452***	0.01	0.1397***	0.006
Landlocked	(omitted)	(omitted)	23.403	69.314
_cons	179.39	271.18	-103.89	99.857
R-sq: within	0.9385		0.9351	
between	0.8137		0.9888	
overall	0.8845		0.9578	
Number of obs	2319		2319	
Number of groups	46		46	
Obs per group: min	49		49	
Avg	50.4		50.4	
Max	51		51	
*, **, *** denotes significance at the 10%, 5% and 1% respectively				

Indeed, each of the three models has its own weakness which is why it necessary to estimate estimating multiple equations (procedures) for more reliable and accurate results for a more complex panel equation. For instance, the FE model drops the time invariant variables implying that they do not have any influence on the trade flow of goods in the selected countries. FE is found to be more simplistic instead of considering some real determinant which cannot be countered and recorded. RE, on the other hand, includes time invariant determinants but it rarely deals with interpreting correlation of unique (time invariant) ignored (errors) variables. Also, like FE, POLS examines the traditional regression which is naturally weak in the presence of autocorrelation of errors, which is normal in panel data settings. However, in case time series properties are met, especially the unit root, POLS can produce significant and efficient coefficients for a panel equation (Arellano, 1991; Chamberlain, 1983; Cinyabuguma, 2010; Baltagi, 2008; Gindling, 2009; Greene, 2008).

The values of the within, between and overall R^2 of the above estimation indicates that the volume of flow of goods and services in the selected cross section are highly explained by the selected variables and thus the selected variables are the key variables for trade policy-making/adjustments in different regions in SSA. Therefore in the above gravity estimations, the key determinants of the size of the economy and distance between the trading partners as specified by the gravity equation are estimated. Variables such as official development aid from UN agencies have produced very interesting results which can provide very insightful knowledge with regard to debate on the role of aid in developing countries. In specifying the gravity equation, this study assumed aid reduces intra regional importation (negative correlated with local production) and increases global importation of goods and services. Aid is categorised as development aid and humanitarian aid, and the functions of the UN agencies fall either in facilitating humanitarian or development aid to developing countries. For instance, it is expected that aid from UNHCR and UNCEF to have less or no impact on the flow of goods within the cross section as they are aimed at financing emergences for human lives rather than development projects.

Table 9 Hausman Test Results

	(b) FE	(B) RE	(b-B) Difference	sqrt(diag(V_b-V_B)) SE
Merchandise exports (current US$)	0.0743	0.083	-0.008	0.004
Agricultural land (sq. km)	2825.2	-58.25	2883.5	1331.3
Arable land (hectares)	-475.2	-46.43	-428.7	50.86
Telephone lines	-1801.8	-2115.42	313.60	37.87
Surface area (sq. km)	-81.08	-247.13	166.05	304.25
Rural population	247.84	175.65	72.18	16.15
Quasi money (current LCU)	-0.000	-0.000	-0.000	0.000
Population, total	-155.7	-129.074	-26.63	8.881
GDP (current US$)	0.126	0.121	0.005	0.002
Oil rents (% of GDP)	0.000	0.000	0.000	0.000
Official exchange rate (LCU per US$, period average)	0.080	0.073	0.007	0.001
Net official development assistance and official aid received (constant 2008 US$)	-0.611	-0.036	-0.576	0.064
Net official development assistance and official aid received (current US$)	0.519	-0.254	0.774	0.081
Gross national expenditure (current LCU)	1.169	1.089	0.079	0.000
Foreign direct investment, net inflows (BoP, current US$)	5.158	2.101	3.057	0.535
Foreign direct investment, net inflows in reporting economy (DRS, current US$)	0.009	0.015	-0.005	0.001
Food production index (1999-2001 = 100)	0.004	0.006	-0.002	0.000
Electric power consumption (kWh)	0.000	0.000	0.000	0.000
Gross savings (current LCU)	0.145157	0.1397	0.0055	0.001

b = consistent under Ho and Ha; obtained from panel regressions
B = inconsistent under Ha, efficient under Ho; obtained from panel regressions
Test: Ho: difference in coefficients not systematic
chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)=152.76
Prob>chi2 =   0.0000
(V_b-V_B is not positive definite)

Table 10: Breusch and Pagan Lagrangian multiplier test for random effects

Breusch and Pagan Lagrangian multiplier test for random effects	
a[names,t] = Xb + u[names] + e[names,t]	
Estimated results:	
	Var	sd = sqrt(Var)
a	3.07E+07	5539.146
e	1117824	1057.272
u	11765.71	108.4699
Test: Var(u) = 0 chi2(1) = 383.54 Prob > chi2 = 0.0000	

Following the panel estimated results, the pooled regression indicated that the volume of trade within the selected countries has been growing[24] year after year as indicated by higher adjusted R^2 of the pooled regression. In addition to that, despite the weaknesses of pooled equation analysis, the key variable (population and income) that determines the market size within a regime indicates to have strong relationships across the cross sections. On the other hand, from the gravity results, some key variables that were assumed to define the impact of costs of transport on the volume of trade are portraying insignificant results, especially oil rents, openness (landlocked) and electric power consumption of each country. Also, from the pooled results, variables capturing the impact of electricity supply (electric power consumption) in the region trade have portrayed very significant results with a positive parameter which can simply be interpreted as reliable power supply increases the volume of trade in a block and an economy with abundant supply of electricity has a higher trade volume as compared to economies with struggling electricity supply.

Also from the pooled results, one can conclude that net official development assistance and official aid received, and net official flows from UN agencies WFP, UNHCR and UNFPA decreases the volume of trade within Africa. While on the other hand, net official flows from other UN agencies especially UNTA, UNICEF and UNDP are indicating to a small impact on the trade flow in the African market. (Moyo, 2009; Collier, 2007) have argued that aid is not working and is not the only solution to Africa[25], instead it is damaging growth of trade in the region. However, we fail, at this stage, to agree or disagree on the debate of the impacts of foreign aids on trade flow of least developing countries since the results are from the pooled regression which has its own limitations.

the critics against the pooled equations mentions that, pooled analysis is a weak procedure of estimating a panel equation as it does not capture the impact of time and space on a panel data. Some literatures simply define pooled equation as an equation

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[24] The Adjusted R2 shows an adequate explanation of bilateral trade the selected across sectors Philippidis, G. a. S. n., A.I (2006), "An Examination of Morocco's Trade Options with the EU." *Journal of African economies, Oxford University,* Vol. 16, No.2: pp. 259–300..

[25] There are only four solutions to African economic challenges excluding Aids according to Dr Moyo. That is that African governments should access international bond markets for funds, Chinese investments should be welcomed in Africa, Africa as a whole should pursue free trade within the continent and pursue micro finance and other less conventional financial solutions Moyo, D. (2009), "*Dead Aid: Why aid is not working and how there is another way for Africa,"* New York, Farrar, Straus and Giroux..

that combines time series for several countries, whereby data has repeated observation on fixed units. In addition, the error term of the pooled equation is not independent from one period to the next (serially correlated); therefore, it does not consider the fact that errors in one country at a given time may be correlated with errors in another country at time t. Also, using a pooled estimation, it is difficult to identify whether errors estimated contain both temporal and cross-sectional components that reflect whether there are cross-sectional dependence between variables and if the error may have differing variances (heteroskesdastic) in across section. For example, from the above analysis, large economies in Africa especially Nigeria and South Africa tend to be more volatile with higher unemployment rates than Rwanda and Malawi which are less exposed to the world market fluctuations. Therefore we follow more specialised panel specification procedures of FE and RE as specified the previous pages.

By following the FE RE procedures, first, the gravity panel equation is balanced for analysis as signified by the values of the probability of Prob > chi2 for RE analysis and Prob>F for FE implying all coefficients are not equal to zero (β_0…….$\beta_t \neq 0$) indicating the selected independent variables have significant explanatory power on the dependent variables. The gravity estimation correlation value Corr(u_i, Xb) for both fixed and random effect equations is indicating that the differences across the selected variables are positively and significantly correlated. Also, the Hausman specification test had a Prob>chi2 = 0.0000 indicating that our panel estimations reject the null hypothesis (Random effect analysis) and accepted the alternative that errors and independent variables are not correlated and fixed effects procedures are relevant for our data set. Also, from the Hausman specification test, one can conclude that the volume of trade determinants in one country within the selected African countries is not much influenced by the determinant of volume of trade of other countries, i.e. there are no cross-sectional dependences and variations between the selected determinants of the volume of trade within the selected countries of Africa.

On the other hand, to ensure robustness of our gravity fixed effect analysis, the Breusch and Pagan Lagrange Multiplier which examines the existence of significant differences (heteroskedasticity) across the cross section, rejects the null hypothesis that random effects are still crucial and there are cross sectional dependence of the variables. BPLM also rejects that there are no significant differences (heterogeneity) and the variance across countries is zero at Prob > chi2 = 0.0000 implying that there are no significant cross sectional dependences of the selected variables across the cross section. At this

point, for policy implication one can argue that the factors that determine the trade volume in each SSA country have a strong correlation to those determining the volume of trade in other countries within the block. In a nutshell, (Greene, 2008; Baltagi, 2008) mentioned that the BPLM procedure identifies the behaviours of the panel variances and also helps to find the variances of the estimated FE residuals and the independent variables.

Studies by (Baltagi, 1990; Baltagi, 2001; Baltagi, 2008) also pointed there are always some problems in identifying cross sectional dependence in macro panels such as the one used by this part, which is larger than 20 years and more than ten variables, and in order to escape those problems and to provide some results for comparisons necessary for policy implications, we have included both random and fixed-effect interpretations as we strongly believe that the differences across the selected countries have some influences (even if they are not significant at selected degrees of freedom) on the dependent variable that is measuring the volume of trade. Generally, most of the parameters of the fixed effect equation are portraying the results as anticipated. Many of the variables included in table 9 are highly regarded as the main indicators of the size of the market, costs of transport and transaction costs of the selected countries. The indicators of the costs of transport/distance are very few due to unavailability of accurate data but the selected one has many implications on the structure of other facilitating variables.

For example, the negative parameter of the number of telephone lines (-2188.5***) in each country implies "the higher the number of telephone lines, the lower the costs of transport/distance" and hence higher volume of trade. Therefore, modern means of communication are the key to speed economic integration in least developing countries and they are crucial in promoting deeper integration and probably the introduction of a single currency throughout the continent. In the sub-Sahara region as a whole, technology is still very limited, especially in the rural areas, and for the sake of enabling free mobility of labour and capital it is necessary to attract more investments in the transport and communication industry so as to expose the market to the nearby markets. Also, due to unavailability of oil imports and exports data for each country, we included oil rents for the purposes of capturing the impact of oil on the cost of transport. Availability of oil supplies in an economy has many implications on the growth of trade and the market in general, but many studies that have applied the gravity model have failed to include the oil variable due to unavailability of historical data that can reflect

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the key assumptions of the equations. Oil rents, however, have produced some very useful results, since a country with higher values of oil rents per year also imports oil more than countries that charges lower oil rents. In addition, we included a dummy variable that is capturing whether a country is landlocked or it has access to sea transport. Therefore it is 1 for a none-locked country and 0 for landlocked country, despite being omitted by the FE procedures but the generally a landlocked country (negative coefficient) has higher costs of transport as compared to a country that has access to sea transport.

As briefly introduced in the above paragraphs, the indicators for the official foreign financial aids have also produced the anticipated results except the Net official development assistance and official aid received, and Net official flows (unreported) from UN agencies WFP, UNHCR and UNFPA which have a negative parameter implying they are reducing the speed and magnitude of trade within the selected African countries. At the same time, the net inflow (unreported) from UN agencies UNTA, UNICEF and UNDP are positive and significant indicating that they are very useful in extending the local market of the selected countries. Also, in terms of size of the surface area of each country, sub-Saharan Africa as a whole is a very large market and that means by encouraging more integration the market will be expanded and provide more market options for the local produce and hence sustainable growth. Moreover, rural areas are not given much attention on policy formulation in Africa despite the fact that a large percentage of total population lives in rural areas. For instance in our results obtained, the rural population parameter is very significant at 99.99% (212.53***).

It is worthy of note that many developing countries, in Africa particularly, have a very high population growth rate as compared to the developed and mid- developed countries. For instance, Tanzania's population growth rate is 4% while China has 0.04% population growth rate. Some survey conducted by the World Bank country report for Tanzania indicated that almost 50% of the total population is fifteen (15) years of age or younger, which also means almost 50% of the total population are children. Under that scenario, the economy becomes compromised due to lack of enough labour force to complement the expanding market. Also, in our FE results, despite being insignificant at 1%, 5% and 10%, we capture the impact of population on the volume of trade by using the parameter results of the rural population variable. In addition, from the FE results, we find that availability of power supply throughout the region is one of the key areas

that the entire country of Africa should consider jointly so as to increase economic productivity of their economies. The parameter for electric power consumption is at 0.000076*** implying countries that consume more energy are bigger economies and therefore, to escape the trade creation and trade diversion problems, there are needs to mobilise their resources together so as to invest more into joint electricity projects.

Furthermore, the parameters in the equation are indicating that to improve both merchandise exports and imports within Africa, there are needs to undergo further tariff reduction and policy reforms that will favour intra-business and growth. At this point there are still very heavy restrictions between African countries despite the fact that by eliminating restrictions, countries are expected to reduce importation from expensive markets hence promoting local production and growth. Also, the impact of GDP $\beta_1(Y_iY_J)$, is robust as expected by the gravity assumption implying that countries with large GDP are expected to be trading more than small economies which have a small GDP. It is important, however, in the future to expand the income $\beta_1(Y_iY_J)$ variable as there are number of factors that may influence income size of the economy whereby some of those factors are unique in each market. Previous studies used the GDP per capita instead of the GDP as used by this study and their results and interpretations were almost similar. Once again the gravity FE analysis results have portrayed the importance of savings. We found that, in order to increase the volume of trade within Africa, savings (investment) must be encouraged by cutting down unnecessary government spending within the entire region plus other structural adjustments in different variables of the macro economy.

Table 11: Panel Generalised Method of Moments

	Method: Panel GMM EGLS			
Dependent variable: Merchandise imports (current US$)	**Effects Specification; Period fixed**		**Effects Specification; Cross section fixed**	
Merchandise exports (current US$)	-0.044**	0.020	-0.056**	0.020
Agricultural land (sq. km)	85.853	236.182	219.91	238.61
Arable land (hectares)	-58.09***	13.703	-69.63***	14.042
Telephone lines	-1921.7***	247.646	-1914.85***	259.669
Electric power consumption (kWh)	0.00003**	0.000	0.00003*	1.62E-05
Foreign direct investment, net inflows in reporting economy (DRS, current US$)	0.0085*	0.005	0.0095*	0.005
Foreign direct investment, net inflows (BoP, current US$)	3.7751**	1.225	-3.587**	1.564
Surface area (sq. km)	-315.4***	95.875	-334.93***	97.37
Food production index (1999-2001 = 100)	-0.002	0.002	-0.004*	0.003
GDP (current US$)	0.1008***	0.011	0.1152***	0.011
Rural population	126.87***	19.100	123.03***	19.469
Quasi money (current LCU)	0.0005**	0.000	0.0005***	0.0002
Population, total	-87.52***	14.811	-81.027***	15.153
Landlocked	17.251	65.392	21.531	65.751
Oil rents (% of GDP)	-2.2E-08	0.000	4.28E-08	2.39E-06
Official exchange rate (LCU per US$, period average)	0.001139	0.041	-0.087**	0.042
Net official development assistance and official aid received (constant 2008 US$)	0.3817**	0.152	0.8093***	0.167
Net official development assistance and official aid received (current US$)	-1.487***	0.241	-2.261***	0.273
Gross savings (current LCU)	0.1881***	0.013	0.1766***	0.013
Gross national expenditure (current LCU)	1.7101***	0.204	1.6443***	0.213
C	-132.65	111.473	490.29***	140.24

Effects Specification			
		S.D.	Rho
Cross-section random		0.000	0.000
Idiosyncratic random		1240.51	1

Weighted Statistics			
R-squared	0.95	Mean dependent var	1554.28
Adjusted R-squared	0.94	S.D. dependent var	5592.29
S.E. of regression	1250.687	Sum squared resid	3.52E+09
Durbin-Watson stat	0.93	J-statistic	4.31E-22
Instrument rank	21		

Unweighted Statistics			
R^2	0.95	Mean dependent var	1554.28
Sum squared resid	3.52E+09	Durbin-Watson stat	0.93

*, **, *** denotes significance at the 10%, 5% and 1% respectively

2.2.2: Intra (EAC) Volume of Trade.

In this part we isolate the EAC countries from the forty six (46) SSA countries used in the above discussion. The aim is to measure the volume of merchandise imports within the EAC zone and hence draw conclusions that will determine whether the flow of trade is significant enough to promote deeper integration. The theoretical foundation of common market and currency union predicts that if the variables in the gravity model are significant and having a long run equilibrium relationship, it is more profitable to promote further elimination of trade restrictions. Furthermore, the inclusion of both direct and indirect determinants of trade flow such as "financial aids" in the equation helps to determine the exact tools that can be used to correct the market in the event of any structural shock in the economy.

Therefore, to confirm this prediction, the macroeconomic and costs of transport variables that are assumed to be common throughout the EAC region are used in the estimation below to measure the speed and magnitude of intra trade between the members and the rest of the world. Like the previous analysis, in this part all variables (except the time invariant) are transformed into natural log form so as to estimate the coefficient in terms of their elasticity relationships between the dependent and the explanatory variables. This model does not depart from the existing literature that applied the gravity model as most have estimated the model through FE, RE, POLS and GMM. In addition, the results being gathered have been very interesting as each researcher produced different but interesting results depending on the region they studied and the set of variables included in the analysis. One of the points being used to differentiate the gravity specification and findings is the treatment of distance (determinants of costs of transport) and trade barriers. Our specification and findings have treated distance and trade barriers in terms of transportation barriers, information barriers, communication barriers and policy barriers.

Table 12: Gravity equation panel estimation results

Merchandise imports (current US$)	FE	Std. Err.	RE	Std. Err.
Merchandise exports (current US$)	1.471***	0.082113	1.434***	0.085
Agricultural land (sq. km)	-6786.8**	3336.094	-10508.5***	2529.17
Arable land (hectares)	85.346	75.93393	334.21***	62.803
Telephone lines	-340.67	477.0811	-481.38	482.626
Surface area (sq. km)	-185.94	342.6874	605.71**	315.547
Rural population	183.07***	51.32493	48.56015	47.137
Quasi money (current LCU)	0.0003**	0.000121	0.0002*	0.0001
Population, total	-223.94	39.48209	-139.62***	38.378
GDP	0.0891***	0.016338	0.1289***	0.0142
Oil rents (% of GDP)	-0.0025*	0.001508	-0.0017	0.0016
Official exchange rate (LCU per US$, period average)	0.4543***	0.077892	0.5998***	0.071
Net official development assistance and official aid received (constant 2008 US$)	0.0531	0.105578	0.1046	0.107
Net official development assistance and official aid received (current US$)	0.4989***	0.151598	0.4065**	0.157
Foreign direct investment, net inflows (BoP, current US$)	-3.370**	1.18493	-2.8955**	1.083
Foreign direct investment, net inflows in reporting economy (DRS, current US$)	-0.0101*	0.008101	-0.0179**	0.008
Food production index (1999-2001 = 100)	0.0382**	0.012308	0.0368**	0.013
Electricity production (kWh)	-0.001***	6.02E-05	-0.0005***	0.000
Gross savings (current LCU)	0.093***	0.010	0.0683***	0.008
Landlocked	(omitted)	(omitted)	1511.4***	419.12
_cons	1193.119	378.441	254.51	90.448
R-sq: within	0.98		0.98	
between	0.001		0.99	
overall	0.59		0.98	
Number of obs	251		251	
Number of groups	5		5	
Obs per group: min	50		50	
Avg	50.2		50.2	
Max	51		51	
*, **, *** denotes significance at the 10%, 5% and 1% respectively				

Table 13 Hausman fixed random

	Coefficients			sqrt(diag(V_b-V_B)) S.E.
	(b) FE	(B) RE	(b-B) Difference	
Merchandise exports (current US$)	1.471	1.434	0.037	0.000
Agricultural land (sq. km)	-6786.8	-10508.5	3721.7	2175.5
Arable land (hectares)	85.35	334.20	-248.8	42.68
Telephone lines	-340.6	-481.4	140.71	0.000
Surface area (sq. km)	-185.9	605.7	-791.6	133.6
Rural population	183.07	48.56	134.51	20.31
Quasi money (current LCU)	0.0003	0.000	-0.000	0.000
Population, total	-223.94	-139.6	-84.32	9.269
GDP	0.089	0.129	-0.039	0.008
Oil rents (% of GDP)	-0.002	-0.00	-0.001	0.000
Official exchange rate (LCU per US$, period average)	0.454	0.599	-0.146	0.032
Net official development assistance and official aid received (constant 2008 US$)	0.053	0.105	-0.05	0.000
Net official development assistance and official aid received (current US$)	0.498	0.407	0.092	0.000
Foreign direct investment, net inflows (BoP, current US$)	-3.370	-2.89	-0.475	0.481
Foreign direct investment, net inflows in reporting economy (DRS, current US$)	-0.011	-0.02	0.007	0.000
Food production index (1999-2001 = 100)	0.038	0.037	0.001	0.000
Electricity production (kWh)	-0.001	-0.00	0.000	0.000
Gross savings (current LCU)	0.094	0.068	0.026	0.006

b = consistent under Ho and Ha; obtained from panel regressions
B = inconsistent under Ha, efficient under Ho; obtained from panel regressions

Test: Ho: difference in coefficients not systematic
chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)=   32.87
Prob>chi2 =   0.0000

(V_b-V_B is not positive definite)

Table 14 Breusch and Pagan Lagrangian multiplier

Breuschand Pagan Lagrangian multiplier test for random effects			
	a[names,t] = Xb + u[names] + e[names,t]		
		Estimated results:	
		Var	sd = sqrt(Var)
	a	2620812	1618.892
	e	35849.85	189.3406
	u	0.000	0.000
	Test: Var(u)=0.000 Chi2(1)= 0.000 Prob > chi = 1		

We follow similar procedures like in the previous analyses whereby, first, the model is fit for the data set as indicated by the rejection of the null hypothesis of the Prob > chi2 and Prob > F at (0.01) 1% degrees of freedom. Then we estimate the gravity model with control for the five EAC countries to measure the volume of "intra trade" whereby according to the Hausman specifications test ,we fail to reject the null (H_0) hypothesis at five percent (0.05) degrees of freedom that random effect procedures are appropriate for the intra data set. Also, at first and second differences the data is stationary and non-stationary at the level data implying the variables in the specified model have long-run equilibrium relationships (cointegrating towards equilibrium). Also, our results have included the pooled results for comparison purposes which, as explained by the previous analysis, are weak for panel analysis as they tend to ignore the impact of time and space which are very crucial properties for any panel equation.

In general, despite not considering some dummy variables that have been included by most of the cited studies, our analysis of the volume of intra trade are statistical and economically significant for policy implications. We find that, despite having infrastructure problems, the volume of trade within the EAC region is higher as could be expected by the gravity and other key development studies assumptions. Therefore, one can agree that EAC countries indeed are natural trading partners and more harmonisation of economic variables will increase the volume of trade within the block. Also, we find that the gap of intra-exchange rate between the block members has been declining (as portrayed by an increasing volume of intra trade) every year, indicating that some convergence criteria (variables for adjustments) have been achieved even though the speed is not too high.

Some previous studies including (Alesina, 2002; Mundell, 1960, 1961, 1962) in the area of regionalisation have suggested that if countries differ in the stages of economic development, then trade integration may lead to trade diversion instead of trade creation. However, this is not the case for the EAC block given the fact that they are almost at similar levels of development; therefore each country is benefiting from an increasing volume of intra trade given the size of the market. The policy representations of these results are statistical and socially significant and they are indeed useful for future researches. The key suggestion from this part of the analysis is that it is indeed significant and appropriate for the EAC countries to further deeper integration criteria

including increasing the speed towards single currency union hence to champion the advantages that comes from reduction of transaction costs.

From this part we identify the need for EAC countries to introduce some joint regulatory standards that will foster significant trade within the region, especially on infrastructures and macro policies that ensures free flow of capital and labour. We argue that if the tested variables, which are found to explain trade flow, follow the current market expansion and development path for the next 20 years, the EAC region will be the hub of the sub-Saharan economy. At this stage, as shown by the time series results of this analysis, the EAC block have met some convergence criteria especially on the growing volume of intra trade and speed of advancements on the key variables that integrate the market especially infrastructures, stock market and banking services (which is explained by the analysis that followed VAR and GARCH procedures.

Furthermore, EAC intra volume of trade combined with the total volume of trade within some selected African countries suggests that it is not only fair policies, peace and democracy that can improve the market of these countries but also merging the economies will crucially help African countries to eradicate poverty and under development. We also argue that, as noted by many researchers and columnists, millennium development goals cannot be easily achieved in Africa unless small markets merge with large markets within Africa so as to promote industrial and trade growth in the region. Due to lack of enough and accurate data, however, it is worth noting that our gravity did not include enough and more reliable financial variables that could help to determine the impact of introducing a standardised exchange rate throughout the region, even though "quasi money" produced significant results.

It is obvious that quasi money may not represent the true value of a certain local currency but it may be interpreted in terms of the advantages of a country having massive liquid assets and a country with less liquid assets (quasi money). In general many African countries are facing similar liquid problems but the "level" of quasi money is almost similar. In the EAC region, for instance, we find that the average value of the liquid assets per GDP is almost similar, ranging $24 to $34 million for the past 50 years given the size of the economies. However, the GARCH analysis is expected to produce some results that will measure whether the volatility levels of the EAC banking sectors can allow the introduction of a single currency. This chapter only answers one key question of the project: "is the volume of trade enough to allow a single currency?"

It is significant to note that the EAC market indeed has long-standing monetary trade relationships given the economic history of the region. However, one cannot easily measure some variables that reflect the current needs of any economy in the sub-Sahara region due to inadequate and improper recording of data in these countries, despite the few historical macro data that has produced very useful results. The key important findings from the measurements of the EAC intra- volume of trade can be concluded that there are more needs for adjustments on the fiscal policies of the region that will ensure stable sources of revenue within the region and also the need for some countries to reduce the dependence on aid from UN organisations, as they have indicated to be interfering the flow of goods and services in the EAC market and sub-Sahara in general. In his discussions about the bottom billion, Paul Collier has noted the importance of ensuring the trade window of African countries is expanded in the world market before increasing the amount of foreign aid flow in African countries.

Therefore in order to increase the amount of intra-trade flow, it is important to keep in mind that most of the imports from the rest of the world are sponsored by foreign aid and therefore EAC countries need to make some policy adjustments that will enable a decline on the aid dependence and hence promote capital production in the region. Also, from the macro variables highlights of the EAC countries, one can notice that the volume of trade in general is very low given the size of the members' markets and the level of infrastructure in the region. However, our significant parameters have indicated an increasing volume of intra trade between the members and the current adjustments on fiscal policies have encouraged stable growth in the region. As suggested by the strength of the results, this chapter notes some important (significant) inter-country differences on the sources of government revenue and spending due to differences in the main sectors of the economies, historical, economical and political factors.

2.2.3: Volume of trade between EAC, SADEC and COMESA blocks.

Under this category we examine the volume of trade between EAC countries and countries forming the Southern African Development Community (SADEC). The key point to note, as highlighted earlier, is that, most of the African countries are participating in more than two trade unions within Africa. As suggested by the African economic union, the first step is to make stronger regional economic blocks and then each block will decide which block to amalgamate and form one powerful economic zone that will force the entire African market to be unified. As noted by the

introduction, EAC is the most relevant trade union in Africa at the moment due to its fast implementation of the preliminary trade union requirements. Also, EAC is indicating to be mutually benefiting the participating economies and already there are optimal returns from the market that each country is experiencing due to the harmonisation.

On top of that, there are some eastern central African countries such as the Republic of Sudan, South Sudan Congo, Zambia and Somalia that are eying to join the EAC market, while one of the key questions posed is: which block neighbouring countries should be motivated to join the union given the difference in political and economic settings. To answer this question, the next two subchapters measure the volume of trade between EAC and the other neighbouring trade unions of SADEC and COMESA. Therefore we follow similar procedures of panel estimations using the same specified gravity equation used by the analyses in subchapters 2.2.1, 2.2.2, 2.2.3 and 2.2.3.1 where we measured the trade volume between each EAC member and members in SADEC and followed by countries that are participating in COMESA. Again dummy variables are used to isolate the regions so as to estimate more specific results.

2.2.3.1: Intra-blocks volume of Trade between EAC and SADEC

Table 15 Intra-Blocks Trade Flow

Merchandise imports (current US$) EAC and SADEC	FE	Std. Err.	RE	Std. Err.
Merchandise exports (current US$)	0.129***	0.023	0.0903***	0.022
Agricultural land (sq. km)	2403.1	2137.72	-1524.63***	424.96
Arable land (hectares)	-585.48***	160.594	14.847	46.220
Telephone lines	-1714.8***	327.450	-1492.25***	315.265
Surface area (sq. km)	1082.4	994.345	-61.609	175.821
Rural population	25.499	75.189	85.83*	48.985
Quasi money (current LCU)	-0.001***	0.0001	-0.0005***	0.0001
Population, total	-47.451	54.296	-102.79**	40.687
GDP	0.081***	0.015	0.1386***	0.014
Oil rents (% of GDP)	-0.0149***	0.005	-0.0143**	0.005
Official exchange rate (LCU per US$, period average)	0.0476	0.051	0.0504	0.052
Net official development assistance and official aid received (constant 2008 US$)	-0.8773**	0.347	-0.477*	0.314
Net official development assistance and official aid received (current US$)	1.817***	0.477	1.3404**	0.447
Gross national expenditure (current LCU)	1.715***	0.093	1.6826***	0.097
Foreign direct investment, net inflows (BoP, current US$)	-2.759	2.760	-2.661	2.245
Foreign direct investment, net inflows in reporting economy (DRS, current US$)	-0.007	0.006	-0.0095*	0.006
Food production index (1999-2001 = 100)	0.0004	0.003	-0.0005	0.003
Electric power consumption (kWh)	0.0001**	0.000	0.0000	0.000
Gross savings (current LCU)	0.1863***	0.013	0.1335***	0.012
Landlocked	0	(omitted)	384.98***	105.941
_cons	784.84	761.09	476.853	201.082
R-sq: within	0.95		0.95	
between	0.93		0.99	
overall	0.94		0.97	
Number of obs	958		958	
Number of groups	19		19	
Obs per group: min	50		50	
Avg	50.4		50.4	
Max	51		51	
*, **, *** denotes significance at the 10%, 5% and 1% respectively				

Table 16 Hausman Test

	Coefficients			
	(b) FE	(B) RE	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
Merchandise exports (current US$)	0.129	0.090	0.039	0.007
Agricultural land (sq. km)	2403.08	-1524.63	3927.71	2095.1
Arable land (hectares)	-585.48	14.847	-600.33	153.79
Telephone lines	-1714.8	-1492.25	-222.55	88.496
Surface area (sq. km)	1082.44	-61.61	1144.05	978.68
Rural population	25.499	85.83	-60.32	57.04
Quasi money (current LCU)	-0.001	-0.001	-0.001	0.000
Population, total	-47.45	-102.79	55.339	35.95
GDP (current US$)	0.081	0.138	-0.058	0.005
Oil rents (% of GDP)	-0.015	-0.014	-0.001	0.001
Official exchange rate (LCU per US$, period average)	0.048	0.050	-0.003	0.000
Net official development assistance and official aid received (constant 2008 US$)	-0.877	-0.476	-0.400	0.148
Net official development assistance and official aid received (current US$)	1.816	1.340	0.476	0.169
Gross national expenditure (current LCU)	1.715	1.683	0.032	.
Foreign direct investment, net inflows (BoP, current US$)	-2.759	-2.661	-0.098	1.606
Foreign direct investment, net inflows in reporting economy (DRS, current US$)	-0.007	-0.009	0.003	0.002
Food production index (1999-2001 = 100)	0.0004	-0.001	0.001	0.000
Electric power consumption (kWh)	0.000	0.001	0.004	0.000
Gross savings (current LCU)	0.186	0.133	0.053	0.006

b = consistent under Ho and Ha; obtained from panel regressions
B = inconsistent under Ha, efficient under Ho; obtained the panel regressions
Test: Ho: difference in coefficients not systematic
chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 29.86
Prob>chi2 = 0.0001
(V_b-V_B is not positive definite)

Table 17 Breusch and Pagan Lagrangian multiplier test

Breuschand Pagan Lagrangian multiplier test for random effects		
	a[names,t] = Xb + u[names] + e[names,t]	
	Estimated results:	
	Var	sd = sqrt(Var)
a	6.17E+07	7856.442
e	1569036	1252.612
u	0.000	0.000

Test: Var(u) = 0
chi2(1) = 0.000
Prob > chi2 = 1.0000

Table 18 Intra-blocks volume of Trade between EAC and COMESA

Merchandise imports (current US$)	FE	Std. Err.	RE	Std. Err.
Merchandise exports (current US$)	0.539***	0.033	0.651***	0.031
Agricultural land (sq. km)	-4741.6***	1009.2	497.31***	140.06
Arable land (hectares)	-80.14**	41.873	-57.26***	14.608
Telephone lines	2924.67***	179.12	2871.58***	179.76
Surface area (sq. km)	1.689	128.43	-139.79**	55.75
Rural population	44.656**	23.171	50.19***	14.356
Quasi money (current LCU)	-0.000	0.004	0.000	0.000
Population, total	-21.41	17.716	-35.92**	12.034
GDP (current US$)	0.023***	0.006	0.031***	0.005
Oil rents (% of GDP)	-0.000	0.000	0.000	0.000
Official exchange rate (LCU per US$, period average)	-0.004	0.014	-0.057***	0.016
Net official development assistance and official aid received (constant 2008 US$)	-0.304***	0.066	-0.055	0.060
Net official development assistance and official aid received (current US$)	0.609***	0.103	0.562***	0.095
Gross national expenditure (current LCU)	0.242***	0.062	0.0602	0.064
Foreign direct investment, net inflows (BoP, current US$)	0.809	0.698	0.076	0.655
Foreign direct investment, net inflows in reporting economy (DRS, current US$)	0.0014	0.003	-0.002	0.003
Food production index (1999-2001 = 100)	0.006***	0.001	0.005***	0.001
Electric power consumption (kWh)	0.000	0.000	0.000**	0.000
Gross savings (current LCU)	0.071***	0.006	0.033***	0.005
Landlocked	0	(omitted)	191.36***	31.88
_cons	859.7692	153.10	-113.4	53.16
R-sq: within	0.92		0.91	
between	0.05		0.96	
overall	0.32		0.92	
Number of obs	855		855	
Number of groups	17		17	
Obs per group: min	49		49	
Avg	50.3		50.3	
Max	51		51	

*, **, *** denotes significance at the 10%, 5% and 1% respectively

Table 19 Hausman Test

	Coefficients			
	(b) FE	(B) RE	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
Merchandise exports (current US$)	0.539	0.651	-0.111	0.009
Agricultural land (sq. km)	-4741.6	497.31	-5238.9	999.43
Arable land (hectares)	-80.14	-57.26	-22.88	39.242
Telephone lines	2924.67	2871.58	53.09	0.000
Surface area (sq. km)	1.689	-139.78	141.48	115.71
Rural population	44.66	50.19	-5.543	18.187
Quasi money (current LCU)	0.005	0.000	0.000	0.000
Population, total	-21.41	-35.92	14.517	13.001
GDP (current US$)	0.023	0.031	-0.008	0.003
Oil rents (% of GDP)	0.000	0.000	0.000	0.000
Official exchange rate (LCU per US$, period average)	-0.004	-0.057	0.053	0.000
Net official development assistance and official aid received (constant 2008 US$)	-0.304	-0.055	-0.248	0.027
Net official development assistance and official aid received (current US$)	0.609	0.562	0.047	0.032
Gross national expenditure (current LCU)	0.243	0.060	0.183	0.000
Foreign direct investment, net inflows (BoP, current US$)	0.809	0.076	0.733	0.239
Foreign direct investment, net inflows in reporting economy (DRS, current US$)	0.001	-0.002	0.003	0.000
Food production index (1999-2001 = 100)	0.006	0.005	0.001	0.000
Electric power consumption (kWh)	0.000	0.000	0.000	0.000
Gross savings (current LCU)	0.071	0.033	0.038	0.004

b = consistent under Ho and Ha; obtained from panel regression
B = inconsistent under Ha, efficient under Ho; obtained from panel regression
Test: Ho: difference in coefficients not systematic
chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B) =   226.32
Prob>chi2 =   0.0000
(V_b-V_B is not positive definite)

Table 20 Breusch and Pagan Lagrangian multiplier test

Breusch and Pagan Lagrangian multiplier test for random effects

$a[names,t] = Xb + u[names] + e[names,t]$

Estimated results:

	Var	sd=sqrt(Var)
a	1969030	1403.22
e	121193.5	348.13
u	0.000	0.000

Test: Var(u) = 0
chi2(1) = 0.000
Prob > chi2 = 1

The model is well tested by the Prob > F test whereby at (0.05) 5%, we reject the null hypothesis that the equation is not balanced and indeed the selected regressors explains the response variable significantly. Also we follow similar time series procedures as the above measurements whereby our data sets are found to be stationary at first and second difference giving the permission to follow all the necessary panel estimation procedures. First, the Hausman test at (0.001) 0.1% suggests we reject the null hypothesis that the two analyses are random effect and thus there is no correlation between individual effects and the explanatory variables and thus fixed effect analyses are more consistent and efficient for the given data sets. Also, the intra class correlations (rho fraction of variance due to u_i) indicated that variance is not explained by the differences of the cross section at 0.5%.

Therefore, from the above results, the country's specific effects are correlated with the selected independent variables of the panel equation and most of the manipulated variables portrayed as expected by the gravity assumptions except a few, including the amount of hectare available as arable land for agriculture in each selected country. The displayed negative significant coefficient of this variable implies that the more the availability of arable land within a given block the lower the volume of trade between members in a trade union, other things being equal. This is absolutely not true or it may have other explanation and thus further investigation is recommended on this. In addition to the availability of arable land, our analysis produced unexpected results on the variables capturing the size of surface area (Sq km) in each country which was included so as one of the common measure of the size of the market especially in Agricultural dominated countries

Moreover, as found earlier, the amount of official aid assistance also produced results that do not match with the assumptions set while introducing the gravity equation. For instance, the net official aid inflow from the UN agencies UNFPA and UNHCR produced negative significant parameters, indicating the higher the amount of aid flow from these organisations, the lower the volume of trade and vice versa. It is important to specify that the higher flow of aid from UNHCR may imply political instability, since most of the UNHCR aid is aimed at civil war victims. On the other hand, UNFPA aid is always focused on regulating population growth in an area. Therefore, it is difficult to deny whether the significant negative parameters on the impact of aid flow on the volume of trade between African countries is false, since the gravity assumptions could

have expected positive results to reflect the higher the amount of aid flow, the large the size of the market and hence higher intra trade.

However, we argue that the produced results are very true given the impact of aid on trade in developing world, and further statistical investigation is to be conducted so as to produce useful statistical and policy implications. In addition to that, the volume of trade between EAC block and SADEC block are positively impacted by the increase in the number of telephone lines in the participating members, whereby the gravity assumed that availability of reliable communication means it reduces the costs of transport within a block. In recent years there have been massive revolutions and greater improvements on the availability of telecommunications in the sub-Sahara, but unfortunately that has been leading to a lower volume of trade. Further investigations or another variable are recommended so as to measure their impacts on costs of transport and hence volume of trade

2.3: Conclusion and General Discussion.

Overall, our main findings are robust as all the important panel estimation procedures have been followed and the results are significant for policy interpretations in the EAC common market. In the first data set, we found an increasing volume of intra trade within the region despite the fact that we found some interesting information which are contrary to the initial hypothesis of the gravity equation. In addition, the degree of intra trade between EAC countries and the other two regional blocks (SADEC and COMESA) is also significant and growing implying that an expanded free market area to include the entire Central East and Southern Africa is viable and optimum. The trade dependence between EAC countries and none members, especially those sharing same borders with EAC states, is significant and growing overtime. Through the series of examinations conducted above, one can use our results to asses an applicant that want to join the EAC common market.

Also the trade flow between EAC and the rest of the world is indicating to grow at a significant path especially from when unified trade policies were adopted by the EAC member countries. In addition to becoming more open to the rest of the world, the growth of other variables such as infrastructures and technology indicators in EAC is

also very promising indicating income will grow faster in the long run. Apart from the above listed long run drivers of growth, EAC are found to be natural trading partners and the enhancement of good trade policies and political stabilities will encourage more economic diversification. To sum up, this chapter identifies the below outlines points:

(i) The need to promote structural indicators for faster and long run growth of the expanded EAC market. Therefore to investment more into infrastructures, technology, sources of energy/power, political stability. Our findings are contrary to the highly promoted reports which insist corruption and bureaucracy are the key reason for poverty, slower growth and under-development of many SSA economies.

(ii) The volume of trade between EAC countries and other Forty One (41) SSA countries included in our second and third parts of the gravity analysis is growing faster than the growth of intra-SS Africa trade for countries that are non-EAC members. We speculate that the joint programmes been implemented by EAC and other partner such as SADEC and COMESA are promoting trade and growth in the countries that are implementing the initiatives. Also this respond to the point rose earlier that at least each country in the SSA is a member of two trade unions.

(iii) Our results suggest that the volume of trade between EAC states and COMESA states is higher than to that of the SADEC states. Unlike the SADEC zone, the volume of trade into/from the COMESA states from/to the EAC state has been significantly growing from when the EAC started to adopt the criteria for the highest stages of economic integration in 2005 - 2010. Therefore given political stability and joint fiscal policies, EAC and COMESA can jointly implement same trade policies so as to foster growth and trade flows in most parts of the SSA.

(iv) EAC requires a joint plan that will help to stabilise disturbances that originates from supply shocks. For example a joint programme on oil, gas and electricity is needed urgently so as to ensure the costs of production are maintained throughout the extended market.

(v) Foreign aids are found to be explaining the volume of trade of the cross section. To be more precise, foreign aids that originates from organisations that promote trade and growth such as WTO, UCTAD, World bank and IMF are found to have positive impacts on openness of the extended market. Other sources such as UNFPA and UNHCR produced negative coefficient to imply they have negative impacts on the openness and flow of trade in the selected countries.

(vi) The food production index indicates that the more EAC and SADEC produces food products, the less the volume of trade between the two blocks. On the other hand, the more EAC and COMESA produce food products, the higher the volume of trade between the regions. We argue that COMESA is the highly industrialised region as compared to EAC and SADEC regions and therefore markets that produce similar products but differentiated (non homogenous products) are likely to trade as compared to markets that are none industrialised as they are subjected to less differentiation of the products.

(vii) The official exchange rate (LCU per US$) for individual countries is not significant correlated to the flow of trade and openness of an economy. Despite devaluating the exchange rate since late 1980s to favour trade flows and openness to the rest of the world, the local exchange rate is found to be insignificantly correlated to the flow of trade across the SSA region. Rather, structural factors are the most explaining factors of trade flows.

(viii) The gravity equation lacks econometric theoretical foundation and hence the validity of the results relies on the efficiency of other statistical testing procedures for panel equations. Therefore, it relies on how one tests the time series properties of the panel to forecast the short and long run trends of the series.

(ix) The main assumption of the gravity model is that distance has a negative coefficient and reduces the flow of trade between a pair of country. This study validates this assumption but we notice that the magnitude of the

impact of distance on volume of trade varies depending on a range factors such as technology, infrastructures and means of communications. The traditional gravity model does not specifically state on how to deal with the varying factors that determines distance.

(x) Despite the above weaknesses, the gravity model remains very powerful, consistent and significant to estimate panel data sets. The arrangement of the gravity equation allows all panel estimation procedures and statistical testing to be carried out without any problems. For instance, in this chapter we conduct the time series unit root tests, cointegration and other forecasting models which help to identify the short-run and long-run relationships between the selected variables in the cross section and their impact on the long run income convergences and growth.

CHAPTER THREE

Measuring Market Responses of the EAC Economies to
Business Cycles

3.0: The impacts of symmetric shocks on a monetary union

One of the key elements of an optimal currency area, as suggested by (Mundell, 1961), is to ensure that countries participating in a common market respond in similar way to business cycles. This can also mean that economies in a block must have similar responses to internal or external shocks that may affect their macro variables that drive their economies. Therefore, when some of the countries in a block experience boom or recession, the rest of the union members should (likely) respond similarly by either a boom or recession, respectively. Mundell's idea was based on the fact that when all countries in a region respond similarly, it becomes easier for the centralised monetary system to promote and maintain the price levels and growth (especially during hard times such as when the region experience recession or financial shakes). On the other hand, if countries in a trade union respond differently during recession or boom (positive or negative shocks) there is a danger of leading to trade divergences and imbalances which may favour only few parts of the extended market.

The recent Euro region meltdown of some of the participating economies is good evidence that a clear and strong mechanism is required while adopting the early stages of integration. The procedure to solve the meltdown in the euro area has taken a long period of time to agree on which measures can be effective and are viable to the listed countries in the union. Therefore, forming a currency regime in an area where participating economies do not respond similarly (symmetric) may lead to a collapse of a common market and its impact may spread to the rest of the extended market, hence causing long-term problems on the key macroeconomic indicators. The recent euro meltdown has not only affected Greece, but also it has spread throughout Europe, leading to recession in non-euro exchange regime members, such as the United Kingdom, which experienced negative growth rate in the first two quarters of 2012.

As also highlighted in the previous two chapters, Rwanda and Tanzania have had a higher economic growth rate, booming at an average of 5% - 7% respectively for the past five years (2007 – 2012). This has been driven by a number of factors, including the recent discoveries of natural gas, oil, gold, diamonds and increased productivity in

the agriculture and tourism sectors in the two economies. The number of jobs being created every year in these countries has been significantly increasing as compared to the rest of the region, while prices (inflation) at the same time have been increasing at an average of 7% - 8%, implying positive long-run growth and increased supply (investments) in these two cited countries. The rest of the EAC member countries (Kenya, Burundi and Uganda) have also been responding by a steady growth averaged above 5% for the past five years, which originates from other sectors rather than mining (Except Uganda which was due to start exporting oil products from 2012). Previous studies such as (Saxena, 2005; Buigut, 2006; Blanchard, 1989; Bayoumi, 1992) have investigated the status of the key variables such as unemployment, inflation, exchange rate, GDP, GDP growth, GDP per capita and money supply. In their findings, the key discussions was to analyse whether the responses of the key macro variables to symmetric or asymmetric shocks.

In addition, they investigate the response to both external and internal shocks hence concluded with regard to the Mundell's criteria for optimum currency areas. For example, the recent world economic crises which drove many countries into recession, has had different impacts in developing countries. For instance, China and some eastern Asian countries were the winners from the recession as evidenced by the fast growth and development they attained, due to higher flow of FDI's. Developed countries (Western Economies) on the other hand,   struggled to stabilise macro variables and adjust the imbalances back to recovery. Least developing countries, have experienced lower exports, lower commodity prices, lower FDI into key sectors (agriculture and tourism sectors) which employs a large percentage of the population of LDCs.

By definition, business cycles are the movements (changes) of the entire economy from time to time. The economy can never be static forever as it will boom, will recess towards depression then will recover towards peak points and the process will continue. There are many reasons that cause economic cycles and they can differ depending on the levels of development, history of the core variables that drive the economy and the setting of the key sectors of the economy. For instance, in many SSA countries, political tensions have been playing a significant role on the behaviour of the economy. A good example is during political elections in many sub-Saharan African countries, many economic activities in urban areas stop due to the tension that normally emerges within the society and that can cause temporally changes in the movements of the economy.

Another example, as noted above, agriculture contributes a big percentage in terms of employment and share to the economy in LDC such as the group of EAC countries and therefore, few or an excessively rainy season may lead to changes in the business cycles of the economy. Therefore, business cycles happen due to disturbances to the economy's sectors hence pushing the economy above or below full employment or targets of the economy. Since there are no clear points that are suggested as boom or depression turning points, business cycles are dated from when the direction of the economic sectors change towards another direction. In a simple definition, recession happens when the economy grows by negative percentages while recovery/boom is when the economy continue to grow by positive percentages

3.1: Methodology and Data Specifications

This chapter follows the Blanchard and (Blanchard, 1989; Bayoumi, 1992) procedures which identify the underlying structural shocks of the participating block members by applying the Vector Autoregressive (VAR) technique which was first developed and tested by (Blanchard, 1989). The VAR procedures allow conducting cross variables dependence and estimation on how an unpredictable disturbance affects different variables in a setting of variables in a cross section. Thus through Vector Autoregression, we expect to identify the incidence of asymmetric demand and supply shocks across the EAC member countries and their short-run and long-run impacts on different macro variables in a panel setting. In the second chapter the key point was to measure the volume and speed of trade within the EAC region and the intra-volume of trade between the EAC and other regional blocks in the Sub- Saharan Africa market. Therefore, using similar procedures, this study intends to identify the responses to structural shocks of EAC countries and how each country responds to market cycles of the regional block of SADEC and COMESA. In other words, this chapter will also help to identify which block within sub-Saharan Africa has similar responses to those of the EAC countries business cycles; hence identify which individual countries can be welcomed anytime to join the EAC common market.

The VAR, VECM and the structural-VAR procedures have proved to be very strong techniques in identifying accurate responses of variables to internal/external shocks. This is evidenced by a large number of literatures which identify the responses by composing variables of a group of countries (region), and their results were very

powerful in explaining different policy implications. Thus as noted above in the introduction, one of the advantages of adopting these procedures is to answer one of the key determinants of a n optimal currency area as suggested by (Mundell, 1961). It also helps to forecast and suggest powerful solutions for the long-run behaviours of the macro variables of countries in a cross section. The key targeted variables for this analysis is the GDP growth and inflation so as to identify and highlight the role of growth and price levels of the participating countries in a trade union, and their role towards the formation of a currency regime of developing economies. So far the volume and speed of trading between the EAC countries has been identified as significant and growing at appropriate percentages that can persuade a trade union to have a single currency/fixed exchange rate.

In this chapter, therefore, we go step by step whereby the unrestricted normal VAR is estimated so as to identify results found at that stage before going into VECM (if necessary) and finally where the structural VAR is employed to identify demand and supply shocks and their symmetric levels. All other times series econometric procedures, especially the unit root and cointegration testing procedures are followed so as to explain the long-run behaviour of these variables, which we assume to be the key variables that can easily unify a block. Other studies conducted in data-rich countries investigated the structural correlation between monetary variables, such as the interest rate, and some indicators of money supply and different shocks that can happen to any country within a set of countries. This study, therefore, investigates fiscal-related variables, hence draws conclusions under the same basis as those examined on the monetary side. For instance, from the correlation between GDP deflators, GDP growth and other factors being held constant, this study basically tests how fiscal authorities react to shocks (volatility) in prices (GDP deflator/inflation). In future studies and examinations, further investigations should be conducted to measure the interaction between monetary (interest rate, money supply) and fiscal (taxation, government spending) policies to see how economic institutions react to external shocks.

The first phase of this chapter computes the structural shocks to aggregate real output (GDP) and the GDP deflator (price levels) for the five EAC participating countries, while the second phase includes other countries that form SADEC and COMESA so as to produce results with implications of which block has more similar shocks to EAC countries. We slightly follow the VAR procedures employed by the studies of

(Blanchard, 1989; Bayoumi, 1992), which basically follow the common explanation of the aggregate demand and aggregate supply. This procedure has also been adjusted and applied by studies such as (Saxena, 2005; Buigut, 2006) which noted a few assumptions to be followed while applying this framework. The first assumption states that; higher prices (inflation) discourage real wages and unemployment hence increase in real output (GDP). In addition, in the short-run aggregate supply curves are positively upward sloping implying higher prices (inflation) lead to higher supply, other factors remaining constant. This can be summarised that, in the short run, higher prices lead to an increase in supply and output, and that shock can negatively affect the unemployment rate since an increase in the aggregate supply increases employment opportunities.. In the long run the supply curve is vertical, implying prices do not influence supply of output in the market since all factors of production vary. Further to that, this process concludes that, in the long run, all factors of production are fully employed.

The second part of the assumptions of this process is based on the demand side which initially states that the aggregate demand curve is negatively downward sloping both in the short run and in the long run, to imply higher price levels (inflation) discourage demand for goods and services and hence it reduces the real output (GDP) that consumers are ready to buy. In other words, this assumption implies lower prices promote demand for more outputs (goods and services) (GDP) and that cycle continues leading to a positive shock on the levels of investment and a negative shock on the levels of unemployment rate. Therefore, as also explained in the preface[26], this process is basically based on the determinants (forces) of demand and supply in a given free market.

Therefore, the key point to note from these set of assumptions is that demand shocks have no long-run impacts on the levels of output (real GDP), while supply shocks lead to a permanent changes on the level of output. Factors that can cause positive structural shocks on supply, hence permanent change on the levels of output, includes improvements in technology, infrastructures, education, healthcare systems and changes/improvements of the policies guiding the market. in addition, factors such as investment in infrastructures, injection of new techniques of production and employing educated and a healthy labour force, leads to an increased productivity of the factors of

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[26] Therefore, the difference between the AS and AD shocks is that the supply shocks lead to permanent changes in the economy while demand shocks are temporal (short term) changes; also, supply shocks reduce prices while demand shocks increase market prices.

production in a free market. Therefore, this cycle can be summarised as, technology and good infrastructure leads to an increased quantity of goods and services in the market, which will encourage competition and quality in the market, productivity increases, Government revenues increases, employment opportunities increase, prices fall, and finally the total GDP (output) shifts to the right. The opposite of that sentence is also true.

On the other hand, factors that can cause a positive demand shocks[27] include: change in income, taxes, availability of substitutes and compliment goods/services, expectations and increase in population. Any changes in the above listed causes of demand shocks lead to a short-run increase in real output. For example, an increase in income leads to an increase in demand for goods and services in the market. The supplier responds to that by increasing the price levels without increasing the level of output to supply in the market, hence forcing demand to return to the point where the supplier can produce to the available market demand. Therefore, demand shocks lead to a permanent change on the level of prices, while the level of output remains the same. The same will happen, (other factors remaining constant) to other causes of demand shocks for example, a decrease in taxes increases income and demand, while the final impacts are the same as the one explained above. Also, shocks such as expectations can force consumers to buy more or buy less, hence forcing suppliers to respond in a similar way as above without increasing or decreasing the level of output in the market.

Therefore from the above explanations, one can notice that both supply and demand shocks have impacts on the price levels, though the responses are different as the former cause prices to fall while the latter cause price increases. In addition, supply shocks have permanent (long-run) impacts on the level of output (GDP), while demand shocks have no impact on the levels of output both in the long run and short run. Thus, for long-run growth, lower unemployment rate, lower prices and more goods in the market, this argument suggest that economies should always advocate improvement and advancement in technology, improvement in infrastructures, investing in education and a good healthcare system to ensure a healthy working society. That also implies, planners should prefer adjustments that encourages supply shocks. Therefore, we start by specifying an unrestricted VAR whereby the key assumption is that; any

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[27] Demand shocks do not have any impact on the level of output (GDP), rather they have permanent impacts on the price levels (inflation).

changes/fluctuations in the log of real GDP (Δy_t) and GDP deflator (Δp_t) are the result of both demand and supply shocks when the two variables are stationary and they do not have a unit root. Therefore, this can initially be explained as follows:

$$\left[x_t \equiv \begin{array}{c} \Delta y_t \\ \Delta p_t \end{array} \right] \tag{3.1}$$

Under the infinitely moving average representation, this joint process can be written as a vector of the two variables and equal number of structural shocks as shown below:

$$\left\{ X_t = A_0 \varepsilon_t + A_1 \varepsilon_{t-1} + A_2 \varepsilon_{t-2} + \dots = \sum_{i=0}^{\infty} L^i A_i \varepsilon_{t-i} = \sum_{i=0}^{\infty} L^i \begin{bmatrix} a_{11i} & a_{12i} \\ a_{21i} & a_{22i} \end{bmatrix} \begin{bmatrix} \varepsilon_{dt} \\ \varepsilon_{st} \end{bmatrix} \right\} \tag{3.2}$$

Where L is the lag operator, A_i are the matrices to capture the impulse response (the effects of shocks to real output and prices) of the demand and supply shocks to the variables of the vector X_t. ε_{dt} and ε_{st} are independent white-nose demand and supply shocks which are normalised so that VAR(ε_t)=I. ε_{dt} and ε_{st} are not observed, therefore we estimate a finite version VAR(p) with 2 lag length to allow movements in the business circle and hence identify shocks. Then, to decompose the structural shocks, the (Blanchard, 1989; Bayoumi, 1994b; Bayoumi, 1994a) framework assumes that any changes in demand (demand shocks) do not have any effect on output in the long run. Therefore, the total effect of the demand shock on the change of the log of real GDP ($\sum_{i=0}^{\infty} a_{11i} = 0$) must be equal to zero. We then recover both the demand and supply side shocks by estimating a VAR of finite order. The optimal lag length g is selected to allow residuals approximate while noise process. Each element of X_t is regressed on lagged values of all the elements of X;

$$X_t = K + \delta_t X_{t-1} + \delta_2 X_{t-2} \dots + \delta_g X_{t-g} + \phi_t \tag{3.3}$$

δ_t are coefficients estimated from the equation and the residual vectors (ϕ_t) in (3.2) are a composite of demand and supply shocks $\begin{bmatrix} \Delta y_t \\ \Delta p_t \end{bmatrix}$ and the long term impact, according to the above specified model is a permanent rise in GDP deflator (higher prices). We then assume the procedure is covariant stationary so as to calculate the mean m of the process.

$$m = K + \delta_1 m + \delta_2 m \, ... \phi_p m \qquad (3.4)$$

We then subtract equation (3.3) from (3.4) to identify how X_t is diverting from the mean m.

$$(X_t - m) = \delta_1(X_{t-1} - m) + \delta_2(X_{t-2} m) + ...\delta_g(X_{t-g} - m) + \phi_t \qquad (3.5)$$

The VAR (g) in (3.4) can be represented as a VAR (1) process by first defining (3.5) as follows:

$$\ell_t \equiv \begin{bmatrix} X_t - m \\ X_{t-1} - m \\ . \\ . \\ X_{t-g+1} \end{bmatrix}, R \equiv \begin{bmatrix} \delta_1 \delta_2 ....\delta g \\ I_2 0.... \\ . \\ . \\ 0.....I_2 0 \end{bmatrix}, T_t \equiv \begin{bmatrix} e_t \\ 0 \\ . \\ . \\ 0 \end{bmatrix} \qquad (3.6)$$

Therefore we write (3.5) as VAR (1) using the definition in (3.6) above as follows:

$$\ell_t = R\ell_{t-1} + T_t \qquad (3.7)$$

While the recursive alternative of (3.7) implies that:

$$\ell_{t+s} = T_{t+s} + RT_{t+s-1} + R^2 T_{t+s-2} + ... + R^{s-1} T_{t+1} + R^s \ell_t \qquad (3.8)$$

Both the (Blanchard, 1989; Bayoumi, 1992) procedures note that the $F^s \rightarrow 0$ as $s \rightarrow \infty$ and the VAR is covariance stationary if the eigenvalues of R lie inside the unit root circle and the first two rows of (3.8) give the vector moving average (∞) representation of X_t:

$$X_t = m + e_t + C_1 e_{t-1} + C_2 e_{t-2} + C_3 e_{t-3} + C_4 e_{t-4} \qquad (3.9)$$

Where $C_j = R_{11}^j$ and R_{11}^j denotes the upper left block of F^j which is noted as the matrix R raised to the power of j. Therefore the estimations from equation (3.1) to equation (3.9) provide the correlation between the estimated residuals (e_t) and the structural shocks ε_t.

$$e_t = A_0 \varepsilon_t \qquad (3.10)$$

To estimate the underlying structural supply and demand shock, we now need to understand the elements of A_0. From estimation, we obtain the C_is and the variance-covariance matrix of residuals:

$$E(e_t e_t') = A_0 E(\varepsilon_t \varepsilon_t') A_0' \qquad (3.11)$$

Since our case is a two-by-two, we therefore need to introduce four restrictions in order to recover the elements of A_0 whereby two are simple normalisations defining the variances of ε_{dt} and ε_{st}. According to (Bayoumi, 1992), the third restriction assumes that supply and demand shocks are orthogonal so that $E(\varepsilon_{dt}\varepsilon_{st}) = 0$ since ε_{dt} and ε_{st} are deemed to be pure shocks. Then we drop $E(e_t e_t^{'})$ in (x) as I_2 to obtain:

$$E(e_t e_t^{'}) = A_0 A_0^{'} = \Omega \tag{3.12}$$

And then, since variance-covariance matrix of residuals Ω is a known symmetric matrix, then we obtain the following three restrictions: the two restrictions are normalised to define the variance of the demand and supply shocks while the third restriction is capturing the assumption that demand and supply shocks are orthogonal

$$Var(e_{yt}) = a_{11}(0)^2 + a_{12}(0)^2 \tag{3.13}$$

$$Var(e_{pt}) = a_{21}(0)^2 + a_{22}(0)^2 \tag{3.14}$$

$$Cov(e_{yt}e_{pt}) = E(e_{yt}e_{pt}) = a_{11}(0)a_{21}(0) + a_{12}(0)a_{22}(0) \tag{3.15}$$

And finally, we impose the last and most important restriction that demand shocks have temporary (short run) impacts on output (GDP) as explained by equation (3.2) and as initially introduced in the introduction chapter. Therefore, this restriction also allows matrix c to be identified uniquely so as to estimate the demand and shocks. In terms of VAR process, this restriction is expressed as follows:

$$\sum_{i=0}^{\infty} \begin{bmatrix} c_{11i} & c_{12i} \\ c_{21i} & c_{22i} \end{bmatrix} \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} = \begin{bmatrix} 0 & * \\ * & * \end{bmatrix} \tag{3.16}$$

It is worth noting that, however, the final restriction does not indicate[28] the impacts of the restrictions (shocks) on prices rather it produces the responses of output to the two shocks that are demand and supply shocks leading to an increase and decrease in prices, respectively. In summary, the four introduced restrictions lead to identification of the demand and supply shocks by simply defining uniquely the matrix A_o and hence two

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[28] The restriction are not imposed to identify their impacts on prices, it is easy to think as they are over-identified restrictions for testing and interpretation of the results Bayoumi, T. a. E., B. (1992), 'Shocking aspects of European Monetary Unification."s' Available at: (accessed

series of exogenous shocks are obtained and hence the correlations of these shocks are computed for the EAC block. Also, according to the (Bayoumi, 1992) framework, the impulse response function (A_0) and structural shocks are obtained as well, as we have enough data and information required by the specifications above. Therefore in order to obtain the impulse responses, we follow the following procedure:

Let y_t be a k-dimensional vector series generated by the following two steps:

$$y_t = A_t Y_{t-1} + \ldots\ldots\ldots + A_p Y_{t-p} + \delta_t \tag{3.17}$$

$$y_t = \psi(B)\delta_t = \sum_{i=0}^{\infty} \psi_i \delta_{t-i} \tag{3.18}$$

Whereby ψ_i is the moving average coefficient capturing the impulse responses of selected variables; more explicitly it is written as $\psi_{jk,i}$ meaning the response of variable j to a unit impulse in variable k occurring i^{th} period ago. As far as this study is concerned, the impulse responses will be useful in measuring the effectiveness and impacts of policy changes in certain selected macro variables that is real output (GDP) and general price levels (Deflators). It is crucial to note that, given the usual econometric assumption that $\sum$ is non-diagonal and therefore one variable cannot experience any shock if other variables are fixed, and that some forms of transformation are needed, whereby this study preferred the Choleski decomposition procedure which has been applied by a number of studies of this kind. The procedures are as follows:

We assume p to be a lower triangular matrix such that $\sum = PP'$ so that equation (3.2) can be re-written as:

$$y_t = \sum_{i=0}^{\infty} \Theta_i w_{t-i} \tag{3.19}$$

Whereby $\quad \Theta_i = \psi_i P,$

$\qquad\qquad w_t = P^{-1} U_t$

$\qquad\qquad E(w_t w_t') = 0$

Then the Choleski decomposition procedure requires allowing D to be a diagonal matrix with same diagonal dimensions with P and also to let $W = PD^{-1}$ and $\wedge = DD'$ so that after some manipulations to obtain equation (3.20) below:

$$y_t = B_0 y_t + B_1 y_{t-1} + \ldots\ldots\ldots\ldots + B_p Y_{t-p} + V_t \tag{3.20}$$

Whereby $\quad B_0 = l_k - w^{-1}$

$$w = PD^{-1}$$
$$B_i = w^{-1}A_i$$

Basically, B_0 is a lower triangular matrix with zero (0) diagonals suggesting that the Choleski decomposition imposes a recursive causal structure from the top variable(s) to the lower (bottom) variable(s) but this process does not go the other way round (from bottom to the top structure of the variables). Finally, it is suggested that if the first responses of variable j to an impulse in variable k is zero, then the following responses are all zero. The results for this procedure are presented by impulse responses graphs below.

3.1.1: Data

Unlike the usual monthly and quarterly frequencies used by previous studies which were conducted in data-rich economies, yearly data is used in this chapter so as to identify yearly responses of the macro variables used in the analysis. Data used by this chapter are obtained from the World Bank's world development indicators, IMF's international financial statistics and governmental reports. At different stages, we drop some countries from the setting due to various reasons, including unavailability of accurate data covering a significant period of time that is acceptable by the techniques of analysis. Also, we select one country out of a group of countries that share similar history and similar history of their macro economic variables. Further to that, most statistical software, especially E-views, cannot compute a procedure such as VAR that has more than 50 variables at once. Therefore, countries included in the dataset have been selected considering the above reasons.

To measure changes in output and prices due to structural shocks, we employ real GDP as an indicator for total output of an economy while GDP deflator[29] is employed as the final price levels of goods and services produced per year in an economy. Unlike many previous studies that employed GDO growth and inflation, this study employs the two variables (GDP and GDP deflator) so as to produce results that can be more useful in policy creation and formulation in least developing countries. It is worth we insist that,

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[29] The GDP deflator is a measurement tool that includes the total costs of goods and services (all new produced, in stock) produced in an economy within a given period.

the GDP deflator is more preferred[30] by this analysis to the inflation rate because it provides clear insights on how productive and efficient the economy is at time t as it takes into account the prices of all new and final goods/services that have been produced in an economy per given period of time, hence it is easier to predict and forecast the productivity level of an economy. On the other hand, the size of the economy (Real GDP) is the most important indicator of the size of the economy at time t as compared to the rate of growth (GDP growth rate) of the economies in a group. Therefore, under this analysis, real GDP and the GDP deflator are the most important determinants of an optimal currency area; thus their history and future trends will determine a strong or a weak exchange rate regime.

Some previous literatures have investigated the responses of other macro variables such as exchange rate, taxes and government spending to structural shocks. Their findings were controversial and weak to apply on policy formulation of other key indicators of economies. In addition to that, given the lack of historical data-sets on other variables necessary for integration, we strongly rely on output and price levels of goods and services as the key indicators. All the variables are transposed to logs then we compute the first or even the second difference, since all the series contain a unit root at level data. This also means we estimate at what stage our series are stationary without a unit root so as to escape the biases that can be created by a stochastic trend. In addition, we conduct a cointegration test to measure the long run equilibrium relationships of prices and output across the EAC region and other non-members. The unit root and cointegration procedures employed by this chapter are suitable for our limited data set, which can affect the selection of the number of lags for estimations of the autoregressive procedures to be estimated below. It is important to note that, since most of the series have a unit root at level data, we employ a special VAR procedure named Vector Error correction Model (VECM) which isolates the impact of a unit root in the auto-regression. This special VAR (VECM) also isolates the short-run and long-run autocorrelations of the variables in the setting. Finally we estimate the structural Vector Auto-regression which captures the responses of output and price levels to demand and supply shocks in the economy within a specified period of time.

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[30] GDP and Inflation are the most important macro variables indicators in the Africa region (Buigut, 2006). Other macro economic variables, especially the interest rates, are less important and they are not the most important tools for economic adjustments Buigut, S. K. (2006), " Feasibility of Porposed Monetary Unions in the Eastern and Southern African region." No.

In their analysis, (Bayoumi, 1992) started by describing their data set as unprocessed, whereby they measured a standard deviation and the correlation coefficients for the logarithm of the GDP growth rate and GDP deflator. This study is expected to expand the idea so as to gather as much information as possible, hence wind up with information that can re-shape the way this procedure can be applied. The results are divided into two sections whereby the first section is including the EAC countries only, while the second phase of the results compares EAC countries with other SSA countries that are either members of COMESA or SADEC. Countries that have similar responses to structural shocks can form an optimal currency area, while countries that have different responses to shocks cannot form an optimal currency area. That also means that non EAC countries that have stronger macro-autocorrelation with at least half of the EAC region able to be welcomed to join the EAC market, hence to form a more extended market.

3.2: Results

Response to Cholesky One S.D. Innovations

Response of Uganda GDP (output) to Uganda GDP Deflator (Price levels)

Response of Tanzania GDP (output) to Uganda GDP Deflator (Price levels)

Response of Rwanda GDP (output) to Uganda GDP Deflator (Price levels)

Response of Kenya GDP (output) to Uganda GDP Deflator (Price levels)

Response to Cholesky One S.D. Innovations

Response of Uganda GDP (output) to
Tanzania Deflator (Price levels)

Response of Tanzania GDP (output) to
Tanzania GDP Deflator (Price levels)

Response of Rwanda GDP (output) to
Tanzania GDP Deflator (Price levels)

Response of Kenya GDP (output) to
Tanzania GDP Deflator (price levels)

Response to Cholesky One S.D. Innovations

Response of Uganda GDP (output) to
Rwanda GDP Deflator (Price levels)

Response of Tanzania GDP (output) to
Rwanda GDP Deflator (Price levels)

Response of Rwanda GDP (output) to
Rwanda GDP Deflator (Price levels)

Response of Kenya GDP (output) to
Rwanda GDP Deflator (Price levels)

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Response to Cholesky One S.D. Innovations

Response of Uganda GDP (output) to
Kenya GDP Deflator (Price levels)

Response of Tanzania GDP (output) to
Kenya GDP Deflator (price levels)

Response of Rwanda GDP (output) to
Kenya GDP Deflator (price levels)

Response of Kenya GDP (output) to
Kenya GDP Deflator (price levels)

The impulse responses of the national GDP output to the GDP deflator of the group indicates in most cases that the price levels captured by the GDP deflator goes negatively towards the level of output in the short term while adjusting positively in the long run. In some cases, such as the response of Tanzania's national output to Uganda's price levels (GDP deflator) sharply decline negatively and the correlations remains negative for a long period of time until period seven and then slightly decline between periods eight to nine, and then start to rise. This is similar to the response of Rwanda GDP (output) to the Uganda GDP deflator, also sharply declining and remaining negative until period ten, where the correlation starts to adjust towards positive points. Furthermore, the response of national output of the EAC countries to the Tanzania GDP deflator is highly fluctuating from negative to positive, except the response of Kenya's GDP, which is responding to Tanzania's price levels by fluctuating above the positive points as compared to Uganda, Rwanda and Tanzania itself, where the fluctuations are moving from negative to top, then declining sharply.

Moreover, the initial response of each country's GDP to the unit shock in Rwanda's GDP deflator is different in each country. For instance, Tanzania's GDP (output) increases and sharply declines to negative points and then starts to increase towards

positive points from period four onwards and remains above positive points. On the other hand, Uganda's GDP (output) responds to a unit shock in the price levels of Rwanda and is positive and continues to increase as compared to that of Kenya, which fluctuates above positive points. The response of Kenya's national output to a unit shock on its levels of prices indicates it to be increasing positively over time (fluctuating above positive points). Interestingly, as shown in the appendix, the response of each country's GDP deflator (price levels) to a unit shock of GDP (output) throughout the region is quite similar, whereby at the beginning of ten periods it sharply declines to negative margins then adjusts positively and then remains fluctuating at a positive pace.

Finally, the response of GDP deflators (prices) to a unit shock of GDP deflator (prices) of each country's own and that of the other members is quite the same, except that of Tanzania and Kenya, which are continuously declining towards a negative point over time. The rest are fluctuating on positive points of changes. Some positive fluctuations are identified on the response of GDP (output) to a unit shock on the levels output of the countries participating in the EAC free market. In general, the responses of output to a unit shock of the GDP deflator, which is a proxy for the levels of prices across the EAC block, indicate a long term positive response. That also implies, in the long run, the real GDP (output) of the EAC countries, especially the small economies, is moving positively, while the level of prices (GDP deflator) are moving negatively towards the level of output of the EAC states. The first set of the results is presented in the next page.

Table 21 Cointegration Rank Test Results

Trend assumption: Linear deterministic trend

Series: Uganda GDP Deflator (price levels), Uganda GDP (output), Tanzania GDP Deflator (price levels), Tanzania GDP (output), Rwanda GDP (output), Rwanda GDP Deflator (Price levels), , Kenya GDP Deflator (Price levels), Kenya GDP (Output)

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen-value	Trace Statistic	0.05 Critical Value
None	0.971***	346.47***	159.53
At most 1	0.949***	251.20***	125.63
At most 2	0.849***	170.95***	95.75
At most 3	0.813***	119.84***	69.82
At most 4	0.716***	74.63***	47.86
At most 5	0.569**	40.62**	29.79
At most 6	0.479**	17.91**	15.49
At most 7	0.009	0.27	3.84

Unrestricted Cointegration Rank Test (Maximum Eigen-value)

Hypothesized No. of CE(s)	Eigen-value	Max-Eigen Statistic	0.05 Critical Value
None	0.971***	95.26***	52.36
At most 1	0.949***	80.25***	46.23
At most 2	0.849***	51.11***	40.08
At most 3	0.813***	45.21***	33.88
At most 4	0.716**	34.01**	27.59
At most 5	0.569**	22.71**	21.14
At most 6	0.479**	17.65**	14.27
At most 7	0.009	0.27	3.85

Trace test indicates 7 cointegrating equation (s) at the 0.05 level

 *, **, *** denotes rejection of the hypothesis at the 0.01, 0.05 and 0.10 degrees of freedom respectively. p-values are obtained through the MacKinnon-Haug-Michelis (1999) procedure, Lags interval (in first differences): 1 to 1

In addition to the results portrayed by the impulse responses above, we also estimated the cointegration rank test whereby, from the VECM equation, seven cointegrating equations were indicated. Therefore, at 1% and 5% degrees of freedom, we find that the levels of prices (captured by the GDP deflator) and output (captured by real GDP) have

a long-run equilibrium relationship and are adjusting and converging equally towards equilibrium throughout the EAC region. Further evidence is also portrayed by the variance decomposition explain below and the results are reported by the Variance decomposition tables in the appendix of this chapter. These results can satisfy up to two criteria listed by (Mundell, 1961) on the level of fiscal integration and the responses of the markets to demand and supply shocks. To be more specific, up to this point our results indicate that EAC countries similarly respond to internal and external shocks on price levels and output levels. That can also mean that a positive shock in GDP deflator of one country in the EAC leads to a positive (increase) response in GDP (output) and GDP deflator (price levels) of other countries in the block. However, it is worthy of note that the VAR and VECM procedures are sometimes controversial, especially on estimating and isolating symmetric and asymmetric shocks. Therefore, it is important to apply the Structural VAR (SVAR) which as noted earlier, will help to isolate demand and supply shocks by restricting the short-run and long-run impacts of demand and supply both in the short run and in the long-run.

3.2.1: Variance decomposition

The variance decomposition for both GDP Deflator and the real GDP are quite robust to changes in VAR lag length and data frequency. As reported in the appendix, output of the EAC countries explains the prices and stability of the market by a large percentage. Large economies, especially Kenya and Tanzania, indicate to be explaining more the price levels of the entire block. That also implies since the EAC was formed, large economies have remained strong and have significant impact to the trade transactions of the entire region. It is worthy of note that the variance decomposition is more sensitive in forecasting variables rather than estimating the model, hence the results obtained complement the impulse responses perfectly. Generally, the impulse responses indicate that GDP deflator (prices) cannot be accounted for by large movements in the national output (real GDP). One reason for this is that movements of the national output are highly influenced by the structural adjustments in terms of technology, infrastructures, wages, trade policies and world market trade cycles.

3.2.2: Unprocessed Correlations and Standard Deviations

As noted earlier, this chapter strongly follows the procedure also used by the study of (Blanchard, 1989; Bayoumi, 1992) which started by measuring the standard deviation and the correlation coefficient of their data sets as unprocessed. In this phase also, we go stage-by-stage to clearly examine a structural vector autoregressive model of the EAC's member's output and price levels. First, using the unprocessed data we estimate the standard deviation and the correlation coefficients where it is revealed that prices are highly fluctuating and have been responding to the rest of the world for the past 50 years. For instance, Uganda and Tanzania have experienced higher fluctuations[31] of 1.2 and 0.8 on prices (GDP Deflator) as compared to Rwanda, Burundi and Kenya of 0.3, 0.4 and 0.3 respectively. Also, there have been smaller fluctuations on output (GDP) across the region as indicated by the lower standard deviations, with the lowest of 5.8% and highest 23.7%. That also indicates that for the past 50 years, prices across the EAC have been highly correlated as identified by the correlation coefficients. On the other hand, output levels (real GDP) have been fluctuating at slower margins between the deviation of 0.1 and 0.2.

Table 22 Correlation Coefficients for the unprocessed data

	Burundi	Kenya	Rwanda	Tanzania	Uganda	Standard deviation
Log of GDP Deflator						
Burundi	1					0.357
Kenya	0.955*	1				0.344
Rwanda	0.984*	0.971*	1			0.337
Tanzania	0.908*	0.986*	0.929*	1		0.751
Uganda	0.769*	0.907*	0.794*	0.956*	1	1.186
Log of real GDP						
Burundi	1					0.058
Kenya	0.646*	1				0.123
Rwanda	0.489	0.678*	1			0.137
Tanzania	0.609*	0.986*	0.751*	1		0.171
Uganda	0.500*	0.974*	0.703*	0.988*	1	0.237

* Indicate, significant at 5% (0.05)

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[31] Since the data is in logarithm form, 0.357 means 35.7%, that is 0.751=75.1%

Also as unprocessed, the standard deviation results indicate that Tanzania and Uganda have had higher fluctuations in output within the past fifty (50) years. As noted above, the real GDP (output) correlation coefficients for the entire region indicates to be highly correlated, except the coefficient for Rwanda and Burundi which indicates having a very rare correlation despite being very close geographically, historically and the size of the two markets. To make it more interesting, we spread the data set into five categories (time periods), such as the period privatisation and policy reforms (privatisation) were introduced across the region (1980 – 1989), post privatisation and policy reforms (1990 – 1995), pre EAC integration (1996 – 1999), early stages of the trade agreements (free trade area) (2000 – 2004), economic union and common market era (2005 – 2010). This helps to initially identify which stages have been successful and which have reduced the speed of integration in terms of harmonising income and prices throughout the region.

Table 23 Inflation and GDP disintegrated

Prices (inflation)					
	Burundi	Kenya	Rwanda	Tanzania	Uganda
1980 - 1989	0.91	0.87	0.90	0.89	0.86
1990 -1995	0.57	0.57	0.58	0.59	0.56
1996 -1999	0.24	0.21	0.23	0.22	0.21
2000 - 2004	0.33	0.33	0.34	0.34	0.33
2005 - 2010	0.30	0.29	0.30	0.30	0.29
Prices (inflation)					
	Burundi	Kenya	Rwanda	Tanzania	Uganda
1980 - 1989	3.64	4.17	3.84	4.14	4.07
1990 -1995	2.55	2.93	2.67	2.89	2.83
1996 -1999	0.77	0.88	0.83	0.88	0.88
2000 - 2004	1.45	1.66	1.52	1.64	1.61
2005 - 2010	1.26	1.44	1.33	1.43	1.40

From table 23 and table 24, we identify important results that can be useful for interpreting the entire study as we conclude later. For instance, the standard deviation for the two variables in the EAC region indicates Burundi, Rwanda and Tanzania have

had higher price fluctuations in the 1980s as compared to Kenya and Uganda. In addition, we notice that privatisation and unification of trade policies across the EAC (years 1990 - 2000) have forced the degree of fluctuations to decline by significant margins. Further decline can be noticed between the years of 2000 – 2010 within which EAC countries underwent further adjustments to comply with the requirements of a common market. The decline on the levels of fluctuations is not on the price levels but also on the level of output (real GDP) in the region. In their study, (Bayoumi, 1994b; Bayoumi, 1994a, 1992) noted that in a group of countries, there is a possibility for existence of an optimal currency area that can adopt a single exchange rate if the logarithms of output (real GDP) and prices (GDP Deflator) within the group are highly correlated with lower fluctuations on their price levels. These two approaches were necessary to start with before estimating the structural innovations and also to obtain the related economic interpretive impulse responses of the Structural Vector-auto-regression suggested by the literature. Also, these preliminary procedures are used as part of the robustness checks of the model and the results to be revealed by this chapter.

3.2.3: Identifying supply and demand shocks

In this part, the key objective is to identify the aggregate demand and supply shocks as specified earlier from equation 3.10 to equation 3.20, whereby for each country in the EAC group we use a bivariate VARs. In order to allow enough period of iterations of the series, we use two lag lengths in all the equations of the structural VAR. The same data set covering from 1960 – 2010 is used, whereby during this period a number of significant policy changes have been undertaken especially from the 1980s when the structural adjustment policies were introduced. In addition, during the years between 1980 and 2010 most of these countries experienced some impacts of civil wars that were going on around the region. Therefore, table 25 portrays the identified coefficients for the aggregate demand and supply shocks within the EAC region.

As suggested by previous literatures, positive correlation coefficients are symmetric, while negative correlations are noticed as asymmetric correlations. Both (Buigut, 2006; Blanchard, 1989; Bayoumi, 1994b; Bayoumi, 1994a, 1992) concluded that the more the symmetric the shocks, the more optimal a group of countries qualifies for a successful unified (fixed) exchange rate. On the other hand, if the shocks are asymmetric, literature suggests that a group cannot form a successful currency union. Furthermore, studies by (Lorenzoni, 2006; Kundan, 2009; Boone, 1997) noticed that

aggregate supply shocks have negative impacts on the cycle movements of output, prices and employment in a band of countries. On the other hand, they noted that demand shocks have positive aggregate shocks on the macroeconomic variables despite the common assumption stated earlier that demand shocks do not have any impacts on real GDP (output) in the long term[32].

Table 24 Supply and Demand shocks

	Supply Shocks					Demand Shocks				
	Burundi	Kenya	Rwanda	Tanzania	Uganda	Burundi	Kenya	Rwanda	Tanzania	Uganda
Burundi	1.00					1.00				
Kenya	0.60	1.00				0.05	1.00			
Rwanda	0.54	0.38	1.00			0.25	-0.09	1.00		
Tanzania	0.60	0.45	0.39	1.00		0.02	0.45	0.41	1.00	
Uganda	-0.27	0.22	-0.10	0.02	1.00	-0.70	0.19	-0.12	0.11	1.00

It is important we insist that the results on aggregate supply and demand shocks on table 25 are computed under the assumption that in the long run demand shocks do not have any effect on output; hence supply shocks are easily identified. In general, our results respond to the earlier estimations that the selected group of countries meets one of the key criteria of an optimal currency that is having similar responses to structural shocks. The structural VAR, given the restrictions specified earlier, indicates that EAC group responds symmetrically to external shocks as portrayed by the number of positive correlation coefficients of both aggregate demand and supply. That also means that positive correlations coefficients imply that the selected economies adjusts/responds to disturbances/shocks equally and in the same direction.

It is worth noting that equal responses to shocks can be a result of many reasons, including producing similar (homogenous) products, similar structures of the participating economies and similar development stages of the countries. Many of the reasons behind symmetric are very relevant to the EAC and most of the SSA countries which they seem to be battling against similar economic challenges.

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[32] In their models each level of volatility in productivity shocks, they introduced some restrictions on the amount of short-run volatility that demand shocks can generate Lorenzoni, G. (2006), "*A Theory of Demand Shocks,"* JEL, Blanchard, O. J. a. Q., D (1989), "The Dynamic Effects of Aggregate Demand and Supply Disturbances." *The American Economic Review*, No.

In addition, the correlation from the SVAR estimation produced non-zero coefficients indicating that the selected countries are natural trading partners and automatically depend on one another economically. That also advocates that it is safe to form an EAC currency regime. There are many implications one can notice from our results, for instance demand and supply shocks of Tanzania, Rwanda and Kenya indicate a significant correlation to the rest of the EAC block on both real GDP (output) and GDP deflator (price levels), while Uganda and Burundi indicate having smaller significant coefficients of supply and demand shocks.

Moreover, one can notice that Tanzania and Kenya's demand and supply shocks are highly correlated to the rest of the block members as compared to the coefficient values of the rest of the group members. For instance, the supply shock correlation between Tanzania, and Burundi, Kenya and Rwanda are r = 0.60, 0.45 and 0.39 respectively, as compared to the correlation between Burundi and Uganda, Uganda and Rwanda, which are -0.27 and -0.10 respectively. Given the history and the economic arrangements of the macro variables, there are many reasons behind why Tanzania and Kenya are more integrated to the block than other members which this procedure assumes to be constant. On the one hand, once again Burundi's and Uganda's demand shocks[33] are less correlated to the demand shocks of the other EAC members. In the short run, economies whose demand and supply shocks are less correlated to the rest of the block are expected to adjust (converge) faster in term of output growth and price levels adjusting faster towards the average prices of the block.

That also means, Burundi and Uganda are set to benefit more as EAC continues to adjust towards higher levels of integration. Table 26 portrays the aggregate market shocks for the price levels (GDP deflator) and output (real GDP). The GDP deflator produces many negative coefficients among most of the entire group members, evidencing that price levels in these countries is adjusting at same margins towards equilibrium. This follows the findings in the first phase of this analysis, where it was revealed that the volatility levels of both output and prices have been falling since

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[33] Poor economic performance of Burundi and some other parts of central Africa including Uganda is linked to the political climate which has witnessed civil wars for decades, corruption and poor quality democracy Mkenda, B. K. (2001), " Is East Africa an Optimum Currency Area?" Vol. Working Papers in Economics, Department of Economics, , Goteborg University., No.no 41: pp. , Kundan, K. N. a. J., S (2009), " Is the East African Community an Optimum Currency Area?" *Munich Personal RePEc Archive, Online*, No.

countries started to implement harmonisation programmes to foster stronger integration. That is been followed by symmetric response to external/business cycles throughout the region. These are additional indications that the extended EAC market meets the key optimum currency criterion and meets at least half (up to this point) of the main convergence criteria listed by Mundell and those listed by the Maastricht treaty.

Table 25 Symmetric and Asymmetric shocks

	Burundi GDP Deflator	Burundi real GDP	Kenya GDP Deflator	Kenya real GDP	Rwanda GDP Deflator	Rwanda real GDP	Tanzania GDP deflator	Tanzania real GDP	Uganda GDP deflator	Uganda real GDP
Burundi GDP Deflator	1									
Burundi real GDP	-0.47	1.00								
Kenya GDP Deflator	0.20	-0.59	1.00							
Kenya real GDP	-0.04	0.07	-0.20	1.00						
Rwanda GDP Deflator	0.54	-0.72	0.37	0.30	1.00					
Rwanda real GDP	-0.05	0.32	-0.54	-0.06	-0.18	1.00				
Tanzania GDP deflator	0.47	-0.76	0.68	0.01	0.64	-0.48	1.00			
Tanzania real GDP	0.16	0.07	-0.43	0.78	0.18	0.23	0.02	1.00		
Uganda GDP deflator	0.02	-0.39	0.61	-0.47	0.26	-0.44	0.28	-0.81	1.00	
Uganda real GDP	0.49	-0.61	0.18	0.50	0.68	-0.02	0.66	0.54	-0.19	1.00

However, despite the positive/negative correlation coefficients of the aggregate demand and supply shocks it is worthy of note that one should not rely on this; rather, multiple econometric and scientific approaches should be included before concluding that the proposed EAC monetary union is going to an optimal currency area[34]. Studies by

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[34] Buigut, (2006) study noted that shocks from the rest of the world or other non-full members of the block may have different impacts on the economies of the block members.

(Lorenzoni, 2006; Boone, 1997) have noted if there are unobserved shocks or components which are common to all block members, such as shocks from the EU or China, who are among main trading partners of the EAC countries; this may depict highly correlated shocks in all member states. Studies such as (Buigut, 2006) estimated simple correlation of some macroeconomic variables whereby their results did not show synchronisation of shocks between one block and other regions that are their main trading partners, and this is within the basis of any currency union.

3.2.4: Impulse responses

Finally, the structural impulse equations are estimated to compare the responses of the EAC economies to structural shocks in terms of speed and magnitude of adjustments. From impulse responses, we notice that the larger the size of the structural shocks, the higher the impact to the entire EAC market while the speed of adjustment towards recovery takes a longer period of time as it is very slow. All the figures below represent the impulse response function of real output (GDP) and prices (GDP deflator) of the goods and services for Tanzania, Kenya, Rwanda and Burundi; Uganda is omitted due to limited data set required to estimate VAR procedures. Also as noted by key observers of impulse responses, to identify whether the EAC monetary policy (ies) is (has been) active and has played a key role to the member economies, real GDP (output) should respond positively, while prices (GDP deflator) should respond negatively implying higher GDP (supply) forces prices to fall in the long run.

Common market and free trade are expected to increase supply, varieties and alternatives in the market while, as the market starts to absorb the newly-created opportunities and alternatives in the market, general prices will start to fall towards their minimum points in the long run. Basically, our results respond to our previous findings that the adjustment of the monetary and fiscal policies and the degree of integration between the participating countries are promising in the long run. For instance, the accumulated impact of structural shocks to the price levels in all the participating economies are adjusting positively and negatively (depending on the size of the shock), indicating all fiscal shocks and adjustments in the selected economies have been accommodated without causing any inefficiencies throughout the block. Similar outcomes are observed on the levels of output whereby countries are responding in a similar way and in the same direction to structural shocks, indicating that indeed these

economies are deeply integrated up to this stage (2012) where they are still practising common market policies.

In addition, in the long run, the impulse responses indicate that, as mentioned before, the prices of goods and services in the EAC area have a very small (near zero) impact on output[35], since the GDP deflator is adjusting and responding to structural shocks equally throughout the block. That also indicates that prices cannot determine GDP of the participating countries rather than other structural factors such as technology, infrastructures and cheaper labour. Also, as noted by the study of Boone (1997), an increase/decrease in the impulse response of the price levels (GDP Deflator) results from demand shocks which are temporary (short run) and they produce an increase in price levels. Therefore, the response functions for GDP and GDP Deflator in the region are not too different and their adjustments to supply shocks (permanent impacts) are indicating to mature within the early years and early stages towards full economic integration.

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[35] Demand shocks produce a gradual increase in prices over time (Boone, et al., 1997).

Figure 3.1 Structural Impulse Responses

Response to Structural One S.D. Innovations

Response of Rwanda GDP Deflator to Shock1

Response of Rwanda GDP Deflator to Shock2

Response of Rwanda GDP Deflator to Shock3

Response of Rwanda GDP Deflator to Shock4

Response of Rwanda GDP Deflator to Shock5

Response of Rwanda GDP Deflator to Shock6

Response of Rwanda GDP Deflator to Shock7

Response of Rwanda GDP Deflator to Shock8

Response to Structural One S.D. Innovations

Response of Tanzania GDP Deflator to Shock1

Response of Tanzania GDP Deflator to Shock2

Response of Tanzania GDP Deflator to Shock3

Response of Tanzania GDP Deflator to Shock4

Response of Tanzania GDP Deflator to Shock5

Response of Tanzania GDP Deflator to Shock6

Response of Tanzania GDP Deflator to Shock7

Response of Tanzania GDP Deflator to Shock8

Response to Structural One S.D. Innovations

Response of Kenya GDP Deflator to Shock1

Response of Kenya GDP Deflator to Shock2

Response of Kenya GDP Deflator to Shock3

Response of Kenya GDP Deflator to Shock4

Response of Kenya GDP Deflator to Shock5

Response of Kenya GDP Deflator to Shock6

Response of Kenya GDP Deflator to Shock7

Response of Kenya GDP Deflator to Shock8

Response to Structural One S.D. Innovations

Response of Burundi GDP Deflator to Shock1

Response of Burundi GDP Deflator to Shock2

Response of Burundi GDP Deflator to Shock3

Response of Burundi GDP Deflator to Shock4

Response of Burundi GDP Deflator to Shock5

Response of Burundi GDP Deflator to Shock6

Response of Burundi GDP Deflator to Shock7

Response of BUrundi GDP Deflator to Shock8

Response to Structural One S.D. Innovations

Response of Rwanda GDP to Shock1

Response of Rwanda GDP to Shock2

Response of Rwanda GDP to Shock3

Response of Rwanda GDP to Shock4

Response of Rwanda GDP to Shock5

Response of Rwanda GDP to Shock6

Response of Rwanda GDP to Shock7

Response of Rwanda GDP to Shock8

Response to Structural One S.D. Innovations

Response of Kenya GDP to Shock1

Response of Kenya GDP to Shock2

Response of Kenya GDP to Shock3

Response of Kenya GDP to Shock4

Response of Kenya GDP to Shock5

Response of Kenya GDP to Shock6

Response of Kenya GDP to Shock7

Response of Kenya GDP to Shock8

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Response to Structural One S.D. Innovations

Response of Tanzania GDP to Shock1

Response of Tanzania GDP to Shock2

Response of Tanzania GDP to Shock3

Response of Tanzania GDP to Shock4

Response of Tanzania GDP to Shock5

Response of Tanzania GDP to Shock6

Response of Tanzania GDP to Shock7

Response of Tanzania GDP to Shock8

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Response to Structural One S.D. Innovations

Response of Burundi GDP to Shock1

Response of Burundi GDP to Shock2

Response of Burundi GDP to Shock3

Response of Burundi GDP to Shock4

Response of Burundi GDP to Shock5

Response of Burundi GDP to Shock6

Response of Burundi GDP to Shock7

Response of Burundi GDP to Shock8

To conclude this part, we examine the degree of inter-dependence of output and price levels between EAC states and some major trading partners within the sub-Saharan Africa. Most of the selected countries are the major players of the SADEC and

COMESA trade unions in which EAC countries participate as well. Under this part, therefore, we conduct the Engle-Granger cointegration test and the Granger causality test so as to determine and evaluate the degree of integration especially between countries that share same borders. Also, this part enables the entire study to determine which countries can have the potential to join the EAC market and form a more extended market in sub-Saharan Africa. Therefore, based on the size of the economies, geographical location, trade unions participations and availability of accurate data, we include Zambia, Zimbabwe, Congo DRC, Congo Republic, Nigeria, South Africa and Malawi. Below, we report the cointegration test results of the Engle-Granger procedure, followed by the Granger causality test (Engle, 1987; Engle, 1991).

Table 26 Engle-Granger Cointegration Test

Dependent	tau-statistic	z-statistic	Rho - 1	Rho S.E.
Rwanda GDP Deflator	-7.577**	-53.974**	-1.08	0.14
Rwanda GDP	-7.021*	-102.968**	-1.36	0.19
Kenya GDP Deflator	-7.838**	-129.638**	-1.80	0.23
Kenya GDP	-6.092	-42.924	-0.86	0.14
Tanzania GDP	-6.391	-87.334**	-1.16	0.18
Tanzania GDP Deflator	-6.666	-48.396*	-0.97	0.15
Burundi GDP Deflator	-11.923**	-307.235**	-2.02	0.17
Burundi GDP	-5.546	55.188	-2.45	0.44
Zambia GDP	-6.838*	31.542	-2.46	0.36
Zambia GDP Deflator	-7.338**	-52.316**	-1.05	0.14
Zimbabwe GDP Deflator	-6.758	1556.869**	-1.42	0.21
Zimbabwe GDP	-5.753	-40.285	-0.81	0.14
Malawi GDP Deflator	-7.091*	-52.343**	-1.05	0.15
Malawi GDP	-8.339**	-59.504**	-1.19	0.14
Congo DRC GDP Deflator	-6.219	-45.177	-0.90	0.15
Congo DRC GDP	-6.151	-44.41	-0.89	0.14
Congo Republic GDP Deflator	-3.265	49.735	-2.37	0.73
Congo Republic GDP	-5.361	-36.951	-0.74	0.14
South Africa GDP Deflator	-7.255**	-51.740**	-1.03	0.14
South Africa GDP	-5.245	38.053	-1.52	0.29
Nigeria GDP Deflator	-5.534	15.488	-6.08	1.10
Nigeria GDP	-5.274	-36.267	-0.73	0.14
**, * significant at 1% and 5% respectively				
Automatic lags specification based on Schwarz criterion (max-lag=10)				

From the Engle-Granger cointegration test results, we find that the national output and price levels of most of the EAC countries has a long-run equilibrium relationship with that of Malawi, Zambia, and South Africa's GDP Deflator. Malawi and Zambia participate in both SADEC and COMESA trade unions in which EAC countries participate, in either SADEC or COMESA. Unlike what we expected, our results indicate that Congo DRC and Congo Republic, which are geographically surrounding the EAC block, have a lower long-run relationship with the output and price levels of the EAC members. Furthermore, Nigeria and South Africa are regarded as the giant economies in sub-Saharan Africa; we find that the two countries have no long significant relationship with the EAC states in terms of output (GDP) and the prices of goods and services. From this analysis we can conclude that it might be of long-run advantage if all EAC states could participate in both SADEC and COMESA so as to improve the long-run prospects of the block's output and prices.

Table 27 Pair-wise Granger Causality Tests (Lags: 2)

Null Hypothesis:	F-Statistic	Prob.
Rwanda GDP does not Granger Cause Rwanda GDP Deflator	4.57	0.02
Kenya GDP Deflator does not Granger Cause Rwanda GDP Deflator	3.00	0.06
Rwanda GDP Deflator does not Granger Cause Kenya GDP Deflator	10.44	0.00
Rwanda GDP Deflator does not Granger Cause Tanzania GDP	4.61	0.02
Rwanda GDP Deflator does not Granger Cause Tanzania GDP Deflator	5.20	0.01
Rwanda GDP Deflator does not Granger Cause Burundi GDP Deflator	5.09	0.01
Rwanda GDP Deflator does not Granger Cause Zambia GDP	5.48	0.01
Zambia GDP Deflator does not Granger Cause Rwanda GDP Deflator	3.77	0.03
Rwanda GDP Deflator does not Granger Cause Zambia GDP Deflator	8.33	0.00
Rwanda GDP Deflator does not Granger Cause Zimbabwe GDP	4.08	0.02
Malawi GDP Deflator does not Granger Cause Rwanda GDP Deflator	8.45	0.00
Rwanda GDP Deflator does not Granger Cause Malawi GDP Deflator	4.58	0.02
Rwanda GDP Deflator does not Granger Cause Malawi GDP	12.50	0.00
Congo DRC GDP Deflator does not Granger Cause Rwanda GDP Deflator	5.74	0.01
Rwanda GDP Deflator does not Granger Cause Congo DRC GDP Deflator	4.28	0.02
Congo Republic GDP Deflator does not Granger Cause Rwanda GDP Deflator	5.69	0.01
Rwanda GDP Deflator does not Granger Cause Congo Republic GDP Deflator	5.29	0.01
South Africa GDP Deflator does not Granger Cause Rwanda GDP Deflator	8.97	0.00

Nigeria GDP Deflator does not Granger Cause Rwanda GDP Deflator	12.12	0.00
Kenya GDP Deflator does not Granger Cause Rwanda GDP	4.80	0.01
Kenya GDP does not Granger Cause Rwanda GDP	3.41	0.04
Tanzania GDP does not Granger Cause RWANDAGDP	7.77	0.00
TANZANIADEFLATOR does not Granger Cause RWANDAGDP	5.83	0.01
BURUNDIDEFLATOR does not Granger Cause RWANDAGDP	5.34	0.01
Rwanda GDP does not Granger Cause Burundi GDP	6.57	0.00
Zambia GDP does not Granger Cause Rwanda GDP	3.59	0.04
Zambia GDP Deflator does not Granger Cause Rwanda GDP	4.66	0.01
Malawi GDP Deflator does not Granger Cause Rwanda GDP	4.32	0.02
Malawi GDP does not Granger Cause Rwanda GDP	2.57	0.09
Congo DRC Deflator does not Granger Cause Rwanda GDP	2.80	0.07
Congo DRC GDP does not Granger Cause Rwanda GDP	2.73	0.08
Congo Republic GDP Deflator does not Granger Cause Rwanda GDP	7.27	0.00
Rwanda GDP does not Granger Cause Congo Republic GDP	3.42	0.04
South Africa GDP Deflator does not Granger Cause Rwanda GDP	6.31	0.00
Rwanda GDP does not Granger Cause South Africa GDP Deflator	5.19	0.01
South Africa GDP does not Granger Cause Rwanda GDP	4.09	0.02
Nigeria GDP Deflator does not Granger Cause Rwanda GDP	4.86	0.01
Kenya GDP does not Granger Cause Kenya GDP Deflator	2.98	0.06
Kenya GDP Deflator does not Granger Cause Tanzania GDP	4.25	0.02
Kenya GDP Deflator does not Granger Cause Tanzania GDP Deflator	11.22	0.00
Kenya GDP Deflator does not Granger Cause Burundi GDP Deflator	3.12	0.05
Burundi GDP does not Granger Cause Kenya GDP Deflator	4.98	0.01
Kenya GDP Deflator does not Granger Cause Zambia GDP	4.39	0.02
Kenya GDP Deflator does not Granger Cause Zambia GDP Deflator	9.98	0.00
Kenya GDP Deflator does not Granger Cause Zimbabwe GDP	5.65	0.01
Kenya GDP Deflator does not Granger Cause Malawi GDP Deflator	19.38	0.00
Malawi GDP does not Granger Cause Kenya GDP Deflator	3.13	0.05
Kenya GDP Deflator does not Granger Cause Congo Republic GDP Deflator	4.26	0.02
South Africa GDP Deflator does not Granger Cause Kenya GDP Deflator	8.44	0.00
KENYADEFLATOR does not Granger Cause STHAFRICAGDP	5.28	0.01
Kenya GDP Deflator does not Granger Cause Nigeria GDP Deflator	12.35	0.00
Tanzania GDP does not Granger Cause Kenya GDP	3.97	0.03

Tanzania GDP Deflator does not Granger Cause Kenya GDP	3.17	0.05
Zambia GDP does not Granger Cause Kenya GDP	2.83	0.07
Kenya GDP does not Granger Cause Zambia GDP Deflator	3.62	0.04
Congo DRC GDP Deflator does not Granger Cause Kenya GDP	4.35	0.02
Kenya GDP does not Granger Cause Congo Republic GDP Deflator	5.01	0.01
Kenya GDP does not Granger Cause Congo Republic GDP	5.82	0.01
South Africa GDP Deflator does not Granger Cause Kenya GDP	3.65	0.03
Kenya GDP does not Granger Cause South Africa GDP Deflator	7.13	0.00
Kenya GDP does not Granger Cause South Africa GDP	3.97	0.03
Nigeria GDP does not Granger Cause Kenya GDP	3.93	0.03
Tanzania GDP Deflator does not Granger Cause Tanzania GDP	5.94	0.01
Tanzania GDP does not Granger Cause Tanzania GDP Deflator	4.70	0.01
Burundi GDP Deflator does not Granger Cause Tanzania GDP	6.54	0.00
Tanzania GDP does not Granger Cause Burundi GDP	3.28	0.05
Tanzania GDP does not Granger Cause Zambia GDP	5.40	0.01
Zambia GDP Deflator does not Granger Cause Tanzania GDP	7.23	0.00
Malawi GDP Deflator does not Granger Cause Tanzania GDP	6.30	0.00
Tanzania GDP does not Granger Cause Malawi GDP	3.56	0.04
Congo DRC GDP Deflator does not Granger Cause Tanzania GDP	3.83	0.03
Congo Republic GDP Deflator does not Granger Cause Tanzania GDP	6.14	0.00
Tanzania GDP does not Granger Cause Congo Republic GDP	8.70	0.00
South Africa GDP Deflator does not Granger Cause Tanzania GDP	4.93	0.01
Tanzania GDP does not Granger Cause South Africa GDP Deflator	3.61	0.04
Nigeria GDP Deflator does not Granger Cause Tanzania GDP	6.34	0.00
Nigeria GDP does not Granger Cause Tanzania GDP	6.75	0.00
Burundi GDP does not Granger Cause Tanzania GDP Deflator	3.61	0.04
Tanzania GDP Deflator does not Granger Cause Zambia GDP	10.49	0.00
Tanzania GDP Deflator does not Granger Cause Zambia GDP Deflator	11.13	0.00
Tanzania GDP Deflator does not Granger Cause Malawi GDP Deflator	21.52	0.00
Tanzania GDP Deflator does not Granger Cause Congo Republic GDP Deflator	4.83	0.01
South Africa GDP Deflator does not Granger Cause Tanzania GDP Deflator	8.57	0.00
Tanzania GDP Deflator does not Granger Cause South Africa GDP Deflator	3.61	0.04
Tanzania GDP Deflator does not Granger Cause South Africa GDP	5.07	0.01
Tanzania GDP Deflator does not Granger Cause Nigeria GDP Deflator	9.91	0.00

Tanzania GDP Deflator does not Granger Cause Nigeria GDP	3.75	0.03
Burundi GDP Deflator does not Granger Cause Zambia GDP	10.82	0.00
Burundi GDP Deflator does not Granger Cause Zambia GDP Deflator	14.15	0.00
Burundi GDP Deflator does not Granger Cause Zimbabwe GDP	9.61	0.00
Burundi GDP Deflator does not Granger Cause Malawi GDP Deflator	6.37	0.00
Burundi GDP Deflator does not Granger Cause Malawi GDP	4.31	0.02
Congo DRC GDP Deflator does not Granger Cause Burundi GDP Deflator	4.86	0.01
Burundi GDP Deflator does not Granger Cause Congo DRC GDP Deflator	9.22	0.00
Burundi GDP Deflator does not Granger Cause Congo Republic GDP Deflator	7.29	0.00
Burundi GDP Deflator does not Granger Cause Congo Republic GDP	4.36	0.02
Burundi GDP Deflator does not Granger Cause South Africa GDP	9.33	0.00
Nigeria GDP Deflator does not Granger Cause Burundi GDP Deflator	5.43	0.01
Burundi GDP Deflator does not Granger Cause Nigeria GDP Deflator	11.10	0.00
Burundi GDP Deflator does not Granger Cause Nigeria GDP	4.54	0.02
Burundi GDP does not Granger Cause Zambia GDP	3.39	0.04
Burundi GDP does not Granger Cause Zimbabwe GDP Deflator	3.34	0.04
Burundi GDP does not Granger Cause Zimbabwe GDP	5.57	0.01
Burundi GDP does not Granger Cause South Africa GDP Deflator	7.73	0.00
Zambia GDP Deflator does not Granger Cause Zambia GDP	14.56	0.00
Zimbabwe GDP Deflator does not Granger Cause Zambia GDP	6.09	0.00
Zimbabwe GDP does not Granger Cause Zambia GDP	4.41	0.02
Malawi GDP Deflator does not Granger Cause Zambia GDP	14.47	0.00
Zambia GDP does not Granger Cause Malawi GDP	6.19	0.00
Congo DRC GDP Deflator does not Granger Cause Zambia GDP	11.15	0.00
Congo DRC GDP does not Granger Cause Zambia GDP	7.92	0.00
Congo Republic GDP Deflator does not Granger Cause Zambia GDP	5.76	0.01
Zambia GDP does not Granger Cause Congo Republic GDP	4.85	0.01
South Africa GDP Deflator does not Granger Cause Zambia GDP	5.34	0.01
Nigeria GDP Deflator does not Granger Cause Zambia GDP	12.73	0.00
Nigeria GDP does not Granger Cause Zambia GDP	3.41	0.04
Zimbabwe GDP does not Granger Cause Zambia GDP Deflator	5.10	0.01
Malawi GDP Deflator does not Granger Cause Zambia GDP Deflator	3.15	0.05
Zambia GDP Deflator does not Granger Cause Malawi GDP Deflator	25.74	0.00
Malawi GDP does not Granger Cause Zambia GDP Deflator	3.14	0.05

Zambia GDP Deflator does not Granger Cause Malawi GDP	8.52	0.00
Zambia GDP Deflator does not Granger Cause Congo DRC GDP Deflator	6.76	0.00
Congo DRC GDP does not Granger Cause Zambia GDP Deflator	2.97	0.06
Congo Republic GDP Deflator does not Granger Cause Zambia GDP Deflator	3.91	0.03
Zambia GDP Deflator does not Granger Cause Congo Republic GDP Deflator	3.30	0.05
South Africa GDP Deflator does not Granger Cause Zambia GDP Deflator	7.87	0.00
Zambia GDP Deflator does not Granger Cause South Africa GDp Deflator	5.93	0.01
South Africa GDP does not Granger Cause Zambia GDP Deflator	4.66	0.01
Zambia GDP Deflator does not Granger Cause South Africa GDP	6.03	0.00
Zambia GDP Deflator does not Granger Cause Nigeria GDP Deflator	22.91	0.00
Zambia GDP Deflator does not Granger Cause Nigeria GDP	4.20	0.02
Zimbabwe GDP Deflator does not Granger Cause Congo Republic GDP	10.71	0.00
Zimbabwe GDP Deflator does not Granger Cause South Africa GDP	4.23	0.02
Malawi GDP Deflator does not Granger Cause Zimbabwe GDP	5.00	0.01
Zimbabwe GDP does not Granger Cause Malawi GDP Deflator	4.80	0.01
Zimbabwe GDP does not Granger Cause Malawi GDP	4.58	0.02
Zimbabwe GDP does not Granger Cause Congo DRC GDP	4.65	0.01
Zimbabwe GDP does not Granger Cause South Africa GDP Deflator	5.05	0.01
Malawi GDP does not Granger Cause Malawi GDP Deflator	7.33	0.00
Malawi GDP Deflator does not Granger Cause Malawi GDP	6.63	0.00
Congo DRC GDP Deflator does not Granger Cause Malawi GDP Deflator	59.30	0.00
Malawi GDP Deflator does not Granger Cause Congo DRC GDP Deflator	3.60	0.04
Congo DRC GDP does not Granger Cause Malawi GDP Deflator	5.18	0.01
Congo Republic GDP Deflator does not Granger Cause Malawi GDP Deflator	3.42	0.04
Malawi GDP Deflator does not Granger Cause Congo Republic GDP	4.44	0.02
South Africa GDP Deflator does not Granger Cause Malawi GDP Deflator	14.63	0.00
Malawi GDP Deflator does not Granger Cause South Africa GDP Deflator	6.30	0.00
Nigeria GDP Deflator does not Granger Cause Malawi GDP Deflator	3.85	0.03
Malawi GDP Deflator does not Granger Cause Nigeria GDP	5.37	0.01
Congo DRC GDP Deflator does not Granger Cause Malawi GDP	8.91	0.00
Congo Republic GDP Deflator does not Granger Cause Malawi GDP	4.24	0.02
Malawi GDP does not Granger Cause Congo Republic GDP	7.17	0.00
South Africa GDP Deflator does not Granger Cause Malawi GDP	3.22	0.05
Malawi GDP does not Granger Cause South Africa GDP Deflator	5.55	0.01

Nigeria GDP Deflator does not Granger Cause Malawi GDP	7.50	0.00
Malawi GDP does not Granger Cause Nigeria GDP Deflator	3.64	0.03
Nigeria GDP does not Granger Cause Malawi GDP	7.49	0.00
Congo Republic GDP Deflator does not Granger Cause Congo DRC Deflator	18.84	0.00
Congo GDP Deflator does not Granger Cause South Africa GDP Deflator	4.46	0.02
Nigeria GDP Deflator does not Granger Cause Congo DRC GDP Deflator	3.18	0.05
Congo DRC GDP Deflator does not Granger Cause Nigeria GDP	4.41	0.02
Congo DRC GDP does not Granger Cause South Africa GDP Deflator	5.70	0.01
Congo DRC GDP does not Granger Cause South Africa GDP	5.06	0.01
Congo DRC GDP does not Granger Cause Nigeria GDP Deflator	2.90	0.07
Congo GDP Deflator does not Granger Cause Congo Republic GDP	2.85	0.07
South Africa GDP Deflator does not Granger Cause Congo Republic GDP Deflator	8.47	0.00
South Africa GDP does not Granger Cause Congo Republic GDP Deflator	4.66	0.01
Congo Republic GDP Deflator does not Granger Cause Nigeria GDP Deflator	6.13	0.00
Nigeria GDP does not Granger Cause Congo Republic GDP Deflator	4.39	0.02
Congo Republic GDP does not Granger Cause South Africa GDP Deflator	5.67	0.01
South Africa GDP does not Granger Cause Congo Republic GDP	7.67	0.00
Nigeria GDP Deflator does not Granger Cause Congo Republic GDP	4.09	0.02
Nigeria GDP does not Granger Cause Congo Republic GDP	6.53	0.00
South Africa GDP does not Granger Cause South Africa GDP Deflator	4.18	0.02
South Africa GDP Deflator does not Granger Cause South Africa GDP	9.07	0.00
Nigeria GDP Deflator does not Granger Cause South Africa GDP Deflator	5.09	0.01
South Africa GDP Deflator does not Granger Cause Nigeria GDP Deflator	20.11	0.00
South Africa GDP Deflator does not Granger Cause Nigeria GDP	3.55	0.04
Nigeria GDP Deflator does not Granger Cause Nigeria GDP	3.87	0.03
Results are tested at 1% and 5% degrees of freedom.		

3.3: Robustness Check

First we measure stability of the data set to locate the roots of the characteristic polynomial in the unit circle, where we found that most of the indicators were outside the unit circle (non stationary), hence concluded that the VAR model was unstable to estimate powerful results. The Augmented Dickey Fuller, Phillip-Peron tests were initially applied to prove the stationarity of each individual indicator, while the Levin,

Lin, Chu test was used to measure the group stationarity of the series. This (stationarity test) also resulted in a preliminary conclusion that the residuals of the selected variables representing different countries are cointegrating, thus in the long run they appear to be converging towards equilibrium. Therefore we adopted a special VAR procedure of Vector Error correction model which allows restricting especially the movements caused by the series with a unit root. Under this procedure also, it was easier and feasible to isolate the short-run and long-run behaviours/relationships between variables across countries. The significance of the estimated VECM results are portrayed through impulse responses so as to escape repeating and misleading the interpretations, finally, through the VECM procedure, the number of cointegrating equation through trace statistics and eigenvalues.

An additional stability and robustness check compares the VECM and Structural VAR (SVAR) results to see if they produce results with similar interpretations in the short- and long-term. The SVAR uses the Cholesky decomposition procedure to isolate the short-run and long-run responses of the residuals to a number of structural shocks. Since the data set used includes annual data on real GDP and GDP deflator, the number of lag is again one (1) according to Automatic lags specification based on Schwarz criterion. The impulse response functions, variance decomposition and the cointegration results are widely used by the two procedures of VECM and SVAR and have been described and interpretations were also given. Some previous studies have tested the robustness of the SVAR procedure by breaking the data set into different parts under different assumptions.

In this case, as also explained in the interpretation of the SVAR results, the unreported results were divided into three parts, whereby the first part is before the introduction of the structural adjustment policies (1960 – 1980), early and post policy reforms period (1980 – 2000), early stages of the EAC union (2009 – 2005) and the post EAC union was formed (2005 – present). We fail to include the breakpoint results given the limited time length of the data set, but the results indicated some significant adjustments were made from stage to stage. Furthermore, we divided this chapter (data set) into parts whereby the first part is measuring the response of the output and price levels within the EAC region while the second part includes other non-EAC countries to find if they have any influences on the behaviours of the variables and their residuals. In each sample, however, we tried to identify the similarities and differences between the responses of the variables to shocks in each sample.

In all the samples used, therefore, the key difference is the reactions of real GDP (output) to price shocks (GDP Deflator), especially when the short-run and long-run restrictions were imposed (see appendix for further results). In the first data set (EAC), the real GDP appears to decline sharply and then rise sharply and the trade circle process continues in all countries. While in the second data set (including other sub-Saharan countries) the response to a structural shock for most of the countries is positive and less volatile as compared to first data sample. These differences can be resulting from a number of factors, for instance the possibilities of the impacts of the structural adjustments policies the listed countries have undergone and experienced every year.

Also, the recent improvements in the information technology and telecommunications have helped many of SSA countries to achieve faster economic growth, averaging above 5% per year for the past four years. In addition, the discoveries of oil, gas, diamonds, gold and other natural minerals have been crucial to structural changes on the movement of the real output and the general prices of goods and services. Lastly, another reason for the divergences of the results can be due to wrong specification of the model given the fact that many restrictions and assumptions have been built to enable the non-stationary variables to be autoregressed. Therefore, all the listed reasons can be possible, especially the latter, but since the GDP Deflator (price levels) are clearly showing consistent response to GDP shocks in all the included countries, this leads us to the opposite conclusion and our results remain powerful for policy analysis.

Moreover, in order to present more useful information from our results, we included the Granger causality test, which once again is used to prove and extend the idea portrayed by the impulse responses. To extend the knowledge developed from the Granger causality test, the long run equilibrium relationship is once again conducted to measure the degree of cointegration between the EAC countries real GDP, and the GDP deflator to that of the surrounding countries and the larger markets in sub-Saharan Africa. All the results prove that our results and interpretations are consistent and significant for EAC policy formulations.

3.4: Conclusion

In this chapter, we slightly followed the procedure of (Blanchard, 1989; Bayoumi, 1992) for identifying the structural autoregressive models by applying two different data sets that include different countries in sub-Saharan Africa. Through this analysis we were able to identify the macroeconomic effects of a structural shock to the

participating economies in the block. Through this procedure, another key criterion for an optimal currency area is investigated to see if it exists and satisfies the EAC region. That is, we estimate if EAC countries have similar responses to business cycles they provide answers for theoretical assumptions required for a successful exchange. The VAR, VECM and SVAR procedures have been proved and praised by many econometricians to be very strong, valid and easily interpreted procedures, as they basically are the basis of demand supply of the market. Through the VECM and SVAR results, it is also easier to estimate the speed of convergence of the macro variables especially the real output and general prices in the markets of the block by isolating the symmetric and asymmetric responses to shocks for each country in the group.

Furthermore, through restrictions, the estimated exogenous elasticities of the real GDP to income convergence and the GDP Deflator are carefully imposed in the equations; hence identify the short-run and long-run responses of the residuals. Therefore, these procedures play significant roles while computing the structural innovations and the associated economic interpretations from the impulse response functions. The robustness of the models and all the specifications are confirmed by multiple robustness checks that include checking the long-run equilibrium relationships between variables throughout the group of the data set. Also, the sensitivity of the model to the change of the arbitrarily chosen coefficient of the GDP Deflator innovation impact on real GDP was also tested to confirm the accuracy of the specifications of the equation.

The impulse response functions produced by both VECM and the SVAR, however, cannot conclude that the GDP Deflators (price levels) show a stronger response to fiscal shocks, since some of the responses are slightly different from country to country within the group. Also, the impulse responses cannot conclude that the impact of GDP per capita is permanent, while the effect of the GDP deflator shock is instantaneous and it is observed within a short period of time and thus we cannot generate an intuitive conclusion on the cross impacts of the output (real GDP) to prices (GDP Deflator), and vice versa. It is worth noting that, the impulse responses portrayed that a shock in the national output of the participating countries on the price levels is both instant and permanent, implying a change in output can either increase or decrease price levels both in the short run and in the run. Also, one cannot conclude that output or price shocks in one country lead to a structural change on the same variables of the other surrounding countries in the cross section; rather the movements and correlations are identified and isolated using these procedures.

The theory suggests that at the early stages of integration, small economies such as Rwanda, Burundi and Uganda are expected to grow faster than large economies such as Tanzania and Kenya hence achieving convergence of income and growth throughout the region. The impulse responses produced some results that are useful to conclude and answer that important criterion, but one has to be careful that the most important scenario portrayed by the impulse response equations is on how one responds to changes in the other, but it does not necessarily show how long and at which speed it takes to adjust towards equilibrium. All these divergences and weaknesses of some of the results portrayed by the impulse responses and the variance decomposition of the VECM and SVAR procedures can be due to the fact that real GDP is used as the major variable for economic activities without regarding other factors that can contribute to some divergences.

In addition to that, some real GDP shocks are total, originating from unique factors and thus if the stabilisation mechanisms are implemented by the same volume and same model throughout the group the results yield is likely going to diverge from country to country. That also implies the impulse response results cannot necessarily reflect the impacts of fiscal expansion and contractions given a group of countries that may differ in the settings of the key macroeconomic variables. The harmonisation towards equilibrium and elimination of the trade restrictions have also been forced by international communities, especially the European Union, World Bank and the IMF, which at some point between 2008 and 2009 campaigned and encouraged the EAC to speed up the process in return for benefiting from EU markets. This was seemed as controversial as economies need to adjust hence allowing them to respond symmetrically to shocks on their national output specifically. The real GDP and the GDP Deflators sometimes respond to the political status of some economies, especially those in our cross section and some political shocks may lead to short-run or long-run shifts of the national output and prices.

Finally, overall this chapter has shown that EAC is a potential optimal currency area despite the risks involved in integrating especially small developing markets which are subjected to many factors that limits growth and convergences. Generally, in EAC there are strong short-run and long-run relationships between the levels of prices of all new, domestically produced goods and services in an economy and the total output produced by the selected economies. Also, unlike the EU single currency regime, EAC countries have symmetrical responses to structural shocks that can happen within the trade union

as shown by the demand and supply restrictions imposed in the estimations. That also means, by measuring the stochastic trends and the co-integrating vectors of the variables across countries in the group, we reject the null hypothesis that EAC is an optimal currency area and the alternative cannot be rejected as proved by the estimation above.

As noted in the introduction, the first EAC common market collapsed (1977) due to fast convergences (fast growth/adjustment) of the small member economies, that led to the panic of Kenya (large economy) which started to demand more power/control in decision-making bodies of the community. Given the current strong integration of the national output as shown in our analysis, one should not expect the union to fall/collapse since the removal of one country will have its own impact and that of the entire block. The present status and behaviour and the arrangements of the macroeconomic variables in the region is quite similar and they are adjusting almost at the same magnitude and direction, hence making the block more significant to all the small and large economies in the region.

Therefore, in summary this chapter identifies many points that can be useful for policy analysis, policy formulation and future studies as listed below:

(1) First the standard deviation indicates that the level of output and price level fluctuations throughout the EAC region and the entire East Central and Southern Africa. The unreported results on normal correlation matrix of the standard deviation of prices for every five years indicates that possibly these countries have symmetric responses to output/price shocks. However, given the weaknesses of the traditional standard deviation, we introduced the vector autocorrelation procedures to investigate more on the behaviours of the selected variables in the cross section.

(2) The time series of measures for unit root and long-run behaviours of the cross variables also proved to be very important, especially when investigating any time variant variables. Both individual and group unit root (summary) tests were conducted and concluded that many of our variables were having a unit root at level data. That implied, the traditional approaches of estimating equations such as OLS and the unrestricted VAR were weak tools for analysis for the data sets used by this chapter, hence a more adjusted form of VAR (VECM) and the structural factorisation were applied to produce more consistent results and evidences which have been interpreted at a certain level. In addition, the

existence of a unit root indicated that the residuals were cointegrated and thus they have a long-run equilibrium relation and they indicated to be converging towards equilibrium.

(3) Both the VECM and the SVAR results for the two data sets indicate that indeed the EAC countries and the neighbouring countries, especially Malawi, Zambia and Zimbabwe, are natural trading partners and their output and price levels are highly inter-correlated. This is evidenced by the symmetric response of the variables to shocks of other variables within the same economies or other economies within the group. Also, following the primary assumptions of the supply and demand, our results easily isolate long-run and short relationships between price levels and output of an economy.

(4) Our analysis notices that despite undergoing some adjustments aimed at favouring unlocking trade restrictions within the block for the past ten years, the speed of fiscal integration is still lower. The allocation of government spending the tax (revenue) system of the entire block still needs to be adjusted, especially in the fast-emerging economies so as to encourage deeper cooperation, especially the areas that determine real GDP and GDP deflators.

(5) As compared to the second and fourth chapters which have found an increasing volume and speed of intra-trade, this chapter find a slow speed of convergence on the income per capita of the EAC countries. The personal income divergence between countries is still huge and is declining very slowly, hence raising doubts on the future trends of different indicators in the block. Therefore, this chapter points out the necessity of encouraging and re-evaluating the income distribution model so as to ensure strong convergences are achieved, hence promoting intra-region developments.

(6) By including other non-EAC member countries, this chapter was able to identify some potential countries whose price levels and output are highly correlated in terms of how they respond to shocks in the short and long run. Therefore, we argue that some measures and adjustments should be adopted so as to welcome Zambia, Malawi, Congo DRC, Zimbabwe and Congo republic so as to expand the market, hence faster growth and development. In addition to that, the two big economies (South Africa and Nigeria) in the SSA region also have significant correlation to the EAC region in terms of output and price levels. This also is

evidenced by the response of all the countries included to symmetric shocks, which is almost the same.

(7) Given the differences on how the real GDP and the GDP Deflators are determined in each country, the estimations and procedures applied by this chapter have shown the prices and output play a significant role in the process of integrating economies and ensuring faster convergences of the economies. In addition, we argue that adjustments and policy reforms should be aimed at stabilising and strengthening the behaviour of output throughout the block.

(8) Despite the fact that prices in the developing markets are pre-determined and highly influenced by world markets, the responses to any shock in the region have indicated to be the same. This also means that the EAC block is responding symmetrically to external shocks as well. On the other hand, this is evidence that prices have no long-run impacts on the level of output (supply); rather they change the quantity of output/supply in the economy for a short period of time.

Therefore, as introduced by (Mundell, 1961), the degree and direction of responses to business cycles is an important indicator of an optimum currency area. Lessons learned from the recent 2010 – 2012 euro crisis, where highly-affected countries such as Greece, Ireland, Spain and Italy have set an alarm for the EAC countries to ensure significant adjustments are made to ensure all countries are responding symmetrically to structural shocks. While large economies in the EU group have been resistant and even more determined to solve the problems created by the business cycles, small economies that were affected have experienced both permanent political and economic changes. It is worth to note that, during the euro crisis, countries that were achieving fast convergence and had started to gain from a monetary union, have been damaged and have ruined financial ratings and it will take some years or even a decade to adjust back to where the growth was heading to.

At this point, EAC has not yet developed a more practical model that can be used in the event of shocks so as to eliminate any impact that can originate from business cycles in the region. Most of the proposed measures listed in the EAC commission documents are more theoretical and not necessarily practical especially in least developing countries where variables are determined by number of variables including political stability, infrastructures, rain seasons per year and social stability.

In addition, up to this point the EAC commission has not yet given full mandate to act as an intermediate agency that can act on behalf of other decision making boards in the event of to adjusting any discrepancies in the region and that raises even more questions on where resolutions can be achieved if the cycles of the economies changes in the future. Furthermore, the fiscal policy in terms of resources allocations and how the governments can spend and the extend the governments collect revenues has no clear mechanism hence each government is maintaining national agendas as priority and giving less emphasis on the projects that aims at expanding integration. However, given all the limitations and strength revealed by this chapter, EAC is an optimal currency according to (Mundell, 1961) since all the five economies are responding symmetrically to shocks.

Appendix

Response to Cholesky One S.D. Innovations

Response of Uganda GDP Deflator (Price levels) to Uganda GDP (ouput)

Response of Tanzania GDP Deflator (price levels to Uganda GDP (output)

Response of Rwanda GDP Deflator (price levels) to Uganda GDP (output)

Response of Kenya GDP Deflator (Price levels) to Uganda GDP (output)

Response to Cholesky One S.D. Innovations

Response of Uganda GDP Deflator (price levels) to Tanzania GDP (output)

Response of Tanzania GDP Deflator (Price levels) to Tanzania GDP (output)

Response of Rwanda GDP Deflator (Price levels) to Tanzania GDP (output)

Response of Kenya GDP Deflator (Price levels) to Tanzania GDP (output)

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Response to Cholesky One S.D. Innovations

Response of Uganda GDP Deflator (price levels) to
Rwanda GDP (output)

Response of Tanzania GDP Deflator (price levels) to
Rwanda GDP (output)

Response of Rwanda GDP Deflator (price levels) to
Rwanda GDP (output)

Response of Kenya GDP Deflator (Price levels) to
Rwanda GDP (output)

Response to Cholesky One S.D. Innovations

Response of Uganda GDP Deflator (price levels) to
Kenya GDP (output)

Response of Tanzania GDP Deflator (price levels) to
Kenya GDP (output)

Response of Rwanda GDP Deflator (Price levels) to
Kenya GDP (output)

Response of Kenya GDP Deflator (Price levels) to
Kenya GDP (output)

Response to Cholesky One S.D. Innovations

Response of Uganda Deflator (Price levels) to
Uganda GDP Deflator (Price levels)

Response of Uganda GDP Deflator (Price levels) to
Tanzania GDP Deflator (Price levels)

Response of Uganda GDP Deflator (Price levels) to
Rwanda GDP Deflator (Price levels)

Response of Uganda GDP Deflator (price levels) to
Kenya GDP Deflator (price levels)

Response of Tanzania GDP Deflator (Price levels) to
Uganda GDP Deflator (price levels)

Response of Tanzania GDP Deflator (price levels) to
Tanzania GDP Deflator (Price levels)

Response of Tanzania GDP Deflator (Price levels) to
Rwanda GDP Deflator (price levels)

Response of Tanzania GDP Deflator (price levels) to
Kenya GDP Deflator (Price levels)

Response of Rwanda GDP Deflator (Price levels) to
Uganda GDP Deflator (price levels)

Response of Rwanda GDP Deflator (price leveles) to
Tanzania GDP Deflator (Price levels)

Response of Rwanda GDP Deflator (price levels) to
Rwanda GDP Deflator (price levels)

Response of Rwanda GDP Deflator (Price levels) to
Kenya GDP Deflator (Price levels)

Response of Kenya GDP Deflator (price levels) to
Uganda GDP Deflator (price levels)

Response of Kenya GDP Deflator (Price levels) to
Tanzania GDP Deflator (Price levels)

Response of Kenya GDP Deflator (Price levels) to
Rwanda GDP Deflator (Price levels)

Response of Kenya GDP Deflator (price levels) to
Kenya GDP Deflator (Price levels)

Response to Cholesky One S.D. Innovations

Response of Uganda GDP (output) to Uganda GDP (output)

Response of Uganda GDP (ouput) to Tanzania GDP (output)

Response of Uganda GDP (output) to Rwanda GDP (output)

Response of Uganda GDP (output) to Kenya GDP (output)

Response of Tanzania GDP (output) to Uganda GDP (output)

Response of Tanzania GDP (output) to Tanzania GDP (output)

Response of Tanzania GDP (output) to Rwanda GDP (output)

Response of Tanzania GDP (output) to Kenya GDP (output)

Response of Rwanda GDP (output) to Uganda GDP (output)

Response of Rwanda GDP (output) to Tanzania GDP (output)

Response of Rwanda GDP (output) to Rwanda GDP (output)

Response of Rwanda GDP (output) to Kenya GDP (output)

Response of Kenya GDP (output) to Uganda GDP (output)

Response of Kenya GDP (output) to Tanzania GDP (output)

Response of Kenya GDP (output) to Rwanda GDP (output)

Response of Kenya GDP (output) to Kenya GDP (output)

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Variance Decomposition of Uganda GDP:

Period	S.E.	a	b	c	d	e	f	g	h
1	3.29	8.96	91.04	0.00	0.00	0.00	0.00	0.00	0.00
2	4.82	4.59	67.14	0.62	2.37	8.57	2.72	8.55	5.44
3	5.54	6.15	48.13	0.75	20.97	9.27	2.01	7.38	5.34
4	7.31	11.18	41.57	0.73	24.47	9.56	2.00	6.02	4.46
5	9.28	13.57	37.54	1.70	23.54	9.47	3.74	6.45	3.98
6	10.64	11.85	34.98	1.76	21.88	10.63	5.18	9.26	4.46
7	12.48	10.53	33.83	1.69	21.01	12.04	5.94	9.79	5.16
8	14.28	11.67	30.22	1.65	21.19	13.87	6.64	9.39	5.38
9	15.42	11.98	26.79	1.49	21.89	16.31	6.19	9.78	5.57
10	16.12	10.56	25.14	1.70	21.17	19.39	5.36	10.65	6.03

Variance Decomposition of Tanzania GDP:

Period	S.E.	a	b	c	d	e	f	g	h
1	0.92	5.56	0.76	43.90	49.78	0.00	0.00	0.00	0.00
2	1.41	4.52	1.14	35.20	47.85	0.86	6.22	3.04	1.17
3	2.20	4.14	12.65	35.54	35.87	1.40	6.93	2.34	1.13
4	2.56	7.11	14.31	31.20	32.84	4.11	6.56	2.22	1.64
5	2.81	6.67	16.17	27.37	29.06	4.59	12.08	2.56	1.49
6	3.18	5.57	17.77	26.62	29.22	3.88	12.53	2.85	1.57
7	3.76	5.13	20.29	26.48	28.80	3.60	11.71	2.56	1.44
8	4.29	4.98	21.27	25.83	27.64	3.48	12.63	2.78	1.38
9	4.76	4.50	24.13	22.76	25.40	3.85	12.79	4.70	1.87
10	5.35	3.79	28.20	19.70	24.81	4.12	11.92	5.01	2.44

Variance Decomposition of Rwanda GDP

Period	S.E.	a	b	c	d	e	f	g	h
1	2.67	3.01	0.46	8.12	0.27	0.27	87.87	0.00	0.00
2	2.99	3.85	2.41	13.59	10.30	1.74	58.38	7.33	2.40
3	3.43	5.89	16.83	10.07	16.96	6.07	35.93	6.35	1.91
4	3.77	7.29	16.73	9.72	14.68	13.08	30.47	5.93	2.10
5	4.13	6.93	16.26	10.32	14.39	12.79	30.58	6.04	2.69
6	4.57	6.63	16.64	10.64	18.07	12.65	27.47	5.46	2.43
7	5.22	6.28	16.81	10.56	16.41	16.10	24.74	5.91	3.19
8	6.04	6.62	15.39	9.97	16.48	18.83	23.24	5.53	3.95
9	7.16	7.11	16.23	9.21	15.38	20.60	22.61	5.11	3.76
10	8.81	6.40	18.02	11.26	14.15	20.40	21.78	4.60	3.39

Variance Decomposition of Kenya GDP

Period	S.E.	a	b	c	d	e	f	g	h
1	4.59	3.48	10.42	0.54	12.18	43.87	0.01	17.31	12.20
2	5.15	4.88	10.94	0.19	13.23	49.82	0.11	11.98	8.86

Period	S.E.	a	b	c	d	e	f	g	h
3	6.01	7.19	8.40	2.61	13.09	50.13	0.30	9.90	8.39
4	6.41	9.02	6.92	3.87	14.41	47.04	0.55	9.91	8.28
5	6.85	9.85	6.61	3.38	16.69	44.45	0.50	10.20	8.33
6	7.51	10.90	6.96	3.16	17.00	43.29	0.59	9.99	8.12
7	7.93	11.47	6.72	3.39	16.47	42.82	1.06	10.03	8.05
8	8.10	11.40	6.70	3.49	16.32	42.26	1.24	10.37	8.22
9	8.69	11.14	7.36	3.29	16.39	41.82	1.19	10.38	8.43
10	9.67	11.26	7.72	3.17	16.26	41.78	1.15	10.17	8.49

Cholesky Ordering: a, b, c, d, e, f, g, h,

Whereby: a= Uganda GDP Deflator, b= Uganda GDP, c = Tanzania GDP Deflator, d= Tanzania GDP, e= Rwanda GDP Deflator, f= Rwanda GDP, g= Kenya GDP Deflator, h= Kenya GDP

Variance Decomposition of Uganda GDP Deflator:									
Period	S.E.	a	b	c	d	e	f	g	h
1	3.29	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	4.82	52.46	3.04	9.13	19.14	0.77	3.08	7.15	5.23
3	5.54	41.78	2.65	22.55	19.24	0.71	2.88	5.58	4.59
4	7.31	31.38	5.30	14.33	17.89	10.16	3.21	10.05	7.68
5	9.28	30.90	4.15	10.77	18.97	17.87	3.25	7.30	6.80
6	10.64	31.66	3.37	11.17	15.06	24.42	2.54	6.10	5.69
7	12.48	24.94	2.62	14.76	11.45	29.91	1.85	8.13	6.34
8	14.28	20.65	3.76	11.44	12.22	33.31	1.42	9.26	7.94
9	15.42	21.16	3.63	9.95	12.69	34.78	1.22	8.43	8.14
10	16.12	22.25	3.70	10.05	12.35	34.82	1.17	7.89	7.76

Variance Decomposition of Tanzania GDP Deflator:									
Period	S.E.	a	b	c	d	e	f	g	h
1	0.92	2.40	5.92	91.68	0.00	0.00	0.00	0.00	0.00
2	14.10	3.43	5.56	85.06	4.77	0.06	0.30	0.17	0.65
3	22.00	3.37	15.69	65.96	4.79	5.51	1.13	3.05	0.51
4	25.60	2.80	18.72	54.78	4.16	9.18	4.64	4.98	0.74
5	28.10	3.62	21.01	53.03	3.50	8.00	6.03	4.19	0.62
6	31.80	7.59	25.85	46.26	3.42	7.08	4.91	3.90	0.99
7	37.60	16.16	26.80	35.59	5.48	6.47	4.29	3.61	1.60
8	42.90	24.15	23.39	26.52	9.22	7.00	3.78	3.93	2.02
9	47.60	25.87	19.47	19.20	11.59	11.60	3.22	6.11	2.93
10	53.50	22.91	16.40	13.10	12.06	19.31	2.99	8.69	4.53

Variance Decomposition of Rwanda GDP Deflator:									
Period	S.E.	a	b	c	d	e	f	g	h
1	2.67	0.27	3.15	20.91	3.79	71.88	0.00	0.00	0.00
2	2.99	7.72	9.36	28.92	2.10	31.54	19.43	0.21	0.72

Period	S.E.	a	b	c	d	e	f	g	h
3	3.43	4.89	31.07	18.51	8.37	20.70	12.24	1.83	2.38
4	3.77	9.38	28.13	16.24	19.48	14.29	8.53	1.88	2.08
5	4.13	17.47	23.97	13.92	19.33	13.24	7.61	1.84	2.61
6	4.57	18.04	21.95	14.00	17.80	12.61	10.88	2.00	2.72
7	5.22	15.66	21.18	11.96	15.97	11.49	14.49	6.06	3.20
8	6.04	12.59	20.51	13.08	16.03	12.99	13.17	7.29	4.33
9	7.16	12.82	17.70	11.43	17.26	17.10	11.74	7.26	4.69
10	8.81	11.35	14.95	10.49	17.33	22.59	9.82	8.35	5.11

Variance Decomposition of Kenya GDP Deflator:

Period	S.E.	a	b	c	d	e	f	g	h
1	45.90	0.65	0.19	14.72	12.94	1.25	44.35	25.91	0.00
2	51.50	0.36	0.18	36.59	17.72	4.68	25.21	14.98	0.28
3	60.10	0.46	7.56	28.14	12.33	7.87	29.77	10.12	3.75
4	64.10	4.57	23.82	18.31	12.23	7.83	23.43	6.52	3.29
5	68.50	18.91	19.80	16.51	10.20	6.70	19.53	5.61	2.73
6	75.10	27.51	16.69	16.30	10.25	5.62	16.41	4.93	2.30
7	79.30	29.27	16.16	14.27	10.83	6.37	14.28	6.25	2.57
8	81.00	28.85	15.02	11.00	9.52	11.90	12.46	7.60	3.64
9	86.90	27.81	11.40	7.99	9.85	19.35	10.10	8.48	5.01
10	96.70	24.55	8.75	6.05	12.10	25.99	7.33	9.12	6.11

Cholesky Ordering: a, b, c, d, e, f, g, h

Whereby: a=Uganda GDP Deflator, b=Uganda GDP, c=Tanzania GDP Deflator, d=Tanzania GDP, e=Rwanda GDP Deflator, f=Rwanda GDP, g=Kenya GDP Deflator, h=Kenya GDP

CHAPTER FOUR

The EAC Foreign Direct Investments Flows

4.0: The impacts of monetary union arrangements on the flow of FDI

FDI Inflows plays an important role in economic development as they contribute to capital accumulation, balance of payments, wealth creation and economic prosperity of any given economy. While introducing the policies (SAP) that could encourage the flow of FDIs in Africa, IMF defines FDI as part of total investments from other economies in the country, which aims at existing and operating for a long-term. Operating for a long period of time also implies the investor (from other markets) intends to have a significant influence (share) in the management and operation of an enterprise. To be more specific, especially in developing economies, an enterprise is categorised as an FDI if the investors maintain at least a minimum of ten per cent (10%) of the voting stock (shares). On the other hand less than ten per cent ownership of shares is called a portfolio investment. Furthermore, FDI can be induced in the economy through takeovers/acquisitions, capital transfers between parent companies or can be injected in the economy from outside the boundaries of an economy new capital

Also, the basis of FDI lists horizontal and vertical FDI as the two patterns of FDI whereby the horizontal pattern is when investors expand their market by investing more in other economies within the same industry as in the home country. In addition to that, a horizontal FDI pattern is when foreign investors/multinational companies invest/produce the same line of products/services in the host country. This pattern has less distributing impact and it may boost income in both original and host economies. On the other hand, a vertical FDI pattern is categorised into two forms, namely forward and backward whereby backward FDIs are when enterprises invest in industry that will produce goods/materials for a firm operating in the home country of the investors. This type (backward) has become very popular from the early of the 2000's whereby Western companies invested in economies with less costs of production, especially China, India, Brazil, Indonesia and Malaysia, while their targeted market has remained the Western markets. That is, backward FDIs are motivated by least costs of production supported by conducive investment policies in the host economies. On the other hand, forward FDIs are when an enterprise purchases a significant amount of share into an

industry that buys from a firm that operates in the investor's home country. In least-developing economies, however, most of the FDIs flow are both horizontal investments, backward and vertical FDIs due to lower costs of production especially cheap labour.

Despite all the economic down-turns, some emerging economies such as China, Malaysia, Indonesia and Japan have experienced massive flow of FDI's in their economies. From late 2008 BRIC and later BRICS countries also dominated in the discussions about global development dues to number of [progresses they were making including the attractiveness to FDI and global trade. Another debate followed in mid 2010 as eight (8) out of ten (10) fastest growing economies were African countries including South Africa, Angola, Ethiopia, Tanzania, Mozambique, Ghana, Rwanda and Liberia. Previous studies that concentrated on the trends and movements of the FDI inflow and outflow within a specific sector have noted the mineral sector (mining, oil and gas) as the most attractive sectors that FDI are highly targeting to invest especially in most of the developing countries especially in the sub Sahara region.

In addition, transport and communication (infrastructures) and construction also have been of the higher recipients of FDIs in Africa compared to the highly depended (in terms of employment) sector of agriculture and tourism. Study by (Desbordes, 2009) has noted that most of the studies on the FDI inflows have omitted SSA countries in their data sets due to different factors, including lack of accurate sources of information (data) for detailed statistical/scientific analysis. While the few available studies on FDIs flow in the SSA region have also been inconsistent due to limitation of the short period of time lag in their data sets and thus they have focused only on very few factors that can attract FDIs in developing countries. It is also important to note that, most of SSA countries are characterised by their unique political philosophies, economic approaches and historical backgrounds which makes even more interesting to identify the true determinants in each country. Those differences make it difficult to highlight the key important tools that can be useful to attract FDIs and trade without causing trade diversion problems. For instance, evidence shows that FDI from western markets tends to flow in countries that have philosophical affiliations, such as democracy and rule of law, economic centralisation and colonial affiliations. Therefore, one has to consider those facts while assessing the volume of FDI inflow specifically in any of the SSA countries (Schiavo, 2007; Jenkins, 1998; Desbordes, 2009).

Moreover, availability of foreign exchange and the costs of capital and raw materials tend to affect the trend and flow of foreign investments in a developing market. Foreign firms feel constrained by the availability and stability of financial markets in general, which is one of the major economic problems in small economies. Surprisingly, in his study, (Jenkins, 1998) found no significant impact of price controls on the FDI flows especially when firms are run under cost-plus basis so as to ensure there are motivations (profit) to the firms. As noted above, most SSA countries are grouped as highly indebted poor countries (HIPC) with an excessive external national debt and yet we fail to find any empirical study examining the correlation between FDI, external debts and any other foreign assistance. However, the World Bank development indicators shows there have been a continuous decline in the external debt of many SSA countries for the past ten years, while FDI have been increasing within the same period of time. But that cannot draw the conclusion that the two are negatively correlated until further statistical investigations are undertaken.

However, we also fail to do so, due to unavailability of data for such variables for most of the listed SSA economies. With regard to this paper's case, there are five key regional blocks within the SSA region including the SADEC[36], COMESA[37], ECCAS[38], EAC[39] and ECOWAS[40], each one comprising countries on each part of the sub Sahara. From different points of time, these blocks were formed aiming at removing trade barriers within the group to attract intra-trade and joint FDI inflow in the region. The discussions on the matter of poor performance of the SSA economies despite the massive structural reforms have been discussed widely by different platforms and have drawn hundreds of suggestions and conclusions.

Therefore, this paper examines variables that have been discussed by different platforms as the determinants of attracting foreign direct investments in developing countries. We try to introduce Kenya's exchange rate as a fixed exchange rate across the region so as to examine the behaviours of the parameters of the selected variables when the value of the currency is fixed throughout EAC. As will be specified by the model, studies such as (Collins, 2004; Buys, 2010; Abbott, 2011; Shambaugh, 2004; Aze´mar, 2009; Rose, 2000; Me´litz, 2007), have investigated variables such as education (skilled and ready-

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[36] SADEC is the Southern African Development Community
[37] COMESA is the Common Market for Eastern and Southern Africa
[38] ECCAS is the Economic Community of Central African States
[39] EAC is the East African Community
[40] ECOWAS is the Economic Community of West African States

to-work labour force), degree of democracy, quality of macro-economic policies, security of property right, qualities of infrastructures, historical/political affiliations, language, exports and imports and openness of the market. Furthermore, recent commentators have suggested health-related variables are also determinants of attracting international businesses in the economy due to the fact that poor health services imply poor supply of labour. Another implication is that poor health care system implies lower life expectancy and lower market (lower income to spend). Sub Sahara region, particularly, have been seriously affected by the wide spread of danger diseases such as Malaria, HIV-AIDS and tuberculosis. This has affected the allocation of resources in the health care system of many countries. Therefore, healthcare variables can be used to explain their impacts to FDI flow in the targeted countries

The gravity model of international trade has been widely used by the above-mentioned studies and the results have been powerful as compared to other econometric panel equations. Basically the gravity model is being developed from the Newtonian law of gravitation force which states that two celestial bodies are subjected to a force of attraction that is directly proportional to their mass and indirectly proportional to their distance. That also means that the final impact of a force of attraction depends on the size of the object and the distance from the original to the final destination (Rose, 2000; Me´litz, 2007; Abbott, 2011). The paper of (Tinbergen, 1962) introduced the gravity model from the initial Newtonian law by introducing a simple form of gravity equation (model) of bilateral trade in analysing the trade flow between a pair of countries. Since then the gravity model has been widely used to assess trade, FDI, tourism and all other analysis that involves flows of people and capital from one market to other market(s). We specify and explain more about the gravity model especially the variables used in the equation.

4.0.1: Motivations of the chapter

After the collapse of the first EAC in 1977, East African countries remained bonded in terms of trade, tourism, FDI and economic development promotions. The entire region went through massive structural policy adjustments in the mid-1980s which led to the persuasion of reforming once more the East African trade block in the later of 1990s. Therefore, in addition to the 1980s adjustments, East African countries have undergone through other adjustment that have allowed the formation of the common market of the East African countries (EAC). Through this period of more than ten years, EAC

countries have experienced some structural development in terms infrastructures, technology, social services and an increase in FDIs. As noted by the world economic report of 2011by the World Bank, FDIs in the mining/oil industry have been contributing a huge percentage of the total flow while other sectors, especially the agriculture sector, is one of the least recipients of foreign investments. Therefore, one of the key motivations is to investigate using econometric procedures to draw results that will specify which factors are motivating and significant for the flow of FDI in the region.

In addition, this part aims at measuring whether EAC as a common market is attracting FDI as a block with unified policies or some countries are benefiting more from the unified policies than the rest. The final results will also be used (for policy purposes) as the factors that influence the location decision of the multinational companies. Moreover, as a research, this chapter aims at contributing knowledge on the impact of unifying small developing markets to the flow of foreign investment in individual countries. There are a few studies that have tried to investigate the correlation between FDI and trade unions in developing markets, SSA region specifically, from political and sociological points of views. Their results and approaches were more of qualitative nature as they ignored the adjustments that can happen to variables over time (time lag). In this chapter, the key focus is to include different variables from Forty Six (46) SSA economies hence identify if regionalisation in Africa is promoting or demoting the flow of FDI into the region.

Then from the grouped SSA region, EAC and some countries will be isolated hence determine whether the similar trade policies actually invites more investment or rather favours few within the group of countries (trade diversion). Unlike most of the previous literatures reviewed by this study, we employ more panel econometric techniques rather than time series; hence measure the speed and volume of FDI flows. In addition, this study intends to forecast the most promising key recipients of FDIs in the EAC and SSA in general. Therefore, the gravity model of international trade has indeed motivated this analysis to be carried due to its power on analysing the gravity, speed and volume of movement of resources within a designated extended market. As will be specified in the equation later (also explained in the second chapter) the gravity equation permits inclusion of as many variables as possible while the estimation of the results depends on the levels of autocorrelation and the margins of errors in the equation. In addition,

results from the gravity model are easily interpreted and relate to the policy implications of each variable selected.

4.1: Model and Data

As noted above, a panel data set to measure the flow of FDI in 46 SSA countries uses a dummy variable to distinguish different economic blocks in the region o identify the volume of flow in the EAC countries as compared to other blocks. The theory suggests that, harmonisation of both fiscal and monetary policies increases trade flow both for local produces and foreign produces while FDIs are expected to be spreading to follow the expanded market. Some of the previous literatures reviewed by this study focus on the impacts of bureaucracies, corruption and bad governance as the key determinants for rapid FDIs inflow in an economy, especially in the sub-Saharan Africa region. However, their findings are more simulated than statistically tested and that clearly suggests that their findings cannot be relied upon as a key model for analysis. Therefore, the key assumptions of this analysis are based on the fact that both macro-economic and structural policies play important roles on the promotion of FDI and trade flows in an economy and that we assume by combining the two categories into a panel equation, more information can be derived.

In his conclusion, (Collins, 2004) study noted that the increased economic growth in sub-Saharan Africa is highly correlated with the FDI flows in the region and the approach he employed is quite similar to our approach. In addition to that, he specified that there are more FDI (inflows & outflows) restrictions in the Middle East and North Africa, which he characterised as policy-related restrictions. Unlike in other developing regions, sub- Sahara countries have relaxed and eliminated and restructured many policy-related restrictions towards FDI despite the fact that the responses have not reached the target. Structural and infrastructural restrictions are still obstacles on the attraction of FDIs in the region and due to that, many SSA countries have been categorised as closed economies. As shown in the appendix, in terms of quantity, Nigeria, Ethiopia, and South Africa are the major recipients of FDI in the SSA region despite their ongoing political instabilities, which have lasted for more than two decades. The three countries have emerged as the most attractive markets in the region due to the abundant mineral resources, higher population and openness to the rest of the world in terms of infrastructures. Also, MNCs are more attracted to these countries due

to their economic dominance in their side (block) whereby South Africa is the key player in the south economic block, Nigeria in the West and Ethiopia in the Northern part of East Africa. That also responds to the hypothesis that, while assessing an economy's openness and attractiveness to FDI, all structure and macro-variables are essential FDI explanatory variables. Therefore, as defined above, in its simplest form, the traditional gravity model is given as follows,

$$F_{ij} = \frac{AY_iY_j}{D_{ij}} \qquad (4.1)$$

Where, F_{ij} is capturing the flow of goods and people between a pair of countries i and j (i.e. FDI, trade, migration and tourism). A is a constant parameter (constant proportionality), Y_i and Y_j capture market sizes (measured by population, GDP per-capita and GDP, expenditures, savings) of a pair of countries i and j, D_{ij} is the distance between country i and j measured in terms of distance (mileage/kilometres) and the costs of transport between key economic/financial centres or cities. Therefore, from equation (4.1) (Tinbergen, 1962) defined that the flow of goods/people between country i and j is positively (directly) determined by the market sizes (GDP, population) and is inversely (negatively) correlated to the distance between the participating countries. We follow similar stapes as used by the mentioned literatures which estimated this equation in log linear form and explained the results as elasticity of the bilateral flow of resources.

In addition, different indicators of the key variables (market size and distance) are introduced so as to expand the primary gravity equation (4.1) and capture the key determinant of size and distances. On the other hand, some of the previous studies have used "cross-sectional data sets", due to the theoretical limitations and lack of more specific econometric procedures that could be used to estimate the gravity equation. Their results become more controversial since they just form a simple cross-sectional regression equation, whereby they impose restrictions that the slopes and the intercepts are the same across the pair of countries. To escape such limitations, our equation is estimated by considering the degree of autocorrelation and heterogeneity of variables in the equation, since some of the specified variables are difficult to observe and quantify (dummy). Therefore, we expand model (4.1) to include as many indicators that explains

what attracts the flow of FDI to the selected countries in the data set and the rest of the world:

$$FDI_{ijt} = \phi_o + \phi_1 y_{it} + \phi_2 Collonial_{it} + \phi_3 COMESA_{it} + \phi_4 EAC_{it} + \phi_5 Electricty_{it} + \phi_6 FDIOutflow_{ijt}$$
$$+ \phi_7 GNE_{it} + \phi_8 GNI_{it} + \phi_9 Landlock_{it} + \phi_{10} Language_{it} + \phi_{11} Mobilesubsc_{it} + \phi_{12} NODA_{it} + \phi_{13} OER_{it}$$
$$+ \phi_{14} Oilrent_{it} + \phi_{15} Politicals\,tability_{it} + \phi_{16} Population_{it} + \phi_{17} SADEC_{it} + \phi_{18} Surfacearea_{it}$$
$$+ \phi_{19} Telephonelines_{it} + \phi_{20} TotalTrade_{it} + \omega_{ijt}$$

(4.2)

FDI is the net inflow of foreign direct investments per year between countries i and the rest of the world j at period t. y_{ijt} is the log of per capital income which we expect to have a positive correlation with the flow of FDI. Also, OER_{ijt} captures the exchange rate of local currency against the US dollar (world currency value) and the coefficient is used to define the impacts of the value of the local currency (exchange rate) to the FDI flows. Previous studies have noted as common market converges, the exchange rates for the currencies of the small economies are assumed to adjust and become stronger towards the values of the large economies in the union. Therefore, we expect OER_{ijt} to be positive to imply lower exchange rate (local currency against the USA) value the higher the speed of FDI flow in the economy. TT_{ijt} Captures balance of trade as the sum of exports and imports of goods and services and we expect the parameter be positive to define that a favourable balance of trade motivates FDIs to flow at higher speed and vice versa to be true.

$LANG_{ijt}$ is a dummy variable for the official national languages of each cross section whereby English is the highly spoken language followed by French and other local languages. We expect this to be positively correlated to the dependent variable assuming that most of the FDIs are originating from English speaking countries (west), therefore dummy=1 for English speaking countries for none (other languages) English speakers. Also, the variables for the size of the country's costs of production such as $Mobilesubsc_{it}$, ,$Oilrent_{it}$, are all expected to have positive coefficients to imply they motivate FDI positively and they are among the key structural factors together with $Population_{it}$,$Surfacearea_{it}$ and $Telephonelines_{it}$ are expected to produce positive coefficients to imply they have positive contribution on the growth of FDI flow in developing countries specifically.

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$NODA_{it}$ is expected to be negative assuming that countries that receive a large amount of assistance have lower flow of FDIs in their markets. Also, to identify the impact of participating in multiple trade agreements, we introduce dummy variables isolating three trade blocks in which EAC countries are participating. Therefore, a country participating in multiple trade agreements is expected to have lower taxes and conducive investment policies and hence higher FDI flow. Therefore we introduce $COMESA_{it}$, $\phi_4 EAC_{it}$ and $\phi_{17} SADEC$ in equation 4.2 as dummy variables to isolate trade of which each country is a member. In their study, Abbott and De Vita (2011) found there was no significant relationship between colonial relationships and the flow of FDI between pairs of countries. In this study, given the colonial and political histories in the entire SSA countries in the past 50 years, we introduce a dummy variable $ColHist_{ijt}$ that helps to identify if there are any significant correlations between the political and colonial history and the attractiveness to FDIs whereby ex-British and US colonies are captured as 1, while the rest are 0. Finally, to capture the political status/history of each country, we introduced a dummy variable $Politicals\,tability_{it}$ equal to 1 for a country that has had civil wars within the past 30 years and zero for a country that has been politically stable for the past three decades.

4.2: Results and discussion

All the data used by this chapter has been collected from different government agencies and international organisation agencies covering the period 1960 – 2010 for all the Forty Six (46) SSA countries. That is, gathered data from different sources for each country to cover all the suggested variables in model 4.2. We make sure that the all data is in uniform measurements (standardised) so as to escape data manipulation and unreliable results. the data are not collected manually rather online databases, especially the World Bank's, those of the IMF, UDP, UNCTAD, EAC, COMEA, SADEC, national bureau of statistics and different ministries historical data (archives) provided very useful reports from which all necessary information were obtained and compiled. As briefly noted earlier, SSA countries suffer lack of previous information (data) that is highly demanded by the modern research techniques. The available information is also not such accurate and one has to be even more careful while dealing with data sets from least developing economies. There are some variables with significant amount of data especially FDP inflows, GDP, Population, Growth rate and Inflation rates. These data,

however, are not available in one database rather; one has to compile from different sources.

To standardise the data set, as noted above, all the variables are in units (except the dummy variables) and the base year used to estimate some variables are uniform. To estimate and explain the results, first we run a group stationary (unit root) test to measure the stochastic trends of the specified panel variables and also to initially understand the long-run behaviour of the variables and their expected parameters. Also, given the fact that our model consists of invariant variables captured by dummy variables, we then investigate if "time invariant" is a problem to our model whereby two models of fixed (FE) and random effects (RE) are estimated. Then, the Hausman test (Hausman, 1981) is applied so as to identify which of the two procedures (FE or RE) produces consistency and efficient coefficients of the variables in model (4.2).

We follow all the Hausman's hypothesis on the estimated results whereby, for instance, FE models assume there are no autocorrelation of the residuals, while RE suggests further autocorrelation and heterogeneity examinations to be undertaken if the residuals are correlated. From table 29, there are no multicollinearity problems in our data set as evidenced by coefficients values and the values of the R^2, which are suggesting that the selected variables are robust to test the relationships and flow of FDI's in the selected economies. The correlation matrix, when estimated, also indicated that there was no multicollinearity and all the relationships among variables follow desirable patterns. The Durbin Watson test and the J-statistics also indicate that the data and estimations satisfy the gravity model specifications; hence the estimated results fit the model.

Furthermore, the F test is also significant, suggesting that we reject the null hypothesis that the selected explanatory variables do not explain FDI inflow and therefore the selected determinants can initially be considered as the key factors that attract FDI inflow in a developing economy. The Hausman test suggests we reject the null hypothesis that there is a correlation between countries unobservable individual attractions and FDI inflow/outflows and thus RE (random effect) model is not efficient and consistent for analysing the data set and arrangement of the gravity equation. Since the Durbin-Watson statistic is significant (≤ 2), it implies there is no autocorrelation and the error deviations in the gravity equation are uncorrelated and the fixed effect (FE) procedure and somehow OLS are efficient for explanations. However, given the weaknesses of OLS and FEs, we include GMM estimations to cover some of the

weakness involving the three models. In order to gain more knowledge and for the future studies, all the results are included so as to compare and contrast the values of a weak procedure against a systematic system.

While discussing, we try to focus on the explanatory power of adopting a single exchange rate across the region on the flow of FDIs in selected countries. The theory suggests that, single currency reduces transaction costs and makes it easy to trade in a combination of countries; its impact on the normal flow of FDI is not yet covered, especially in developing economies. Our first step is therefore to analyse the factors that can influence more FDI to flow into the economy and at what capacity they really matter while promoting more FDI's in the market. Therefore, tables 29 and table 30 report the results to explain the determinants of FDI flows in the Forty six (46) SSA economies as specified before. Unlike the way in which this was expected by the gravity hypothesis, some of the coefficients of the host country's size of the economy are not robust (table 29) especially the gross national income (GNI).

Contrary to the first estimation, GNI produced a negative significant coefficient on its impact to the FDI outflows, implying investments remain in the economy instead of flowing to other parts of the world as GNI increases. In addition, table 29 includes dummy variables for the key trade unions across the region of the selected countries (EAC, COMESA and SADEC), which have been found to have negative correlation with the inflow of FDI. To be more precise, EAC and COMESA, under the RE model have negative coefficients to imply the more the integration gets serious, the less the FDI flows into the economies that participate in the multiple trade unions. SADEC, on the other hand, has insignificant coefficient implying it is not a region considered by investors before they decide where to invest in the SSA region.

Table 28 Descriptive Statistic

Variable		Mean	Std. Dev.	Min	Max	Observations
FDI Net Inflows	Overall	137.175	611.955	-1768	9645	N = 2346
	Between		259.599	-94.726	1261.04	n = 46
	Within		555.459	-1862.86	8591.61	T = 51
Total Trade	Overall	142.685	2641.394	-20540	42932	N = 2346
	Between		1248.705	-1076.22	6251.549	n = 46
	Within		2334.726	-19525.1	38725.12	T = 51
FDI Net Outflows	Overall	3.33E+07	6.63E+08	-5.98E+07	1.41E+10	N = 2346
	Between		2.28E+08	-1.35E+07	1.54E+09	n = 46
	Within		6.24E+08	-1.51E+09	1.26E+10	T = 51
Gross National Expenditures	Overall	6160.189	20727.89	-17854	294699	N = 2346
	Between		15157.09	0.27451	98063.45	n = 46
	Within		14311.06	-84952.3	202795.7	T = 51
Electricity Production	Overall	5726.145	22887.09	-104187	260500	N = 2346
	Between		19243.15	39.39216	132496.1	n = 46
	Within		12704.94	-123031	133730	T = 51
Surface Area	Overall	0.472	0.648	0.000	3.00	N = 2346
	Between		0.648	0.000	2.941	n = 46
	Within		0.096	-2.469	0.531	T = 51
Arable Land	Overall	3.373	5.329	0.000	38.00	N = 2346
	Between		5.309	0.000	29.451	n = 46
	Within		0.902	-0.078	12.294	T = 51
Oil Rents	Overall	-55407	6514806	-2.31E+08	1.57E+08	N = 2346
	Between		725440.4	-4521231	1833784	n = 46
	Within		6475157	-2.26E+08	1.55E+08	T = 51
Gross National Income	Overall	893611.3	2309518	-8429123	1.98E+07	N = 2346
	Between		1510689	-7227.61	5820141	n = 46
	Within		1760782	-8946958	1.56E+07	T = 51
Telephone Lines	Overall	0.150	1.262	0.000	20.00	N = 2346
	Between		0.634	0.000	3.431	n = 46
	Within		1.094	-3.281	16.719	T = 51
Population Total	Overall	12.660	100.67	0.000	4797	N = 2346
	Between		20.451	0.000	100.94	n = 46
	Within		98.611	-85.281	4708.719	T = 51
Official Exchange Rate	Overall	1.72E+07	5.19E+08	0.000	2.01E+10	N = 2346
	Between		1.16E+08	0.216	7.90E+08	n = 46
	Within		5.06E+08	-7.73E+08	1.94E+10	T = 51
Noda And Official Aid	Overall	261.949	542.989	-486	11428	N = 2346
	Between		219.902	-7.333	824.490	n = 46
	Within		497.506	-552.541	10906.91	T = 51
Mobile Cellular Subscriptions	Overall	0.653	4.056	0.000	87.298	N = 2346
	Between		1.345	0.007	6.677	n = 46
	Within		3.832	-6.024	81.473	T = 51
Landlocked Countries	Overall	0.344	0.475	0.000	1.000	N = 2346
	Between		0.476	0.000	1.000	n = 46
	Within		0.059	-0.460	0.539	T = 51

Language	Overall	0.527	0.499	0.000	1.000	N = 2346
	Between		0.501	0.000	1.000	n = 46
	Within		0.065	0.331	1.488	T = 51
COMESA	Overall	0.347	0.476	0.000	1.000	N = 2346
	Between		0.480	0.000	1.000	n = 46
	Within		0.029	-0.614	0.386	T = 51
SADEC	Overall	0.321	0.467	0.000	1.000	N = 2346
	Between		0.468	0.000	1.000	n = 46
	Within		0.062	-0.659	0.517	T = 51
EAC	Overall	0.109	0.312	0.000	1.000	N = 2346
	Between		0.315	0.000	1.000	n = 46
	Within		0.020	0.089	1.089	T = 51
Colonial History	Overall	0.391	0.488	0.000	1.000	N = 2346
	Between		0.493	0.000	1.000	n = 46
	Within		0.000	0.391	0.391	T = 51
Political Stability	Overall	0.480	0.499727	0.000	1.000	N = 2333
	Between		0.505047	0.000	1.000	n = 46
	Within		0.000	0.480	0.480	T-bar =50.72

Table 29 Panel estimations for the determinants of FDI inflow

Dependent Variable: FDI NET INFLOWS	Random Effects (Stnd. Errors)	Fixed Effects (Stnd. Errors)	GMM (Stnd. Errors)
Arable Land	0.164 (0.163)	0.870*** 0.228)	0.428* (0.222)
Colonial History	1.165* (0.534)	-	-
COMESA	-0.429 (0.468)	-	-
EAC	-1.468** (0.556)	-	-
Electricity Production	0.091*** (0.025)	0.068** (0.026)	0.094***(0.026)
FDI Net Outflows	-0.017 (0.014)	-0.017 (0.014)	-0.02* (0.014)
Gross National Expenditures	0.106*** (0.030)	0.082** (0.031)	0.084** (0.032)
Gross National Income	-0.018 (0.016)	-0.012 (0.017)	0.003 (0.017)
Landlocked Countries	-0.546* (0.390)	-	-
Language	-0.416 (0.496)	-	-
Mobile Cellular Subscriptions	0.085*** (0.023)	0.089*** (0.023)	0.07178 (0.029)
Noda And Official Aid	0.044* (0.032)	-0.011 (0.034)	0.181***(0.038)
Official Exchange Rate	0.110*** (0.014)	0.101*** (0.015)	0.052***(0.015)
Oil Rents	0.094** (0.032)	0.075* (0.033)	0.067* (0.032)
Political Stability	-0.438 (0.368)	-	-
Population Total	0.313* (0.183)	0.592** (0.223)	0.913* (0.431)
SADEC	0.239 (0.391)	-	-
Surface Area	-0.225* (0.121)	-0.452* (0.242)	-0.593** (0.253)

Telephone Lines	0.252*** (0.037)	0.222*** (0.039)	0.079* (0.041)
Total Trade	-0.038* (0.022)	-0.055** (0.023)	-0.0461* (0.022)
C	1.517 (0.477)	0.701 (0.522)	1.027 (0.813)
Weighted R^2	0.18	0.43	0.48
Adjusted R^2	0.17	0.41	0.46
Durbin Watson stat	0.88	0.90	0.97
Unweighted R^2	0.20		
Durbin-Watson stat	0.66		
J-statistic			2237

The results for the GMM procedure does include (fixed) time invariant determinants but the estimates are not reported. The estimated standard errors for the three procedures are in parentheses. *, **, *** denotes significance at the 10%, 5% and 1% respectively. The estimated results are for the 46 SSA countries included in the dataset. Variables are in log terms to estimate/interpret as elasticities

It is important to note, at this point, that some commentators have widely mentioned corruption as one of the variables with a negative significant correlation with FDI inflow in developing economies (SSA particularly). Despite the fact that there are a lot of studies being undertaken investigating the impact of corruption on different macro variables, there is no viable measure of corruption. Instead many researchers have been using some indicators of corruption. That is, it is difficult to measure the level of corruption in an economy, rather than guessing at it, as corruption happens behind closed doors. Recently, the World Bank institute has developed corruption indices (percentages on corruption and other bureaucracies that are limiting social/economic developments) which still lacked enough time lag to be included in our data set. But so far the indexes show SSA countries as among countries with the highest levels of corruption in the world. Corruption has been widely blamed on how it impacts on GNI, growth, development and government performance and therefore it could have produced very interesting results.

The impacts of the official exchange rate have portrayed the expected positive significant results, implying the higher the FDI flows (outflow/inflows) the stronger the official exchange rate other factors being equal. Investors are more motivated to invest in an economy with not too low exchange rate with fewer fluctuations in the world market of currency exchange. Most of the Forty Six (46) selected economies are also characterised by higher currency fluctuations and less value of their currencies in the

world market. Hence, the significant positive coefficient of the OER comes natural in our results. In terms of being landlocked (access to sea transport), table 29 and table 30 show themselves to be a less/non significant factors that can attract more FDI in/out flows.

Modern technologies in transport and communications have helped to eliminate the "landlocked" criterion despite the fact that technology is growing slower in the selected countries. Initially, the gravity, as also shown by the previous studies, expected landlocked countries to have slower flow of foreign investments as compared to unlocked countries, due to the advantage of reduced costs of transport. During this analysis, the volume and speed of FDI flows in the cross section is almost the same, suggesting either locked countries are benefiting from trade unions or having access to sea transport is not a determinant of FDI flows. This can also be revealed in the summary statistics table in the appendix which is portraying the flow of FDI as a percentage of GDP for each economy. For instance, there is a small difference between the FDI injections as a percentage of GDP in Tanzania and Kenya (access to sea transport) and Uganda, Rwanda, Burundi, which have no access to sea transport. However, it is important to note that, despite this study indicating non-significant impacts on FDI flows, being a locked economy naturally reduces the speed of movement of goods, services and people from/into the economy, hence slower growth.

Table 30 FDI outflows

Dependent Variable: FDI NET OUTFLOWS	Random Effects (Stnd. Errors)	Fixed Effects (Stnd. Errors)	GMM (Stnd. Errors)
Arable Land	0.748** (0.274)	1.217***(0.330)	1.247***(0.336)
Electricity Production	-0.08** (0.037)	-0.09** (0.038)	-0.11** (0.039)
FDI Net Inflows	-0.033 (0.030)	-0.036 (0.030)	-0.05* (0.032)
Gross National Expenditures	0.073* (0.035)	0.056 (0.045)	0.061 (0.048)
Gross National Income C	-0.09*** (0.024)	-0.11*** (0.025)	-0.11***(0.026)
Mobile Cellular Subscription	-0.08** (0.033)	-0.077** (0.033)	-0.010 (0.044)
Noda and Official Aid	0.008 (0.048)	-0.019 (0.049)	0.039 (0.059)
Official Exchange Rate	0.099*** (0.021)	0.083*** (0.022)	0.065** (0.023)
Oil Rents	0.104** (0.047)	0.102** (0.047)	0.113** (0.048)
Population Total	-0.323 (0.293)	0.005 (0.324)	-0.33 (0.654)
Surface Area	-0.087 (0.234)	0.099 (0.351)	-0.18 (0.383)
Telephone Lines	0.233*** (0.055)	0.189***(0.057)	0.157**(0.062)

	Model 1		Model 2		Model 3	
Total Trade	0.0169	(0.033)	0.018	(0.033)	0.021	(0.033)
Colonial History	0.426	(1.341)	-		-	
Landlocked	0.248	(0.965)	-		-	
Language	-1.58	(1.246)	-		-	
SADEC	-0.099	(0.969)	-		-	
Political Stability	1.732*	(0.912)	-		-	
COMESA	-0.187	(1.146)	-		-	
EAC	-0.579	(1.386)	-		-	
C	4.046	(0.961)	4.376	(0.753)	4.10	(0.229)
R^2 (weighted/unweighted)	0.045/0.085		0.52		0.52	
Adjusted R^2	0.037		0.5		0.50	
Durbin-Watson stat	0.934		0.95		0.95	
J-statistic			2237			

*, **, *** denotes significance at the 10%, 5% and 1% respectively

World Bank reports also indicate since the mid-1980s, when most of the selected countries underwent massive structural reforms and policy adjustments, the rate of FDI inflow into the region has declined as to the slope of inflow in the mid-1960s and 1970s. That has also been mentioned by different national archives while lacking statistical evidence to back up that argument. In our analysis therefore, we tried to separate the two periods (before/after reforms in late 1980's) and found insignificant results. That implied, the two separated periods may have brought some shifts on the flow of FDIs but the key determinants of flows have remained the same as specified in the gravity model. The benchmark being used by the World Bank is the Asian countries, especially Malaysia, Singapore, China and India, which have welcomed a significant amount of foreign investments from late 1990s. But still there is no statistical evidence indicating that structural changes imposed by IMF/WB have led to the massive economic positive shifts in the Asian countries.

Interestingly, we find that "Net Official Development Assistance (NODA) and official Aid from UN agencies have had a significant contribution towards FDI inflow in the SSA block but have no impact on the FDI outflow in the listed least developing world. As also noted by the previous chapters, the roles of official financial aid have led to a wide debate on whether it is helping developing countries or it is destroying the economic prosperity of the SSA countries. Our analysis implies, the more the aid in

SSA region, the higher the inflow of FDIs in the region. In addition, foreign investors are found to be more motivated to invest in a small market that has external funding sources, and thus the market prosperity is higher than in an economy with few external and internal sources of funding government expenses.

On the other hand, as some economies believe, aid destroys local productivity and economic creativity; hence investors cannot expand their venture to invest in other economies (FDI outflows). That also implies, as shown by table 30, NODA have had no contribution on the FDI outflow in SSA countries. This also means aid has reduced the speed of local industry growth and has stagnated the manufacturing sector, which is the first step towards higher FDI outflows. On the other hand, since most of the UN's official development aid comes as humanitarian (peacekeeping, Aids, Malaria and refugees packages) aid, it is not such a surprise that NODA have no significant impact on the FDI outflow; rather it has positive impacts on the FDI inflow. For instance, Tanzania is listed as among the top three major recipients of development/foreign aid in the world. One of the reasons is because Tanzania is the home of more than one million refugees from Rwanda, Burundi, Congo and other eastern central African countries which are still experiencing political unrests.

Moreover, the variable oil rent was introduced as an indicator of transport costs and costs of production of an economy. Oil rents increase as the supply of in the country increases and thus the gravity assumed the higher the oil rents the lower the costs of production and the less the costs of transport, hence motivating FDI inflow in the market. In addition, it was expected that the higher oil rents means growing local production hence a positive correlation with the amount of FDI outflows. Therefore, our results both in table 29 and 30 indicate that oil rents have positive significant impacts on the inflow and outflow of investment of the listed economies. The selected countries, given their reduced bargaining power, have limited supply/sources of oil as compared to developed and emerging (mid-income) economies such China, Malaysia and Indonesia. That is why it is expensive to invest in SSA region as compared to China and Indonesia who are noted to have lower costs of production due to an abundant supply of oil, cheap labour and lower costs of transport.

As we specified earlier, oil rents were preferred to oil prices (prices are determined by the world market) due to presence of historical data on oil rents for almost all the selected countries. Other determinants of oil were also not available for further

investigation and given the explanatory power of "oil" on investment and trade in general, this was an important indicator to include in the analysis. To gain more information, we estimated the correlation between oil rent and the other variables included in the gravity equation and indicated to have lower explanatory power that could have been used to measure multicollinearity problems. Future studies can explore more on the impact of oil rents on different variables of a developing economy.

Also, different reports especially the studies funded by the World Bank pointed that the Middle East and the Arab region in general are among the countries with higher costs of production despite being abundant with oil and fuel resources (see World Bank country reports for comparisons). In addition, the reposts indicates that some countries in the mid east are among the top recipients of foreign aid from different international organisation despite being the top suppliers of oil in the world market. Generally, one could expect costs of production to be very minimum in oil exporting countries; instead the answer is opposite, as costs of production are even higher than in the most of big importing countries. And that gave an extra emphasis on the necessity of investigating the role of the availability (supply) of oil in the market on the flow of FDIs and trade in general.

Recent geological reports indicates that it is expected within the next ten years Tanzania, Kenya and Uganda will be exporting oil products following the recent discovery (offshore) of oil deposits in the region. It is not clear whether that will lead to lowering costs of production, transport costs or if it is going to cause the "Dutch disease", hence economic stagnation as in the Middle East and Arab regions. Countries such as Nigeria, despite being an oil exporting economy for more than a decade, the economy have been stagnant with a lower growth rate and increased general prices of household's goods and services. Therefore, availability of oil in an economy does not guarantee that the economy will be more attractive to foreign investments rather it may promote more FDI into one sector (oil).

Also, when we applied random effects (single the FE and GMM) we did not estimate the time invariants; we find that political instability does not have any impact on the flow of FDI in the region. Some previous studies suspected that the lower FDI inflow into the SSA region is the result of political instability and civil wars that have wounded the region for the past thirty years. There have been a wide number of politically-related stories in the region, which at a certain point involved genocide and mass killing.

However it has been reported that, during political instability, investments shift their production/operations to neighbouring countries, while supplying their final goods either through the black market or through international peacekeeping organisation (NGOs). For instance, during the Burundi, Rwanda and Congo wars in the mid 1990's, Tanzania welcomed investors who ran away from the war sites so as to continue producing goods for their targeted market in the neighbouring countries. Therefore, even during political instabilities, the rate of FDI inflows remains slightly the same but the direction of entrance may change, since there is no government at that stage.

Furthermore, population size also produced the expected results with a positive significant coefficient implying the higher the population the higher the speed of FDI inflow. SSA region is comprised of more than forty six markets which, most of them, have less than ten millions total populations. Nigeria is the highest-populated country in the SSA region with a total of 140 million people, while the rest ranges between half a million (0.5 Millions) to Fifty (50) million population. For the past ten years in EAC region, the rate of change of FDI have been increasing more in Tanzania as compared to the rest of the region due to the higher population growth rate, faster improvements in infrastructures, discoveries of mineral resources and political stability. Sticking on the impact of population on the FDI flows, Tanzania is the highly populated country in the EAC; hence the higher flow of FDIs in the country can be responding to such factors. On the other hand, when estimating the FDI outflows, population produced a negative coefficient implying as the population increases, investors decides to invest locally. Population and income are among the key determinant of aggregate demand of an economy. Therefore, so far one can conclude that, capital investments abroad are highly motivated by the level of technology and the stages of development of a country, rather than the macroeconomic variables status.

Also, language is not a determinant for both FDI inflows and outflows; rather it is a determinant of intra-movement of people/labour between markets. The gravity model expected FDIs to be flowing higher in English speaking countries, since it is the highly spoken language around the world (language for business), and most of FDI in the selected Forty six countries comes from English-speaking countries. That is, languages can be a key determinant of communications, negotiations and transactions in a country but it is not a factor that can influence FDIs flows in an economy. Some of the literature noticed that trade was flowing at a higher speed between countries that share the same colonial history and other past political affiliations. In our gravity specifications, we

assumed that most of the SSA countries were ex-colonies of the European Empires and the rest were under American empires rules. Hence we assumed FDIs were highly flowing in the former category than the latter.

The Random effects model indicated that at ten percent (10%) degrees of freedom, FDI injections in the past European colonies are indeed flowing higher than in the second category. This finding can be supported by the fact that most of FDIs going in SSA region have more interest in the mining, gas and oil sectors whereby the key players (companies) in these sectors such as BP, Anglo America, Ashanti and Barrick Gold Mining are either originating from Europe or America and they were established during the colonialism era. Also, we assumed that total trade (X-M) has a significant impact on the flow of FDIs in an economy. The gravity model was expected to produce a positive coefficient for total trade to imply the more balanced total trade, the more the investments from abroad a country receives. The results find a negative significant coefficient, implying the more the country sells its products abroad (exports more) the less it becomes attractive to FDI inflows. One can also explain that, more exports means small room for foreign investments.

Also, the results portrayed that the more the country imports from the rest of the world, the more it becomes attractive to FDIs. That also means a country that imports more have few substitutes and therefore foreign investments will expect to make an extra profit hence will be more attractive to FDI's. The selected countries, as noted earlier, have less manufacturing and the entire industry sector is been stagnant despite adopting policies that were aimed at promoting these sectors and that has forced these economies rely on imports which some are originating from countries with higher costs of production., That indeed makes sense as compared to our gravity hypothesis, since investors are more interested in markets which have a massive trade deficit, so they can make extra profit and long-run investments. In addition, the number of mobile cellular subscriptions and the number of landline telephone lines as indicators of the level of technologies and means of communications produced a positive significant coefficient as it was expected by the gravity model. That indicated that the higher the number of landlines and mobile cellular subscription, the higher the flow the FDI inflow in an economy, ceteris peribus.

The level of technology in the selected economies is lower; making it difficult for the region to encourage more trade and investments as the transaction costs remains high.

Modern communication technologies help to expand the market reduces transaction and transport costs and it helps to explore and expose the available investments and trade opportunities to the rest of the world. The SSA region has experienced massive reforms and improvements in the communication sector and massive foreign investments have flown into the region targeting technology consumers. Recent reports have listed SSA countries among the highest consumers of communications and technology products. Contrary to the impacts of technology on the flow of FDIs, improvements/increases in the number of mobile cellular subscriptions reduces FDI outflow, while telephone lines increase FDI outflow. Generally, we expected these two indicators of the level of communication in the country to be significantly positive on attracting more FDI inflows and encourage more FDI flowing outside the economy (investing abroad).

Finally, the correlation between FDI inflows and FDI outflows is insignificant (not necessarily a causal relationship) implying it is necessary for a country to promote more FDI inflow in order to be able to invest abroad as well in other economies. Finally the time series procedures were also followed whereby the unit root test for individual variables indicating that there are strong convergences between the selected variables in the cross section. That also means the stochastic trend of the time series variables in the panel are adjusting equally in the long run (cointegrating towards equilibrium). For policy formulation, SSA countries should concentrate on adjusting the variables especially those included in the gravity model so as to attract more FDIs in their economies and also to stimulate foreign investments from their local market.

Table 31 EAC FDI inflow

Dependent Variable: FDI Net Inflow	GMM (Stnd. Errors)		FE (Stnd. Errors)	
FDI Net Outflows	0.151	(0.118)	0.053	(0.115)
Gross National Expenditures	0.252**	(0.083)	0.302***	(0.083)
Gross National Income	-0.159**	(0.059)	-0.075	(0.060)
Mobile Cellular Subscription	0.234***	(0.066)	0.209**	(0.069)
NODA And Official aid	-0.409*	(0.249)	-0.089	(0.195)
Official Exchange Rate	0.313**	(0.125)	0.092	(0.115)
Oil Rents	0.855	(1.521)	1.904*	(1.395)
Population Total	-0.429	(1.096)	-0.138	(0.423)
Surface Area	-0.743*	(0.568)	-0.704*	(0.522)
Telephone Lines	0.028	(0.204)	0.265*	(0.173)
Total Trade	-0.33*	(0.186)	-0.355*	(0.183)
Electricity Production	-0.075	(0.088)	-0.004	(0.083)
Arable Land	4.309**	(1.516)	-0.004	(0.083)
Landlocked/unlock	-		-	
Language	-		-	
COMESA	-		-	
SADEC	-		-	
Colonial history	-		-	
Political stability	-		-	
C	-0.611	(2.276)	0.436	(0.539)
R^2	0.52		0.25	
Adjusted R^2	0.48		0.22	
Durbin-Watson Stat	1.11		-	
Total Panel (Balanced) Observations:	255		255	
J-statistic	237			
sigma_u			2.59	
sigma_e			2.08	
rho			0.61	
*, **, *** denotes significance at the 10%, 5% and 1% respectively				

Table 31 presents the final estimation which includes a cross section of five EAC countries to measure the volume/speed of FDI inflow with the total observation of 255. To measure whether a single currency would favour more FDI inflow in the market, we use Kenya's exchange rate as a uniform exchange rate value throughout the region to measure the reaction of the FDI speed/volume. The theory suggests that at early stages when economies adopts a single currency, countries will have to adapt the more stable and highly valued exchange rate within the group whereby for the case of EAC, Kenya Shilling is the highest exchange rate in the region. We find that, Kenya's shillings

exchange rates have a significant explanatory power on the flow FDI in the cross section of the five countries. That also implies it is viable to adopt Kenyan Shilling as single currency throughout the region since it has a positive coefficient on the inflow of FDI. Further to that time series properties of the five official exchange rates in the EAC region indicates that the five currencies have a long-run equilibrium relationship as indicated by the strong convergences of the variables non -unit root at first and second difference.

To gain more knowledge on EAC FDI in/outflows, we conducted several tests to check the robustness of the selected variables, but since most of the tests did not indicate any changes on the parameters, we presented the results that are necessary interpretations For instance, we used FDI outflows instead of FDI inflow as a dependent variable; the results have not been affected as shown by table 29 and table 30. Also, we estimated using both FE, RE and GMM and the results were quite similar and the interpretations are quietly similar. Also, to confirm the degree of convergences, the lagged FDI inflows and outflows (FDI_{ijt}) were tested in equation 4.2 as convergence terms, under the assumption that richer countries in the region receive more FDI and send more investments abroad compared to small/poor member economies. Their coefficients, as portrayed by the unit root tests, indicated a strong convergence and growth of FDI flow in the long run. Furthermore, in the beginning of this analysis the per capita income and GDP were jointly used in the gravity as determinants of FDI movements whereby there were multicollinearity problems and the results were highly insignificant.

Therefore instead, GNI, GNE and population were used and produced significant results portrayed in table 29, 30 and 31. The discussion could have been even more interesting if data on country-to-country FDI flows were available for the entire continent, and that has been noted as one of the areas for future studies of the researcher of this study. In addition, the contribution of FDIs to the lives of the majority (poorest) in the SSA area is unclear and that can also be investigated in the future as there are interesting arguments and debates on the role of FDIs to the majority who live in remote areas. However, the significant correlation between macroeconomic variables and development indicators in the gravity is a testimony that FDI contributes significantly to the lives of indigenous in the SSA region. Another discussion is being launched by the previous studies on the impacts of FDI flows on the financial sector determinants especially on the interest rate. The interest rate has remained constant for more than two decades since the policy adjustments started implementations. For instance, the interest

rate charged by commercial banks in Tanzania ranges between 12% - 22% (World Bank country reports, 2011). There are many reasons behind higher interest rates in least developing countries one being banks are concentrated on doing businesses with multinational companies and governments hence making the loans to local businesses less profitable. That also implies that FDI inflow (multinationals) has been the forced behind higher interest rate since banks are still breaking even despite the fact that they are not performing the actual functions of banks.

Finally, the variance decomposition of the time series variables in the panel indicates that the official exchange rate contributes a significant amount of variation in the total FDI inflows in the selected cross section. The variations are also contributed by population, net official development assistance from the UN agencies, mobile cellular subscription, gross national income and electricity production as the key determinants of FDI inflows/outflows with significant contribution on the amount of variations. Infrastructures and other technology determinants are found to have less significant contributions on the variations of FDI inflows over time. Another interesting finding is that the size of arable land is found to have a significant contribution on the variations of the FDI outflows over time.

In developing countries, availability of arable land implies the agriculture sector is performing well and contributing significantly on exports and investments abroad. On the list factors causing more variations on the FDI outflows it is followed by gross national income, net official development assistance, cellular mobile subscription and total trade; these have significant contributions on FDI inflow variations. Population, unlike on FDI inflow, it is found to have contribute insignificant variations on the amount of FDI outflows. Therefore, most of the structural determinants of FDI inflow/outflows in equation 4.2 are found to have less explanatory power on the variations of FDIs in the SSA economies. In more sophisticated and developed economies, capital market variations contribute a significant amount of shocks on the flow of FDI. This is vice versa in developing countries, since the stock/capital markets are inactive.

4.3: Policy Implications;

The World Bank development indicators show that, since the introduction of the structural adjustment policies in developing countries in mid 1980s, SSA region particularly have experienced a massive fall in FDI inflows despite the reforms of all

policies that were expected to increase trade and foreign investments in the region. In addition, the report indicates that the manufacturing sector of these economies also has remained in bad shape, despite the fact that all the fiscal and monetary policies have been changed, aiming to favour growth, FDI inflow, employment and industrialisation in the listed economies. Moreover, keen to gain more knowledge from our data set, we dropped the dummy variable for the countries participating in the EAC block to find any significant changes on the coefficients of the equation (4.2) and the results were not so different, but the total FDI flow in the entire SSA dropped a little bit.

Therefore, we find that the formation of a free trade area of the EAC countries has been contributing to the growth of total FDI in the entire SSA region not only in EAC members, but also in none members. However, unlike the findings in chapter two, the volume of FDI flows into the countries surrounding the EAC block is not as significant as compared to participating members, despite the fact that there is significant intra-sector dependence between EAC and the surrounding none-member countries. In addition the selected variables across EAC and none EAC countries are found to be strongly converging towards equilibrium in the long run. Also, when we dropped the dummy EAC, the volume of FDI inflows in each country member declined, which suggested that the removal of trade barriers between the five countries has motivated more FDI inflow in the region.

Also, it is important to point out that we lacked data, especially on the paved road quality in each of the selected countries as one of the key determinants of costs of production and FDI attraction in any economy. Moreover, due to lack of accurate data we failed to use other variables used by other previous studies, such as Buys, (2010), which used the distance-weighted-mean road quality index to estimate the costs of transport from one market to another and estimate robust results. Also, we dropped "distance" as one of the key determinants of foreign direct investments flows between the country of origin and the host country because we included the trade to/from the rest of the world. Rather we used other structural determinants. In addition, as explained in detail earlier, Modern technologies reduces the significance of distances as the determinant of costs of transport

Finally we have investigated the determinants of foreign direct investments flows across SSA region and followed all necessary statistical procedures for panel data sets. In particular, this analysis explores the role played by institutional variables on FDI

location and mode of entry into a foreign market. There are many other variables, especially on the quality of the corporate governance institutions and other mechanisms that have a significant relationship with the flow of FDIs in an economy that we dropped to ensure accurate final results. Finally, we recommend that strong macro-economic variables and the arrangement of the institutional arrangement of an economy ensures a significant flow of FDIs and trade in general as shown by the short-run and long-run relationships between the three categories of our dataset. Therefore, our results confirm the statement made by many researchers; that reliable infrastructures, market sizes, macro stability and openness of the economy to the rest of the world jointly attracts FDI and new capital to be injected in the economy, particularly in developing economies.

4.3: Contribution and Significance of the Study

This chapter, based on the gravity specifications, has identified that currency unification can promote both FDI inflows and outflow in a group of least developing economies. In addition we investigated the relationships and long-run behaviours of the most important macro and structural variables that attract more FDI in an economy. Centrally to the previous literatures, this study also notes that trade unions in developing economies are likely to favour small economies (in terms of FDI flows) with lower costs of transport, transaction costs and stable official exchange rate. In addition to that, we noted that FDI is also likely to divert to the richer and sophisticated markets within the EAC group especially Kenya and Tanzania who are more advanced in terms of structural factors and macroeconomic stability as compared to other participants. Also it is worth to note that, as suggested by some commentators, we failed to capture the correlation between corruption, bureaucracy and other government settings on the flow of FDI in an economy since there are no accurate measures for such variables rather than simulations. Therefore, this chapter makes a significant contribution, especially for the future studies, that examines FDI behaviours and their impacts to different economic/social variables. Finally the following issues can be raised from this study:

(i) This analysis provides a significant introduction of the key determinants of FDI in developing markets as identified by our robust and well statistically tested results. Other variables such as the number of available hotel rooms, number of tourism agencies and the status/standard of technology applied in different sectors were not available and hence future studies can explore more from

this introduction. One have to note that the factor that determines FDI flow varies mainly depending on the size of the economy in terms of income and openness of the market and the general status of the economies being studied. Variables that are included in the gravity model are thought to be more significant for analysing a small economy (Jenkins, 1998; Fielding, 2009, 1993).

(ii) The negative perception that currency unification and free market within a specific number of poor economies motivates FDIs to flow into the market is rejected by this study. Rather, this study promotes further integration especially on joint structural factors such as improving infrastructures and technology, openness of the market and policies related variables, lowering currency fluctuations and unifying the exchange rate. All these variables promotes FDI's to flow in the market

(iii) We also insist that, like previous studies, sub-Saharan countries need to ensure political, economic and social stability so as to motivate more FDI inflows and deeper market integration and local productivity.

(iv) For future economic analyses, we argue that if data is available, the variables necessary for analysing the flow of FDIs include the market size, per capita income, economic growth, access to other regional within SSA and global markets, each country specific consumer preferences, market structures, availability of raw materials, cheap/affordable labour, the level of technology in the country, innovative, assets and the quality of infrastructures (power, ports, telecommunications, road). Also, labour productivity, assets depreciation rate, costs of resources and assets of production, costs of production, intra-region road/railway are also necessary determinant of FDI flows.

(v) Business facilitation remains important for every participating market in the region, despite the removal of trade barriers within the block. As suggested by IMF and World Bank policies, investment promotion, conducive and affordable social services, minimum corruption level, government administrative efficiency, investment incentives (such as tax holiday) and social amenities and affordable interest rates promote higher levels of investment/business flows.

4.4: Summary

This chapter briefly examines whether a single currency/common market attracts more FDI inflows and outflows both in the short-run and long-run. The gravity model is used to assess the flow of foreign investments in different countries that are members and none members of the EAC common market. The chapter started by briefly explaining different aspects and the theory of FDI, its categories and the importance of FDI in an economy. Within the introduction, we review the existing literatures on their limitations and findings, which are carefully examined by this study and hence drew the map and aims of this part of the project. Technically, the introduction of this chapter with regard to the findings/suggestions of the previous studies, the critics are more into the role of the government efficiency, infrastructures, investment policies and role of a common market on promoting more FDIs in a developing market.

Therefore our key objective was to investigate stage by stage the role of a trade a union on promoting more FDI inflows and outflows. In the second stage of this chapter, we specify the model which is used to analyse the flow of FDIs within the 46 SSA countries. We follow all the econometric procedures suggested for analysing panel equations, whereby in each stage we explain the implication and validity of the final results. Finally we interpret and discuss in details the final results which have provided very useful implications/information for policy analysis and especially on the areas that the EAC block can improve so as to attract more FDIs in the region. Then we conclude that the above explanations ought to be useful for the EAC and the SSA region in general to attract more FDI in their emerging markets. In the next chapter we investigate the volatility behaviours of the exchange rates of the selected countries. The aim is to obtain information on whether the levels of volatility of the exchange rates are optimal and reasonable to allow a fixed exchange rate regime.

Appendix:

Country	Average Total FDI inflow	Foreign direct investment, net inflows (% of GDP)
Angola	343.66	6.95
Benin	21.86	1.31
Botswana	108.62	3.45
Burkina Faso	20.60	0.48
Burundi	2.26	0.13
Cameroon	78.73	0.99
Cape Verde	31.24	4.50
Central African Republic	10.28	1.07
Chad	86.95	4.75
Comoros	2.33	0.68
Congo DRC	170.31	2.21
Congo, Rep.	260.44	6.76
Cote d'Ivoire	190.10	1.25
Equatorial Guinea	219.16	20.94
Eritrea	47.82	3.87
Ethiopia	1087.29	1.93
Gabon	48.29	0.47
Gambia, The	44.76	4.05
Ghana	387.07	1.61
Guinea	44.79	1.81
Guinea-Bissau	9.85	1.03
Kenya	54.47	0.60
Lesotho	49.29	7.01
Liberia	107.93	9.08
Madagascar	82.98	1.67
Malawi	23.04	1.42
Mali	27.28	1.24
Mauritania	33.15	2.89
Mauritius	40.10	1.14
Mozambique	112.14	2.83
Namibia	126.57	2.33

Niger		65.30	1.55
Nigeria		1273.03	2.69
Rwanda		14.18	0.67
Senegal		44.97	0.94
Seychelles		39.66	10.00
Sierra Leone		16.44	0.88
Somalia		15.34	0.14
South Africa		1185.23	0.74
Sudan		428.74	1.84
Swaziland		31.75	3.99
Tanzania		118.99	2.23
Togo		94.68	1.69
Uganda		115.46	1.78
Zambia		156.75	3.42
Zimbabwe		29.62	0.68

Inward and outward foreign direct investment flows, annual, 1970-2010

YEAR	Average (1970 - 1986)	Average (1986 - 2000)	Average (2001 – 2005)	2006	2007	2008	2009	2010
World	36.5	400.5	750.2	1461.9	1970.9	1744.1	1185.0	1243.7
Developing economies	10.4	102.5	239.9	429.5	573.0	658.0	510.6	573.6
Transition economies	0.0	3.4	20.5	54.5	91.1	121.0	71.6	68.2
Developed economies	26.1	294.7	489.8	977.9	1307	965.1	602.8	601.9
Developing economies: Africa	1.3	6.0	23.5	46.3	63.1	73.4	60.2	55.0
Eastern Africa	0.1	0.7	1.9	3.5	6.1	5.4	5.5	5.9
Middle Africa	0.3	0.8	7.2	12.1	15.7	20.9	16.9	17.8
Northern Africa	0.3	1.9	6.6	23.1	24.8	24.0	18.5	16.9
Southern Africa	0.1	0.8	3.9	0.6	7.1	10.4	6.6	3.1
Western Africa	0.5	1.8	3.8	7.0	9.5	12.7	12.7	11.3
Developing economies: America	4.1	36.4	71.8	98.5	169.5	206.7	141.0	159.2
Caribbean	0.4	5.1	11.3	28.6	60.8	80.6	65.2	48.1
Central America	1.4	8.7	26.5	25.9	37.2	34.0	20.5	24.6
South America	2.4	22.6	34.1	43.9	71.5	92.1	55.3	86.5
Developing economies excluding China	10.1	79.6	182.7	356.7	489.5	549.7	415.6	467.8
Developing economies excluding LDCs	10.1	100.2	228.6	408.6	546.9	625.0	484.0	547.2
Least developed countries	0.3	2.3	11.3	20.9	26.1	33.0	26.5	26.4

LDCs: Africa and Haiti	0.3	1.6	10.2	17.5	22.1	27.8	23.8	23.2
LDCs: Asia	0.0	0.6	1.0	3.2	3.8	5.0	2.5	2.6
LDCs: Islands	0.0	0.0	0.0	0.2	0.2	0.2	0.2	0.6
Landlocked developing countries	0.2	2.1	8.5	11.9	15.7	25.4	26.2	23.0
Small island developing States (UNCTAD)	0.3	1.2	3.0	5.1	5.8	8.0	4.3	4.2
High-income developing countries	5.2	50.9	111.2	221.2	302.8	312.6	242.8	277.2
Middle-income developing countries	3.9	43.4	104.4	148.8	190.3	230.9	178.0	209.0
Low-income developing countries	1.3	8.1	24.2	59.4	79.9	114.5	89.7	87.4
Heavily indebted poor countries (IMF)	0.5	1.9	7.0	12.7	16.9	19.2	16.8	21.1
Major petroleum and gas exporters	2.0	8.7	37.6	96.8	143.1	193.6	138.3	128.5
Major exporters of manufactured goods	27.1	322.8	555.3	987.6	1394.3	1034.2	681.3	743.9
Low-income food-deficit countries (FAO)	1.8	8.9	22.7	67.0	86.5	109.0	88.4	85.9
Emerging economies	4.7	43.8	80.1	112.4	156.2	141.2	95.7	158.8
Newly industrialised Asian countries	2.7	31.3	55.3	110.1	131.6	108.5	91.2	146.8
Africa excluding South Africa	1.2	5.4	20.2	46.8	57.4	64.4	54.8	53.5
Northern Africa excluding Sudan	0.3	1.8	5.3	19.6	22.3	21.4	15.8	15.3
Sub-Saharan Africa	1.0	4.2	18.1	26.7	40.8	52.0	44.4	39.7
Sub-Saharan Africa excluding South Africa	0.9	3.6	14.8	27.2	35.1	43.0	39.0	38.2
South America excluding Brazil	0.8	13.5	17.6	25.1	37.0	47.1	29.3	38.0
South America and Central America	3.7	31.3	60.6	69.8	108.7	126.2	75.8	111.1
Arab Maghreb Union (UMA)	0.0	0.9	3.9	9.7	10.9	12.3	9.0	9.0
East African Community (EAC)	0.0	0.2	0.7	1.3	2.3	1.6	1.7	1.7
Southern African Customs Union (SACU)	0.1	0.8	3.9	0.6	7.1	10.4	6.6	3.1
Central American Common Market (CACM)	0.1	0.7	2.0	3.3	5.5	5.4	3.3	3.5
Caribbean Community (CARICOM)	0.2	0.9	2.9	4.8	4.8	7.1	3.1	3.0
Free Trade Area of the Americas (FTAA)	16.0	140.8	186.2	372.6	445.3	499.1	255.0	366.9
Latin American Integration Association (LAIA)	3.4	30.3	57.6	63.6	101.0	118.1	70.3	104.9
Mercado Común	1.9	14.8	20.0	26.0	42.6	57.2	31.8	57.5

Sudamericano (MERCOSUR)								
North American Free Trade Agreement (NAFTA)	13.1	115.9	145.8	317.5	360.3	389.8	189.6	270.3
Organization of Eastern Caribbean States (OECS)	0.0	0.2	0.4	0.9	1.1	0.9	0.6	0.6
Union of South American Nations (UNASUR)	2.4	22.6	34.1	43.9	71.5	92.1	55.3	86.5
Organization of American States (OAS)	16.0	140.7	185.7	372.0	444.4	498.1	254.5	366.2
Association of South-East Asian Nations (ASEAN)	1.9	17.8	27.9	56.7	75.7	46.9	37.9	79.1
Economic Cooperation Organization (ECO)	0.3	2.0	12.9	33.5	38.0	43.9	33.0	28.5
Gulf Cooperation Council (GCC)	1.5	0.7	10.4	38.1	47.0	60.0	47.1	39.9
European Free Trade Association (EFTA)	0.4	7.1	10.1	54.0	45.1	26.8	41.1	8.2
European Union (EU)	11.9	167.0	335.8	581.7	850.5	488.0	346.5	304.7
Euro area	7.5	109.5	230.6	339.4	550.0	301.7	235.0	229.7
Melanesian Spearhead Group (MSG)	0.1	0.2	0.2	0.5	0.6	0.5	0.7	0.4
Asia-Pacific Economic Cooperation (APEC)	18.1	187.5	295.0	572.7	726.7	789.4	475.6	627.0
Black Sea Economic Cooperation (BSEC)	0.4	4.2	24.5	81.6	110.3	140.9	65.3	69.0
Commonwealth of Independent States (CIS)	-	4.7	16.8	43.5	76.5	106.8	63.1	63.5

Measures: US Dollars at current Prices and Current Exchange Rates in Billions.

Variance Decomposition of Foreign Direct |Investments Net Inflows:										
Period	1	2	3	4	5	6	7	8	9	10
S.E.	1.80	2.01	2.16	2.23	2.28	2.31	2.34	2.36	2.38	2.40
FDI Net Inflows	100.0	93.81	90.74	88.20	86.56	84.66	83.08	81.48	80.11	78.86
FDI Net Outflows	0.00	0.04	0.13	0.81	1.05	1.62	1.94	2.36	2.66	2.96
Gross National Expenditure	0.00	0.46	1.23	1.87	2.30	2.61	2.86	3.09	3.31	3.53
Gross National Income	0.00	0.00	0.07	0.08	0.09	0.17	0.29	0.44	0.58	0.70
Mobile Cellular Subscrip	0.00	0.14	0.36	0.66	1.02	1.35	1.66	1.91	2.12	2.29
NODA And Official Aid	0.00	1.16	1.73	1.64	1.60	1.57	1.56	1.59	1.63	1.68

Official Exchange Rate	0.00	2.05	2.74	2.86	2.80	2.72	2.68	2.69	2.76	2.87
Population Total	0.00	0.22	0.66	1.24	1.83	2.39	2.86	3.21	3.47	3.63
Arable Land	0.00	0.10	0.09	0.12	0.16	0.22	0.27	0.32	0.36	0.39
Total Trade	0.00	0.00	0.02	0.04	0.10	0.20	0.31	0.42	0.52	0.60
Telephone Lines	0.00	0.08	0.37	0.59	0.66	0.68	0.69	0.69	0.68	0.68
Surface Area	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Electricity Production	0.00	1.92	1.85	1.88	1.83	1.81	1.79	1.79	1.80	1.82

Variance Decomposition of Foreign Direct Investments Net Outflows:

Period	1	2	3	4	5	6	7	8	9	10
S.E.	1.13	1.20	1.39	1.46	1.57	1.64	1.72	1.79	1.85	1.92
Fdi Net Inflows	1.09	1.40	1.27	1.30	1.24	1.19	1.12	1.06	1.00	0.94
Fdi Net Outflows	98.91	93.98	93.24	91.00	90.09	88.01	86.35	84.06	81.90	79.47
Gross National Expenditures	0.00	0.01	0.20	0.60	1.00	1.52	2.06	2.71	3.40	4.14
Gross National Income	0.00	0.15	0.12	0.13	0.14	0.19	0.23	0.28	0.30	0.32
Mobile Cellular Subscrip	0.00	0.44	0.48	0.68	0.79	0.99	1.15	1.34	1.51	1.70
Noda And Official Aid	0.00	0.58	0.76	0.80	0.78	1.33	1.82	2.65	3.44	4.37
Official Exchange Rate	0.00	0.29	0.37	0.49	0.55	0.66	0.76	0.85	0.93	0.99
Population Total	0.00	0.00	0.00	0.00	0.00	0.01	0.04	0.09	0.18	0.32
Arable Land	0.00	0.47	0.48	0.96	1.16	1.51	1.73	1.97	2.14	2.29
Total Trade	0.00	0.55	0.99	1.62	2.01	2.41	2.71	3.03	3.31	3.59
Telephone Lines	0.00	0.10	0.49	0.60	0.61	0.58	0.55	0.51	0.48	0.44
Surface Area	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Electricity Production	0.00	2.04	1.61	1.83	1.62	1.59	1.49	1.46	1.42	1.43

CHAPTER FIVE

Assessing the speed and Levels of Volatility of the EAC Individual Exchange Rates

5.0: The EAC financial sector

Like other key economic sectors, the entire monetary sector of the EAC block has had massive reforms aimed at facilitating the maximization of one of the objectives of a common market of free movement of capital in the region. These adjustments also follow the previous (19980s – 1990s) structural adjustment policies which included the devaluation of the value of the currencies aimed at stimulating exports and total trade in the developing countries. The outcomes of the monetary reforms, however, have been disappointing and controversial as compared to the projections that were set by the structural adjustment policies. These adjustments have done little especially on the interest rate and mobilisation of savings (which is one of the major determinants of investment and growth in an economy). The access of most of the monetary instruments have remained minimal until the mid of the previous decade (2002 – 2012) where technology has transformed the sector and exposed more services from different monetary agencies. In the EAC region, not only agencies such as the banking sector poorly operates its activities, but also the stock market is stagnant hence making even more difficulties in assuring free movement of capital, specifically, in an extended market.

The study by (Aryeetey, 2003) also identified that the banking sector in least developing markets were not efficient and actively performing the transfer of capital from rich markets (developed countries) into their economies rather multinational companies were taking advantage of that and acted key players of foreign transfers. That has also been one of the dominant barriers to trade and do business in countries such as the group of EAC and therefore the slower flow of capital within and from outside their market cannot be viewed as a surprise[41]. In addition, some studies blamed local banks for not

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[41] One of the most significant developments in global finance is the growth in capital flow between industrialised and developing economies Aryeetey, E. (2003), "Recent Developments in the African Financial Market: Agenda for Further Research." *Journal of African economies,* Vol. 12, No.2: pp. 111-152, ibid.

intervening and controlling their local exchange rates rather for many years the exchange rates in LDC is highly determined by the movements in the world currency markets. Therefore, all the adjustments being undertaken on the monetary tools by many LDC within the past three decades, still the local banks and other financial institutions have no power to adjust the local exchange rate. In this chapter, we assume that all shocks are internally and externally influenced. Second, the response to shocks, nature of volatilities and speed of adjustments to shocks are unique in each country. Third, given the fact that the EAC countries are natural trading partners, a shock (+/-) on the exchange rates of one country can lead to another shock in other member stages of the common market. Therefore through those assumptions (hypothesis), we apply some time series techniques and hence compare and contrast the behaviours of the exchange rates across the EAC region. We examine the volatility of the exchange rates of the three countries (Uganda, Tanzania and Kenya) who are the founding members and key players of the EAC market against the US dollar. We fail to include Rwanda and Burundi at this stage due to lack of daily data sets on exchange rates for at least two years but the results to be obtained are expected to be useful to analyse the isolated members of the EAC.

To reach our intended objectives, we first apply the traditional standard deviation to examine the trends by measuring how far the daily exchange rates of each country are diverting from the mid points overtime. Through the traditional standard deviation we expect to identify the divergences of the exchange rates as the harmonisations of the monetary instruments in the common market continues. The harmonisation and the entire policy adjustments process is an invisible procedure and thus one has to be careful to observe whether there are significant changes along the line of changes being undertaken by the countries participating in the trade union. That is why a step by step time series procedure for examining the volatility levels of the exchange rates was listed as necessary to be investigated and included in this report.

Adjustments on monetary tools always hurt the economy in the long run on different variables. For instance, many platforms have blamed currency devaluations that happened in late and early 1988s and 1990s respectively as the reason for lower FDIs, lower trade and diminished intra-trade in least developing countries. Some other arguments were established in the second, third and fourth chapters with regard to various variables limiting the free flow of trade, capital and labour across the SSA region. Therefore, the addition of more time series investigations on the behaviours of

the exchange rates of each shilling in the block, which is expected to be fixed throughout the EAC region, is crucial for this study as additional evidence on whether it is optimal to have a single exchange rate in the proposed common market. At descriptive level, the EAC exchange rates indicate no significant changes on the values of the local exchange rate have happened from the year 2007 (early stages of EAC deeper integrations) to the present. The exchange rates and fluctuations have remained at the same path despite the world economic crisis and policies introduced by the newly EAC common market. That also indicates that, unlike in developed countries, the recent world financial crisis has had slightly lower impacts on the exchange rates of the least developing countries. However, other variables such as producer prices, general inflation, growth and FDI flows responded negatively to the recent world economic crises. Most of these variables, however, responded in the later years of the crises, especially between the years of 2009 – 2011, unlike the western countries, which suffered directly from the early years of the economic meltdown (2007).

Theoretically, and from the above introduction, the role of the exchange rate on economic growth, developments of the macroeconomic variables and expansion of the entire monetary sector of an economy, is mixed with very thoughtful arguments. Previous studies have not investigated the behaviours and trends of the exchange rates while investigating optimal currency areas rather they have included the currency values while assessing cross sectional interdependence of the participating markets in the block. That is, the behaviours and the levels of volatilities of the exchange rates are not considered as a significant factor[42] that can encourage or discourage a successive monetary union. Rather, most of the previous studies have ended up generalising that the exchange rate is flexible and is expected to adjust equally to the symmetric country-specific real shocks in the long-run.

Therefore, we emphasise the importance of expanding and modernising the monetary sector so as to improve stability and the value of the local currencies in least-developing markets hence facilitate faster flow of capital and trade. Studies such as (Kasekende, 2007) noted that the role of the banking sector and the indicators for industrialisation is not as significant as it should be. This is due to the fact that EAC economies[43] are

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[42] The continued fragile nature of financial sector cannot be eliminated from the still fragile nature of most of African economies ibid.

[43] According to this view, financial institutions should best be owned and controlled by domestic interests Kasekende, L. (2007), "Plenary Session on Financial Services and Economic Development in Africa:

dominated by small and medium enterprises (future corporative and manufacturing firms) that need an efficient monetary system that could finance these small scale industries efficiently to ensure growth in the informal sectors. Therefore, this chapter explores the status and trends of one of the key variables of the monetary policies and the banking sector.

5.1: The Role of the Financial Sector in a Monetary Union.

As noted earlier, the financial industry of Africa in general has been through different phases of policy changes which have had some impacts on the values of the exchange rates. Those phases are within the broad context of economic stabilisation, structural adjustment programmes and as requirement for trade unions. As identified in chapter four, the exchange rate plays a crucial role in promoting foreign investments and local business as it determines the short run and run values of products in the market. In addition it facilitates transactions and other economic movements to be easier especially when the exchange rate is stable with fewer fluctuations. The Central Bank and all commercial banks in any country have the role of controlling the exchange rate properly without affecting the informal sector and other small scale entities so as to promote future growth and employment opportunities in the block, other things being equal.

It is worth noting that in many SSA RECs (including EAC) other real sectors have been integrating at a good speed and sustainable pace within the regions, while the financial sector (especially banks) have been integrating at a disappointing pace and speed. In addition, the divergences of the exchange rates throughout the SSA have been widening (at descriptive level) instead of converging. There are many reasons behind the widening divergence of the intra-exchange rate between countries in the group one been poor infrastructures employed by the exchange rates governing organs. Also the increasing external control from major world market players have also discouraged convergences to happen faster in many developing blocks. Furthermore this has been due to lack of a skilled labour force, weak (non-functioning) policies and the lack of

Uganda's Experience with Financial Sector Reform and Lessons for Africa, African Development Bank." *Journal of African economies, Oxford University,* Vol. 16, No.

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commitment of the SSA countries governing bodies to undertake harmonised policies as they tent to fear to lose control of their entire local monetary system[44].

Unlike in developed economies, monetary authorities are highly influenced by politics in poor economies and the institutions have not given full power (independence) to make decisions with regard to short run and long run responses. Politically influenced decisions are always poor and most are aimed at achieving short run political promises. Therefore through this chapter, one can anonymously see and evaluate the performance and behaviour of the exchange rates in the EAC despite the political influences on the levels of the indicators. We start at descriptive level, before going into more advanced time series approaches, just to learn the central tendency behaviours and the degree of spread from the mean of EAC shillings. The null hypothesis, therefore, should be that, if the exchange rates of selected countries have similar trends and amount of volatilities, then a currency union (Fixed exchange rate) can be successful.

Through these step-by-step statistical procedures, we expected to identify the impacts of the policy (trade union) arrangements on the exchange rate circles. Also through these procedures, the responses of the exchange rates to symmetric shocks can also be examined easily, hence providing further results for our general discussion and conclusion. One of the key advantages, as mentioned before, of forming a currency union is to eliminate transaction costs that originate from exchange rate divergences within a trade union. However, it is notably difficult to eliminate the transaction costs due to some other factors listed in chapter two and three which include the fact that; some variables such as the exchange rates in LDCs tend to be highly explained by both internal and world (external) market shocks. In addition to that, the magnitude of the impacts of shocks differs from country to country depending on both policy and general economic setting of the market.

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[44] Other studies have blamed the underestimation of the roles of the financial (banking) sector in the process of full economic integration. They insist that literature and the theory of regionalisation do not show explicitly the role of the financial sector's variables such the exchange rate and interest rate. In their concluding remarks they insist the necessity of considering the variables that are managed by the financial sector under similar magnitude, such as how the fiscal policies are investigated. It is necessary we insist, in order to consider the financial sector as one of the key pillars for regional integration harmonisation process in the EAC, it is important to note that most of the challenges facing the industry are similar to those facing other least-developing markets. For instance, lack of skilled human capital and financial capacity of banks can be among the key hindrances on the level of currencies convergences across the region Stichele, M. (2010), "How European Financial Sector Reforms affect Developing Countries." *Stichting Onderzoek Multinationale Ondernemingen*, No..

For instance, the recent world economic crises affected each country in different areas at different magnitude for instance commodity exports and general prices while exchange rates experiences long-run decline of the exchange rate values. For example, Tanzania exports minerals (gold and diamonds) more than any other exports and shock was on the values of other exports while the general/total exports of the country remained almost the same. Kenya, on the other hand, depends more on the manufacturing sector, hence it experienced massive shocks on general prices and the exchange rates. Therefore, exchange rate can sometimes be determined by very unique market shocks in the given economies. Furthermore, other components (variables) of the financial sector, especially the stock markets, insurance and brokerage industries, are also performing very poorly[45]. That has been the reason behind making the banking sector and its variables the easiest monetary indicators to adjust in the awake of any shock in the market. That also means, to clear any inefficiencies and inequalities in the market, the banking variables play significant roles to ensure the economy is going back to recovery as compared to other financial sector intermediaries which are even more dormant in LDCs.

Therefore, the recent world financial crisis and the euro-zone banking/financial sector meltdown (which has lasted from 2010 to date 2012) have awakened other economic blocks to the necessity of ensuring the exchange rate is in the acceptable range that can easily be adjusted in awake of any downturns. There are ongoing studies and discussions at the European commission which are trying to redefine the convergence criteria that will ensure that floating the exchange rate is fairly controlled throughout the zone. And this has become one of the currently interesting areas of research as each euro and none euro member country try to make sure it is not affected by the ongoing crises. Some countries such as Italy, Greece, Ireland and Spain have experienced some serious problems in their banking industries whereby some commercial bank almost went bankrupt as a response to the Regional economic crises.

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[45] Some LDCs such as Uganda and Tanzania have also experienced an economic growth averaging 5% - 7% for the past ten years. The private sector, especially manufacturing, has grown despite the fact that living standards and income per person have remained below the international poverty line. Another group of countries, such as Kenya, Rwanda and Burundi, has also experienced booming investments, industrial growth, exports growth and economic growth in response to allowing private sector to engage more in their economic production ADB (2010), How Regional Financial Integration Can Support Growth, Development, and Poverty Reduction, Financial Sector Integration in three Regions of Africa. IN ADB (Ed.), African Development Bank Group..

The EU financial sector meltdown responds to the point raised in the above paragraphs on the role of the financial sector in the process of economic integration. Therefore, as a preliminary suggestion to stress, integrating variables of the financial sector should be the first stage, followed by the other integration steps which will include other sector's variables such as Fiscal related variables. That also mean; trade integration and financial sector (fixed exchange rate/single currency) to be promoted simultaneously instead of following the traditional sequential of regional integration. it is necessary we stress that transition from stage to stage at the preliminary levels of integration is mostly technical and complicated, while achieving the final integration stage requires reforms/adjustments, especially on the regulatory institutions which are attained in the long-run. As indicated by the webpage of the EAC commission http://www.eac.int/ as per this time (2012), the block has been in the common market stage since 2010, which is supposed to motivate more the free movements (capita, good, services and people) within the five countries.

There are still ongoing institutional adjustments/arrangements which are expected to strengthen the speed of integration towards a single currency which is targeted in 2013.The current ongoing reforms in the region includes the entire financial systems review aiming at attaining a proper model for the EAC market, financial sector infrastructures and models for decision making[46]. In addition, systems of financial reporting, payments systems, banking regulations, legal framework of the banking sector and accounting/recording standards of the key decision making institutions. also are currently under review by different joint review committees. These ongoing adjustments, however, are not considering how they may impact the participating markets, since individual exchange rates (at certain levels) are explained by unique factors. Therefore, this chapter investigates the behaviour of the exchange rates in terms of volatility by first applying all time-series procedures that help to examine the stochastic trend and long-run behaviour of the exchange rate (value of money) for the selected members of the EAC. The procedures will be introduced later and we hope the results will help to identify whether, given the volatilities and time-series status of the exchange rates, EAC is optimal to adapt a fixed exchange rate regime.

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[46] This group has become very open to external world markets; they have been notably listed as among the countries that are easier to start a business in the SSA. As noted by the WB and IFC (2010) report, it takes less than a month (on average) to start a business in most East African countries and it also takes less than four weeks to obtain a loan from banks and any other credit institutions.

5.1.1: EAC Block Experience with Financial Sector Liberalisation

The stage-by-stage reforms in the least developing countries of the 1980s and 1990s have had mixed long-run outcomes. Some regions have moved from least developing to middle income countries while others, including the EAC members, have remained at the bottom of the income line. Countries such as India, China, Brazil, Bangladesh and Malaysia are among the group of countries that have moved to middle-income group as a result of massive reforms and commitments that have been implemented since the mid-1980s. All the macroeconomic variables, the exchange rates specifically, have improved massively, especially in the last decade, while the volatility and dependence to the more developed economies have also fallen in these economies. However, some sectors, the banking sector specifically (even in the middle income countries) have not improved at a good pace as compared to the manufacturing sector of the BRICS. The IMF's SAP vision was basically promoting liberalisation of the key market variables including a market-determined exchange rate so as to stimulate investments, employment and long term economic growth and the results of the adjustments are totally different in SSA as compared to East Asia and India.

To this end, one can notice that the reforms being undertaken are rarely considering the actual market requirements of the countries, as their outcomes seems less effective on the economic growth and diversification of the private sector in general. That is one of the unforeseen reasons why RECs in LDCs cannot easily convert into full integration, as each country seems to respond differently while reforming the key policies guiding different sectors of their economies. For instance, currently SMEs are the heart of the developing economies despite the fact that they are not carefully considered in reforms such as those that affect the exchange rate of the country. Some members of the EAC market[47], such as Tanzania, have identified the role of the SMEs for the past eight (8) years, whereby through government agencies, hundreds of micro schemes have been introduced and sponsored by international organisations such as IDA, IMF, WB and the EU.

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[47]Financial markets play an important role in the process of economic growth and development by facilitating savings and channelling funds from savers to investors Mala, R. a. R., M (2007), "Measuring Stock Market Volatility in an Emerging Economy." *International Research Journal of Finance and Economics, Euro Journals Publishing, Inc*, No.8: pp. .

Also, some have been locally financed by groups' monthly savings (cooperative societies), hence financial services availability through these schemes have been growing throughout the country and making it easier for SMEs to grow in the long run. The aim, therefore, is to finance individuals and groups that are involved in any economic activities aimed at growing, but do not have access to financial services, especially loans. Therefore, the reforms have driven the emergence and expansion of the micro-financing institutions but the interest rate has remained at double digit percentages. Also, the expansions of the micro banks in the EAC for instance, have had no impact on the exchange rate, as it has remained volatile responding to the world market. Therefore, the correlations between reforms, interest rates, exchange rates and the performance of the SMEs have been listed among the areas for future research

Therefore, using the exchange rates daily data set covering the period 2004 – 2011 with 1,848 observations for three countries in the EAC zone, we first examine the monthly standard deviations of the exchange rate to learn the degree of spread from the central point (mean). As shown by table 32 below, we find Tanzania's and Uganda's shilling to have higher deviations from the average exchange rate compared to Kenya. That also implies that Kenya's shilling is more stable to external/internal shocks compared to the other block participants. At the beginning of the year 2004, Kenya witnessed massive fluctuations compared to the rest of founding members of the EAC block. Then, since 2005 (the year EAC became a custom union) Kenya's exchange rate became stable and stronger compared to the other two countries in the block.

Stable and stronger currency has massive implications and contribution such as controlling imports and balance of trade, motivating the manufacturing sector to grow faster, hence making the entire economy grow up faster to catch up with the other adjustments. Tanzania and Uganda, on the other handsaw its currencies highly diverging and fluctuating throughout the period covered by the data set. At this preliminary stage of analysis, one can notice that the smallest economy (Uganda) has had highest fluctuation during the 2007 – 2011 world economic crises, compared to Tanzania and Kenya. The value of the Uganda shilling has declined slightly from early 2008 as compared to Kenya which has been observed to respond in the long run (mid 2010). It is also worth noting that the responses of the exchange rates to recent world economic crises have been almost similar, but the turning point has been slightly different across countries.

That also implies that macro variable have responded towards same directions, but the turning (changing) points varies from country to country. Therefore, one may conclude that the selected currencies respond to both internal and external fluctuations in the same direction but at different margins and different turning points. As shown by the graphs below, for instance during the past world financial crises, the value of the shilling was falling, but the speed of responding was different in each country. This is proven by the value of the mean and variance which when differentiated, are found to be equalled (stationary) in each country. Therefore, as shown by table 32, we investigate the stochastic trend of the unreported standard deviation. By measuring this, we were able to predict the level of convergences in the long run. The augmented Dickey Fuller test is preferred by this data set.

Table 32: Stochastic trend (unit root test) for the fluctuation ratios of the exchange rates of the local currencies against the US dollar

Augmented Dickey-Fuller test statistics & Equation for the standard deviation of the exchange rate for the EAC founding members			
	Uganda (-1)	Tanzania (-1)	Kenya (-1)
t-statistic	-9.19***	-6.83***	-3.69***
Coefficient (standard error)	-0.953***	-0.716***	-0.255***
R^2	0.48	0.34	0.13

The t-statistics and the ADF equation coefficient are significant at 1% (***). Lag length: 1(Automatic –based on SIC maxlag=11)

The Dickey Fuller test for the unit root on the monthly standard deviation of the exchange rates across the block rejects the null hypothesis that there is a unit root (table 32). That also means the Ugandan, Kenyan and Tanzanian shilling have a constant mean and variance and thus in the long run they are converging equally towards the turning point. In addition, once again it has been proven by the values of the R^2 of the ADF equation that Kenya has lower currency fluctuation (significantly stationary) per time as compared to smaller markets of Tanzania and Uganda.

*F*igure 5.1: Exchange Rate Volatility (standard Deviation)
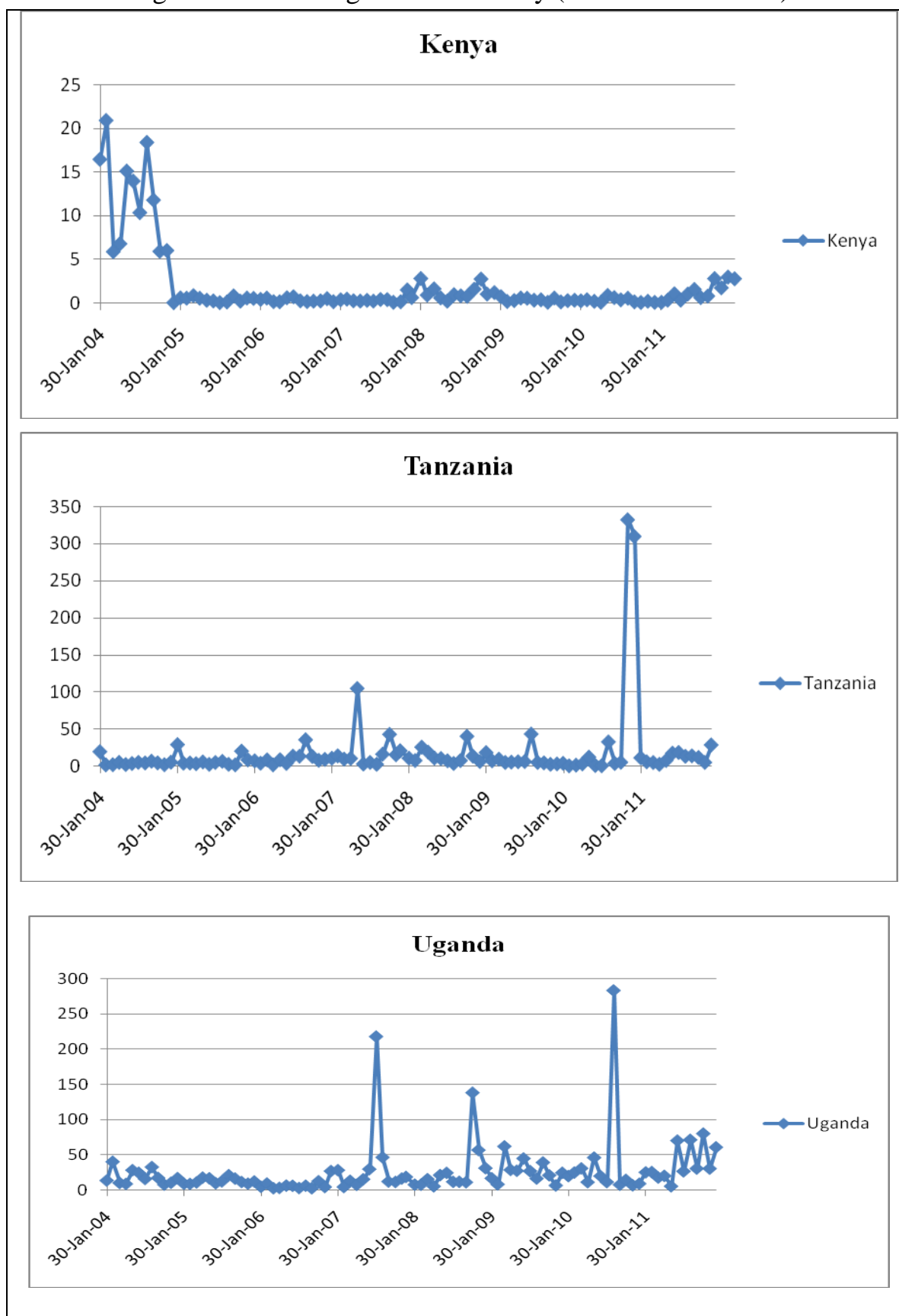
This primary analysis on the volatilities of the exchange rate in the region also complements the previous findings that most of the macroeconomic variables that are necessary for economic integration are converging at an acceptable speed and adjusting by similar magnitudes and direction as time goes by. For instance, the exchange rates in the EAC have similar causes of fluctuation and hence adopting a fixed exchange rate/single currency can reduce the exchange rate risks. Adopting similar financial settings can play a positive, significant role on the promotion of exports in the region, which is the reason for poor growth and development of the macro variables. It is important to insist that this part ignores investigating the volatility levels and their impacts on the values of the currencies in Rwanda and Burundi, due to data unavailability. But given the economic status and the shape of the financial settings in Rwanda and Burundi, these findings are also relevant to the two economies and to the applicants (south Sudan and Somalia) of the EAC market.

The status and shape of the entire EAC financial market can be examined on the descriptive statistics given by the EAC database on http://www.eac.int/, whereby variables such as the savings rate and the interbank rates are similar in size, implying the size and operations of the sector is performing similarly. In addition, the information in the database indicates commercial banks, particularly, are natural inter-bankers (natural trading partners) and thus they inter-depend in their daily operations. In addition, given the tasks of banks on mobilising savings and ensuring availability of liquidity instruments for investment motivation in the market, development in the managerial skills, technology and the framework of the entire sector in the region should ensure deeper integration in the sector. Covering all the mentioned challenges is a long term process, but the first step should be to ensuring a stable exchange rate in each market before deciding to fix it throughout the five markets. Therefore, later we use more specific and advanced methods of measuring volatility levels of the selected cross section.

5.1.2: EAC Exchange Rates Behaviours.

As mentioned before, the behaviour of the financial variables (exchange rate) in the EAC countries is similar to that of other developing economies in the world, mostly, highly disturbed by world (external) market shocks but responding (as shown by the standard deviations) in almost the same direction. One of the key questions to be answered by this chapter is how long it takes for each country to (adjust) return to the

average (normal) exchange rate after disturbances. The magnitude of internal and external disturbances varies in each country, thus by determining the adjustment speed, it is easier to predict and suggest whether the EAC currencies are favourable for a regime. Our null hypothesis is that, if EAC countries exchange rates respond in different directions, different magnitudes and speeds, then they are not favourable to have a fixed exchange rate regime. The alternative hypothesis is that, if they respond in a similar way with almost equal speed of adjustment, then a fixed exchange rate will be favourable for long term stability. In the long term, as will be indicated by the unit root test, the deviations of the currencies from the mean due to fluctuations in the market are expected to be similar, especially in the larger markets in the trade union. As the integration process continues (in the long run) towards deeper integration, the values of the EAC shilling is also expected to be equally converging towards the mean.

Most of the previous studies that used macro level data sets on the causes of volatilities of the exchange rate revealed that most of the divergences of the financial instruments are typically countercyclical and tend to adjust along with other adjustments in the economy. Therefore, the literature suggests that fluctuations in the financial sector, in LDCs for instance, can reflect the results of the policy reforms in other sectors/macro-variables throughout the LDCs group. To stabilise the macro variables, each country takes different approaches, which sometimes impact other markets, especially those with some trade ties (Trade agreements). Therefore, by introducing a single currency/exchange rate regime, it is easier to stabilise and manage fluctuation across the banking sector of the block. Finally, since the main objective of this chapter is to estimate the volatility and behaviours of the exchange rates in the EAC block, we employ the time-varying time series equation GARCH[48] to estimate the impacts of the exchange rate volatilities in the EAC countries. Through this procedure it is expected to identify the degree of the cross-correlations of the volatilities of the exchange rates between the markets to be examined.

5.2: Data and econometric Specifications

Using GARCH procedures, we therefore examine the exchange rate market for the big three economies in the EAC region. The data consists of daily nominal spot exchange

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[48] The GARCH model, apart from being more flexible than the ARCH model, it has the ability of matching a "variety of volatility of patterns of stock" Koop, G. (2009), "*Analysis of Economic Data,*" (3 edn.), John Wiley & Sons..

rates between the US dollar and Tanzanian shilling, Kenyan shilling and Ugandan shilling. The data is gathered from the central banks' databases for the listed countries whereby Rwanda and Burundi are ignored by this analysis as they lack reliable data and accurate sources with a significant number of observations. Also, we assume that given the level of the financial market status and history of Rwanda, Burundi and Uganda, the results and interpretations from Uganda are quietly same to that of the omitted countries. The sample period is different in each country as we collect depending on the availability of information in their databases, but they all cover the period of 2004 – 2011. Therefore, we have 1,784 return series for the dollar–Kenyan shilling, 1,721 return series for dollar–Ugandan Shilling and 1,946 for dollar–Tanzania shilling. Following the standard GARCH procedure, daily exchange rate returns are measured as follows:

$$r_t = 100 * LN\left(\frac{S_t}{S_{t-1}}\right)$$
(5.1)

Whereby r is the exchange rate return at time t, LN is the natural log, S is the spot exchange rate at time t. The standard GARCH[49] procedure has become prominent and famous on analysing time series data sets, replacing the traditional standard deviation procedure for examining volatility analytics. Basically GARCH stands for Generalised Autoregressive (depends in its lags) Conditional (Variance depends on past info) Heteroscedasticity (non-constant variance). Given the nature of the data set, we prefer time series autoregressive procedures so as to produce robust and significant results, since normal regressions may produce misleading results as they mistreat the univariate time series and the autocorrelations of the error terms at time t. Moreover, one of the main features of GARCH according to (Frimpong, 2006; Figlewski, 1997; Choudhry, 1996; Chong C.W., 1999; Chen, 2008) is the fact that the conditional variance of real stochastic process has a unit root and it varies over time due to the heteroscedasticity nature of time series. In addition, GARCH procedures are simple linear functions of precedent for error forecasting and precedent conditional variances which verifies that this specification is suitable for the data set.

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[49] GARCH allows for "the conditional variance to be a dependent variable on past variances and this makes it reliable with the actual volatility outline or model of the stock market where there are stable and unstable periods'' Frimpong, J. M. a. A., E.F (2006), "Modelling and Forecasting Volatility Returns on The Ghana Stock Exchange Using Garch Models." *Munich Personal RePEc Archive,* Vol. . 593,, No..

Originally, GARCH is an extension of the traditional Autoregressive Conditional Heteroscedasticity (ARCH) models. The ARCH models are criticized as insufficient to analyze the dynamics of the conditional volatility of time series and thus the GARCH models are extended to capture and analyze the dynamics. On the other hand, GARCH models are criticized on their ability to model the relationship between signs of the past shocks and the asymmetries of the volatility of the market. In addition, GARCH models do not adjust in a more rapid way to cope with the ongoing volatility and its reductions are slower when there are decreases in the level of volatility in the market. Also, GARCH models are likely to cause misspecification of conditional variance if there are higher volatility shock effects, since GARCH models only capture the effects according to the constructed dataset. In conclusion, critics suggest that GARCH models are not very active in capturing asymmetry effects, which are crucial and are regarded as the major characteristic of financial markets.

However, there have recently been some adjustments towards GARCH models whereby some significant extensions[50] have been made on the equation to enable researchers to analyze their observations with regard to the empirical hypothesis. Even the modern statistical software, such as E-views, have already included these adjustments so as to allow estimations[51] procedures such as GMM, maximum likelihood and the Quasi maximum likelihood to calculate the GARCH models, since it initially is not possible to use OLS, despite the fact that the constant is usually included. Therefore, it is difficult sometimes to understand the differences between ARCH and GARCH processes, and the major distinguishing feature is that the lagged squared residual and lagged conditional variance are included in the GARCH and found to be sufficient for the model. Therefore, as noted above concerning GARCH procedures, this analysis, apart from adding more lags of square root, lags of the volatility measure itself are also added in the model. The standard GARCH equation applied by this study is slightly similar to that of (Chen, 2008) and (Frimpong, 2006) which is expressed as follows:

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[50] Many more modifications have emerged attempting to cope with problems of specific empirical analyses. GARCH models are generally quite flexible and have become a standard tool in most software packages Chen, G. C. Y. a. Z. Y. (2008), "Detections of changes in return by a wavelet smoother with conditional Heteroscedastic volatility." *Journal of Econometrics,* Vol. 143, No.2: pp. 227–262..

[51] Generally, any additional variable (condition) can be added to a standard GARCH model in order to explain the conditional volatility. Well-known adjustments of the standard GARCH model are GARCH-in-mean (GARCH-M) which includes the conditional variance in the mean equation and the exponential GARCH (EGARCH) model measures the asymmetric effects Frimpong, J. M. a. A., E.F (2006), "Modelling and Forecasting Volatility Returns on The Ghana Stock Exchange Using Garch Models." *Munich Personal RePEc Archive,* Vol. . 593,, No..

$$\Delta y_t = \mu + \sum_{i=1}^{n} \delta_i \Delta y_{t-1} + \varepsilon_t \qquad (5.2)$$

$$\varepsilon_t \mid \Omega_{t-1} \tilde{} \; N(0, h_t)$$

$$h_t = w_t + \sum_{i=1}^{m} \alpha_i \varepsilon_{t-1}^2 + \sum_{i=1}^{q} \beta_t h_{t-1} \qquad (5.3)$$

Where Δy is the first difference of the natural logarithms of the exchange rate (US dollar–local currencies) for Tanzania, Uganda and Kenya at time t, δ_i is the coefficient of the exchange rate for each country, and ε is the error term. As required by GARCH models, the error term (ε) is normally distributed with zero (constant) mean and variance (h_t) and Ω is denoting other variables at time t. The coefficients α and β are capturing the GARCH effects by measuring the time-varying (cycling) of lending rate and the nominal exchange rate of the EAC partner states. In addition, the total of α and β is expected to portray the volatility persistence of the selected time series variables. Whereby, if the sum of α and β is less but close to one, then policy harmonisation or policy changes on the exchange rate in one country has a persistent volatility effect on the exchange rate of the other exchange rates in the region (Frimpong, 2006; Figlewski, 1997; Choudhry, 1996; Chong C.W., 1999; Chen, 2008).

The ARCH process is then altered to estimate the GARCH models for the exchange rates of the selected financial markets, whereby after a number of iterations, the tests suggest that GARCH (1,1) is suitable and consistent to estimate the results on volatility levels of the exchange rate of the selected countries. From the study by (Mala, 2007) we notice that the nature of our data set and the objective of the analysis, GARCH (1,1) is consistent and produces robust estimations for the information available. They also highlight the fact that if the lagged variables are producing insignificant coefficients, GARCH (1,1) will be a suitable procedure in order to obtain convergences in many cases and thus equation (5.2) should be reduced to the following form (5.3).

$$\Delta y_t = \mu + \varepsilon_t \qquad (5.4)$$

Hence the specific GARCH (1, 1) equation from formula (5.2) can now be re-written as follows:

$$h_t = w_0 + \alpha_1 \varepsilon_{t-1} + \beta_1 h_{t-1} \qquad (5.5)$$

In addition, this study follows similar procedures employed by: (Frimpong, 2006; Chen, 2008) of using the estimated unconditional variances to capture the volatility levels for the past ten years. On that note, the unconditional variances are to be estimated by the following equation:

$$\delta^2 = \frac{w_0}{1-(\alpha_1 + \beta_1)}, \qquad \text{For } (\alpha_1 + \beta_1) \tag{5.6}$$

The unconditional variance (δ^2) is homosckedasticity though the variance at any time t (h_t) is heteroskedasticity. On the other hand, as noted above, if $(\alpha_1 + \beta_1) = 1$, then the shocks to volatility persists to infinitely and that will also mean the unconditional variance cannot be determined by equation (5.6). Basically $(\alpha_1 + \beta_1)$ is the forecasting equation carried out per unit of given time and the analysis is restricted to a data set that is $(\alpha_1 + \beta_1) < 1$. $1-(\alpha_1 + \beta_1)$ as the fraction that is washed out per time and therefore when changes in time equals zero, the average time necessary to return to the mean can be denoted as R, and expressed as:

$$R_e = \frac{1}{1-(\alpha_1 + \beta_1)} \tag{5.7}$$

In order to compare the magnitude of volatility in the financial market of the EAC zone, this study uses monthly data for only ten years because of two reasons one being the unavailability of data for previous (before 1998) years and second being the fact that EAC started policy harmonisation in late 1999 as a free trade area. That also means the data gathered covers the years EAC trade union was formed. Therefore, by covering this specific period of time we obtain a picture on how the exchange rates in each country are diverging overtime on trends and sector cycles. Therefore, through this analysis, one will be able to understand the volatility and behaviours of the exchange rates that are set to be unified and form a single exchange rate.

Some commentators across the EAC region have accused the suggested EAC market regime as a more politically driven, rather than as a good prospect that will link major economic sectors especially agriculture and small and medium investments, which are driving the economy of many LDC's. They insist that the single currency will create some problem especially given the fact that the nature of volatilities of economic variables such as exchange rates differs across border. Therefore, the multivariate time series GARCH models applied by this chapter are expected to examine the volatility of

the EAC exchange rate as a major indicator of the financial market and hence to draw a conclusion whether the exchange rates of the five economies are integrating towards equilibrium. In addition the results are expected to capture the speed of adjustments to volatilities in each market. First we present results for the unit root test, which examines the stochastic trend of our data sets.

5.3: Results

Table 33 Augmented Dickey-Fuller test statistic - Kenya Exchange Rate

Lag Length	Level	First Difference	Second difference
10	-0.003*	-0.79***	-7.03***
9	0.124***	-0.09*	5.19***
8	-0.109***	-0.21***	4.30***
7	-0.002	-0.22***	3.47***
6	0.046*	-0.17**	2.75***
5	-0.04*	-0.22***	2.04***
4	0.056**	-0.16**	1.47***
3	0.0139	-0.15***	0.97***
2	0.039*	-0.11**	0.58***
1	0.002	-0.10***	0.27***
0	0.072**	-0.03*	0.09***
C	0.186*	-0.003*	-0.002
ADF - t-stat	-1.83	-11.09***	-23.74***
R^2	0.04	0.47	0.80
Adjusted R^2	0.03	0.46	0.79

Method: Least Squares, including the intercept. When both trends and intercept are included, results remain almost same. ADF test also assumes MacKinnon (1996) one-sided p-values. *, **, *** denotes significance at the 10%, 5% and 1% respectively

Table 34 Augmented Dickey-Fuller test statistic - Tanzania Exchange Rate

Lag Length	Level	First Difference	Second difference
10	-0.008	-5.48***	-17.09***
9	-0.85***	3.62***	14.43***
8	-0.73***	2.88***	12.36***
7	-0.62***	2.24***	10.12***
6	-0.53***	1.69***	7.877***
5	-0.44***	1.22***	5.785***
4	-0.36***	0.84***	3.951***
3	-0.28***	0.54***	2.449***
2	-0.19***	0.31***	1.319***
1	-0.12***	0.15**	0.565***
0	-0.06**	0.05*	0.150***
C	11.57	1.46	-0.044
ADF - t-stat	-1.01	-20.84***	-29.43***
R^2	0.43	0.81	0.93
Adjusted R^2	0.42	0.81	0.93

Method: Least Squares, including the intercept. When both trends and intercept are included, results remain almost same. ADF test also assumes MacKinnon (1996) one-sided p-values. *, **, *** denotes significance at the 10%, 5% and 1% respectively

Table 35 Augmented Dickey-Fuller test statistic - Uganda Exchange Rate

Lag Length	Level	First Difference	Second difference
10	-0.005*	-2.90***	-13.38***
9	-0.67***	1.223***	10.823***
8	-0.47***	0.748***	8.992***
7	-0.36***	0.386**	7.053***
6	-0.07**	0.316**	5.337***
5	-0.07**	0.242*	3.841***
4	-0.05*	0.192*	2.596***
3	-0.025	0.165*	1.624***
2	-0.05*	0.102*	0.883***

1	-0.032	0.059	0.389***
0	-0.016	0.026	0.110***
C	9.33	-1.16	-0.027
ADF - t-stat	-1.42	-15.25	-24.19***
R^2	0.34	0.78	0.93
Adjusted R^2	0.33	0.77	0.92

Method: Least Squares, including the intercept. When both trends and intercept are included, results remain almost same. ADF test also assumes MacKinnon (1996) one-sided p-values. *, **, *** denotes significance at the 10%, 5% and 1% respectively

Table 36 Phillips-Perron Unit Root test
Bandwidth: 10 (Used-specified) using Bartlett Kernel

	Kenya		
	Level	First difference	Second difference
Adj. t-Stat	-1.516	-37.42***	-122.63***
Residual variance (no correction)	0.193	0.191	0.292
HAC corrected variance (Bartlett kernel)	0.223	0.177	0.042
KENYA(-1)	-0.002*	-	-
D(KENYA(-1))	-	-0.88***	-
D(KENYA(-1),2)	-	-	-1.38***
C	0.1489	-0.002	0.001
R-squared	0.0012	0.44	0.69
Adjusted R-squared	0.0006	0.44	0.69
	Tanzania		
	Level	First difference	Second difference
Adj. t-Stat	-7.67***	-143.13***	-283.54***
Residual variance (no correction)	4526.28	3593.26	7924.02
HAC corrected variance (Bartlett kernel)	2656.99	627.67	680.16
TANZANIA(-1)	-	-	-

	Level	First difference	Second difference
	0.094***		
D(TANZANIA(-1))	-	-1.49***	-
D(TANZANIA(-1),2)	-	-	-1.66***
C	119.32	0.402	-0.005
R-squared	0.046	0.75	0.83
Adjusted R-squared	0.045	0.74	0.83
Uganda			
	Level	**First difference**	**Second difference**
Adj. t-Stat	-2.32*	-97.71***	-255.89***
Residual variance (no correction)	3172.78	2521.24	5288.5
HAC corrected variance (Bartlett kernel)	810.33	825.43	483.89
UGANDA(-1)	-	-	-
	0.018***		
D(UGANDA(-1))	-	-1.462***	-
D(UGANDA(-1),2)	-	-	-1.66***
C	35.51	-0.638	0.027
R-squared	0.009	0.73	0.83
Adjusted R-squared	0.008	0.73	0.83
Null Hypothesis: The exchange rate for each country has a unit root. *, **, *** denotes significance at the 10%, 5% and 1% respectively			

From table 33 to table 36 we present the results for the unit root test which used the Augmented Dickey-Fuller (ADF) and the Phillips-Perron test which are based on the Fisher Chi-square. At level data, using the user specified lag length: the null hypothesis of non-stationary $(H_1 : \alpha = 0)$ is rejected to favour the non-existence of a unit root $(H_1 : \alpha \rangle 0)$ in the selected time varying variables. At first and second difference, at the same user-specified lag length, we reject the null the hypothesis of existence of a unit root. That also indicates the variables in the selected group of countries are converging at the same speed and have long-run equilibrium relationship. That also indicates the degree of convergence of the exchange rate is strong enough to allow a single currency/fixed exchange rate throughout the region.

Also, rejecting the null hypothesis of the unit root test at the first and second differences signals that the traditional approaches of estimating equations cannot be followed hence more specific approaches such as GARCH can produce more useful results. The value of the estimated R^2 from the ADF equation is also evidence for the stationary behaviour of the shillings in the EAC, which is similar to enhance more integration of the currencies. To gain more knowledge from the data set and the time series procedure we conduct the Engle-Granger single equation cointegration test procedure to investigate the convergence levels and long-run causality between the listed exchange rates. Basically, the Engle-Granger cointegration procedure looks for stationarity on the residual of a first stage regression (Engle, 1987; Engle, 1991). These residuals are estimated from the error term of the static OLS cointegration estimations.

The null hypothesis is that the series are not cointegrated (residuals have a unit root), the alternative hypothesis is residuals are stationary and consist of no unit root. The lag interval for this procedure is user-specified at a uniform ten lags to allow enough iterations, while the trends are at constant level with no additional trends. Therefore we compute both the Engle-Granger tau statistic (t-statistic) and the normalised autocorrelation coefficient (Z-statistic) for the residuals obtained from each series in the group as the dependent variable in the cointegrating equation. The two tests indicate to be similar after being tested at 1%, and 5% degrees of freedom, where we reject the null hypothesis of no cointegration at conventional levels. Furthermore, both the test statistics and the probability values are strongly significant, evidencing that the exchange rates for Kenya, Tanzania and Uganda are adjusting at similar paths in the long-run, hence the null hypothesis cannot be accepted.

Table 37 Engle-Granger Cointegration test

Series: Exchange rates for Kenya, Tanzania and Uganda				
Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
Kenya	-10.747***	0.000	-510.49***	0.000
Tanzania	-4.486**	0.005	-46.15***	0.001
Uganda	-6.784***	0.000	-123.42***	0.000
-		MacKinnon (1996) p-values.		
Intermediate Results:				
	Kenya	**Tanzania**	**Uganda**	
Rho - 1	-0.769	-0.256	-0.541	
Rho S.E.	0.072	0.057	0.080	
Residual variance	0.18	3313.05	2237.52	
Long-run residual variance	0.027	36.952	39.855	
Number of lags	10	10	10	
Number of observations	1708	1708	1708	
Number of stochastic trends	3	3	3	

Null hypothesis: Series are not cointegrated. Numbers of stochastic trends are in asymptotic distribution. Lag lengths are user specified (maxlag=24). *, **, *** denotes significance at the 10%, 5% and 1% respectively.

More evidence is shown by the intermediate results used to estimate the test results for the Engle-Granger procedures in table 37 which produced three stochastic trends in the asymptotic distribution to respond to the number of variables which are categorised (Tanzania, Kenya and Uganda). Also, the long-run residual variance is positive but higher in lower exchange rates of Tanzania and Uganda, while strong in the variable Kenya. All the residual standard errors and residual variances are obtained from the estimated parametric equation. Therefore, the estimators are obtained by dividing the 1 minus the total lag difference coefficients from the residual variance. Then the denominators of the Z-statistic are computed from the long-run variances of the cointegrating equation. Therefore, from a single Engle-Granger cointegration equation the results clearly suggest that exchange rates for Kenya, Tanzania and Uganda are cointegrated. However, it is important to note that the Engle-Granger cointegration test assumes common factor restriction of the variables and it produces an intuitive super-

consistent estimate, but it is biased due to normalisation effects. This approach also limits the scope of investigating the causal correlation between the exchange rates; rather it helps to analyse the behaviours of the variances and standard errors of the selected variables in the long-run.

Therefore, we expand this procedure by employing the Johansen cointegration test which estimates the maximum eigen-values and the trace statistics. In addition, the Johansen procedure examines the maximum likelihood of the entire system hence the number of cointegrating factors in the system can easily be noticed. This system follows the following VAR procedure of order p :

$$y_t = A_1 y_{t-1} + ... + A_p y_{t-p} + Bx_t + \omega_t \qquad (5.8)$$

Where y_t is a vector of non-stationary I(1) set of variables while x_t is a vector of deterministic variables. Then equation 5.8 is expanded and defined as follows:

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-1} + Bx_t + \omega_t \qquad (5.9)$$

$$\text{Whereby} \qquad \Pi = \sum_{i-1}^{p} A_i - I, \qquad \text{and} \qquad \Gamma_i = -\sum_{j=i+1}^{p} A_j \qquad (5.10)$$

Granger's procedure requires that if the coefficient matrix has reduced rank $r < k$ then there are $k\,x\,r$ matrices α and β each with rank r such that $\Pi = \alpha\beta'$ and $\beta'y_t$ is stationary I(0). r is the number of cointegrating rank while each column of β is the cointegrating vector. α elements are known are the adjustment parameters in the vector error correction equation. Therefore, the Johansen procedure estimates the matrix Π from the traditional (unrestricted) VAR to estimate if we can reject the restrictions introduced by the reduced rank of Π.

Table 38 Johansen Cointegration Test

Unrestricted Cointegration Rank Test (Trace)					Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob	Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob
None	0.27	681.77	42.92	0.000	None	0.27	546.09	25.82	0.000
At most 1	0.075	135.69	25.87	0.000	At most 1	0.075	133.37	19.39	0.000
At most 2	0.001	2.31	12.52	0.95	At most 2	0.001	2.31	12.52	0.946

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level.

MacKinnon-Haug-Michelis (1999) p-values

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):				Unrestricted Adjustment Coefficients (alpha):			
Tanzania	Kenya	Uganda	Trend(2)	D(Tanzania)	37.82	-2.84	-0.02
-0.014	0.132	-0.003	0.002	D(Kenya)	-0.01	-0.04	0.02
0.001	0.241	-0.009	-0.002	D(Uganda)	4.05	14.44	0.69
0.000	-0.119	-0.000	0.000				

1. Cointegrating Equation(s): Log likelihood -19955				2. Cointegrating Equation(s): Log likelihood -19888.4			
Normalized cointegrating coefficients (standard error in parentheses)				Normalized cointegrating coefficients (standard error in parentheses)			
Tanzania	Kenya	Uganda	Trend(2)	Tanzania	Kenya	Uganda	Trend(2)
1	-9.36	0.194	-0.185	1	0	-0.163	-0.264
	-0.847	-0.027	-0.009			-0.022	-0.014
				0	1	-0.038	-0.008
						-0.002	-0.001

Adjustment coefficients (standard error in parentheses)			Adjustment coefficients (standard error in parentheses)		
D(Tanzania)	-0.532		D(Tanzania)	-0.535	4.291
	(-0.021)			(-0.021)	(-0.415)
D(Kenya)	0.0002		D(Kenya)	0.000	-0.011
	(-0.000)			(-0.000)	(-0.003)
D(Uganda)	-0.057		D(Uganda)	-0.040	4.005
	(-0.019)			(-0.019)	(-0.361)

Therefore, the first part of the Johansen's estimation shows the existence of strong convergences as indicated by the trace statistics and the eigenvalues which identifies at least two cointegrating equations. In the above estimates, we allowed the deterministic trend in the data set by including intercept (no trend) in the cointegrating equation so as to test the VAR and then detect the cointegrating equations. To determine the number of cointegrating equations r as specified by equation 5.9 – 5.10 under the assumptions made on the trends, we started from $r = 0$ until we were able to accept the null hypothesis of no cointegrating equations. That also implies that the trace statistics in the first column test the null hypothesis of cointegrating equations r against the alternative k cointegrating equations where k is the number of endogenous variables for r = 0, 1, 2, ... k-1. The alternative hypothesis of cointegrating equations of k also corresponds to the case where the series are none stationary at level data except at first and second differences Therefore, the trace statistics of the null hypothesis of cointegrating equations is estimated as follows:

$$LR_{tr}\left(r/k\right) = -T \sum_{i=r+1}^{k} \log\left(1 - \lambda_i\right) \tag{5.11}$$

Where λ_i is the largest eigen-value of the Π matrix specified in equation (5.10) and recorded in the column named Unrestricted Cointegration Rank Test (Trace). The second column is for the Unrestricted Cointegration Rank Test (Maximum Eigen-value) which is estimated for r = 0, 1......... k-1 and the critical values are up to k = 10 series as specified by the following procedure:

$$LR_{max}\left(r/r+1\right) = -T \log\left(1 - \lambda_{r+1}\right) = LR_{tr}\left(r/k\right) - LR_{tr}\left(r + \frac{1}{k}\right) \tag{5.12}$$

The second part estimates the cointegrating relations of β and the parameter that captures the adjustments α of matrix Π estimated by equation 5.9 and 5.10. In this part, we introduce some arbitrary normalisation so as to estimate the cointegrating vector β. The transpose of β is reported in unrestricted cointegration form so that the first, second and third rows of the column named "Unrestricted Cointegrating Coefficients (normalised by b'*S11*b=I) "are the cointegrating vectors. Therefore, this column and the rest of the Johansen's procedure which uses un-identical normalisation process for each possible number of cointegrating equations provides extra evidence that the

exchange rates of the Kenya, Tanzania and Uganda have a long-run equilibrium relationship and they are converging in the same direction overtime. Also, the asymptotic standard errors are reported in parentheses for the cointegrating parameters identified in the two cointegrating equations. Also the impulse responses are estimated as shown below to determine the responses of the exchange rates in the region. A shock to the ith exchange rate affects and spreads to both the ith exchange rate and the rest of the exchange rates in the cross section through dynamic (lag) structure of the Vector autoregressive equations.

Figure 5.2 Impulse responses
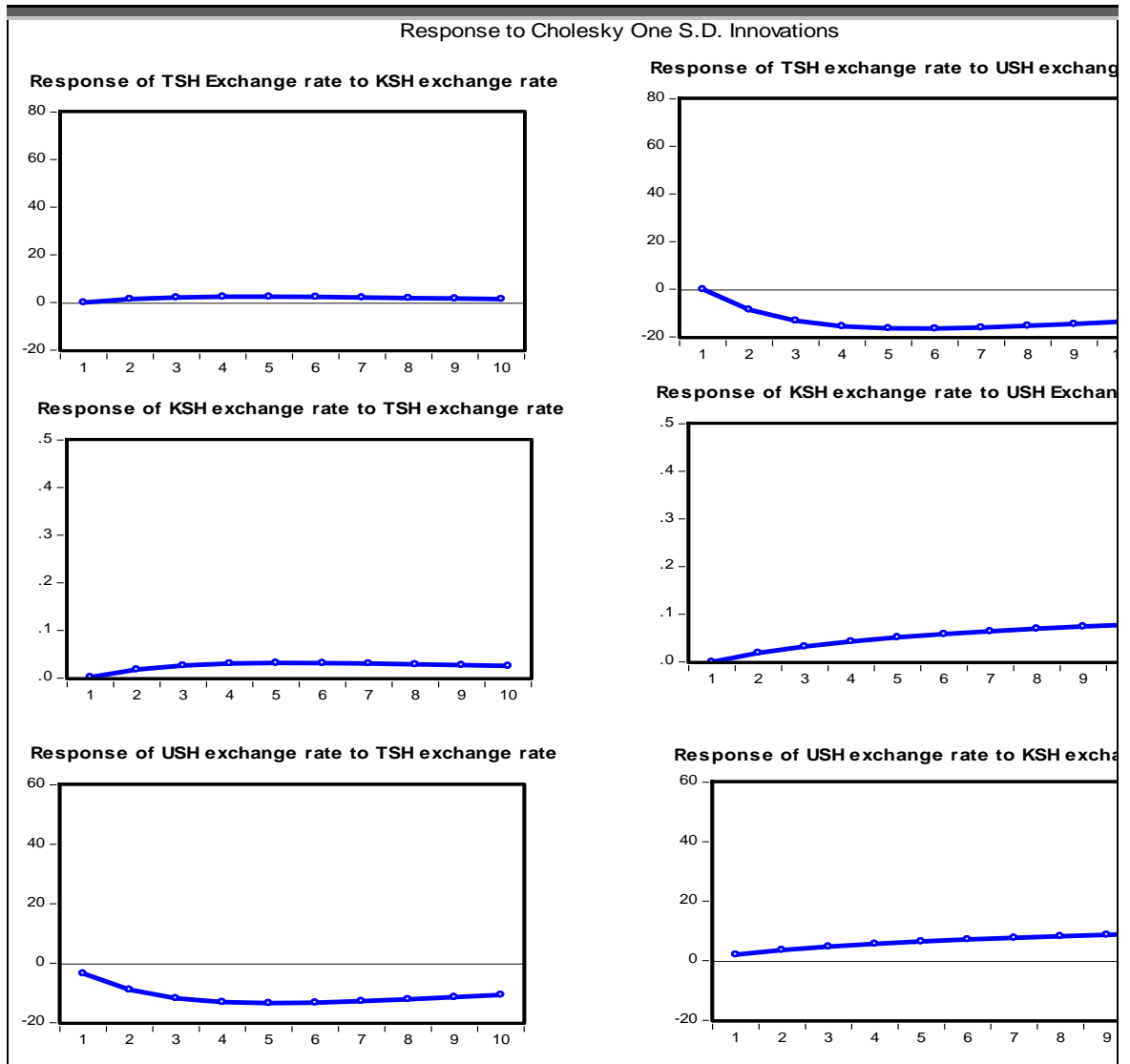
Therefore, the key objective of computing the impulse responses is to trace the impact of one time shock on the exchange rate for country *n* to one of the innovations on the current and future values of the exchange rates across the EAC shillings. We identify a positive impulse response of all EAC shillings to the Kenya shilling. In addition to that,

as shown in the appendix, the variance decomposition, which unlike the impulse responses, separates the variation in an endogenous variable into the component shocks to the VAR leading to estimation of the necessary random shock that determine the variables in the VAR. Also, the variance decomposition proves that Kenya's exchange rate variations have strong positive impacts on the exchange rates of the other participating members of the EAC. Tanzania's and Uganda's shillings shocks indicate that they are negatively correlated to one another but positively correlated to Kenya's exchange rate. That can conclude that Kenya's exchange rate is suitable to be the fixed exchange rate in the regime (EAC) at the initial stage of a single currency. The examination of the exchange rate has produced very interesting discussions so far and the results provide some interesting evidence by simply following the time series procedure employed above.

We understand that the exchange rate of any developing market is hugely impacted by external shocks. We suggest further investigations that can expand the idea by applying multiple indicator variables that can produce more results that can also be used to conclude whether it is safe for markets such as the EAC to have an exchange rate regime. Finally, we estimate the GARCH equation as specified from equations 5.2 to 5.7 and the results are presented in table 39 below. The procedure adopts a GARCH (1,1) process for each of the three currencies whereby the outputs are maximum likelihood estimates under the assumption of normal distribution as specified by (Zhuanxin, 1993; Bollerslev, 1992b; Bollerslev, 1994; Bollerslev, 1992a). The GARCH variables for Kenya and Tanzania are significant at 1% and 5% respectively while Uganda's exchange rate GARCH variables are found to be insignificant.

Table 39 Estimation for Individual Country's exchange rate

	Kenya	Tanzania	Uganda
C	76.25***	1264.25***	1823.44***
Variance Equation			
C	0.003*	25189.03	90939.74
RESID(-1)^2	0.523***	13.18	2289.38
GARCH(-1)	0.500***	-0.008**	0.007
R-squared	-0.003	-0.004	-0.23
Adjusted R-squared	-0.003	-0.004	-0.23

	Heteroskedasticity Test: ARCH		
F-statistic	124.96	0.0003	0.207
Obs R^2	116.89	0.0003	0.208
Prob. F(1,1780)	0.000	0.987	0.649
Prob. Chi-Square(1)	0.000	0.987	0.649
C	0.744***	0.061***	0.0005
WGT_RESID^2(-1)	0.256***	-0.0004	-0.011
R^2	0.07	0.000	0.0001
Adjusted R^2	0.06	-0.0005	-0.0005
Convergence achieved after (iterations)	120	-	96
Convergence not achieved after 500 iterations	-	500	-
Method: ML - ARCH (Marquardt) - Normal distribution			
*, **, *** denotes significance at the 10%, 5% and 1% respectively			

The value of the R^2 and the square of residual lags [RESID $(-1)^2$] indicate the volatilities of the exchange rates in the EAC are two way across the region and thus the exchange rates are integrated in some ways. That is, volatilities in country *i* have impacts on the stability of the exchange rate of the other currencies in the region. The GARCH parameters are strongly significant on all the specifications and exchange rates of the block. One may argue that a fixed exchange rate regime is crucial for the small markets in the EAC to reduce volatilities and improve the values of the lower currencies. The current harmonised policies in the regime have not impacted much the values of the shillings as indicated by the deviations of the values and stabilities but invisibly the exchange rates are integrating and adjusting at almost similar margins. Value differences between the shillings can be reduced in the long run if proper instruments are imposed on the external causes of exchange rates.

Figure 5.3: GARCH

Graphs
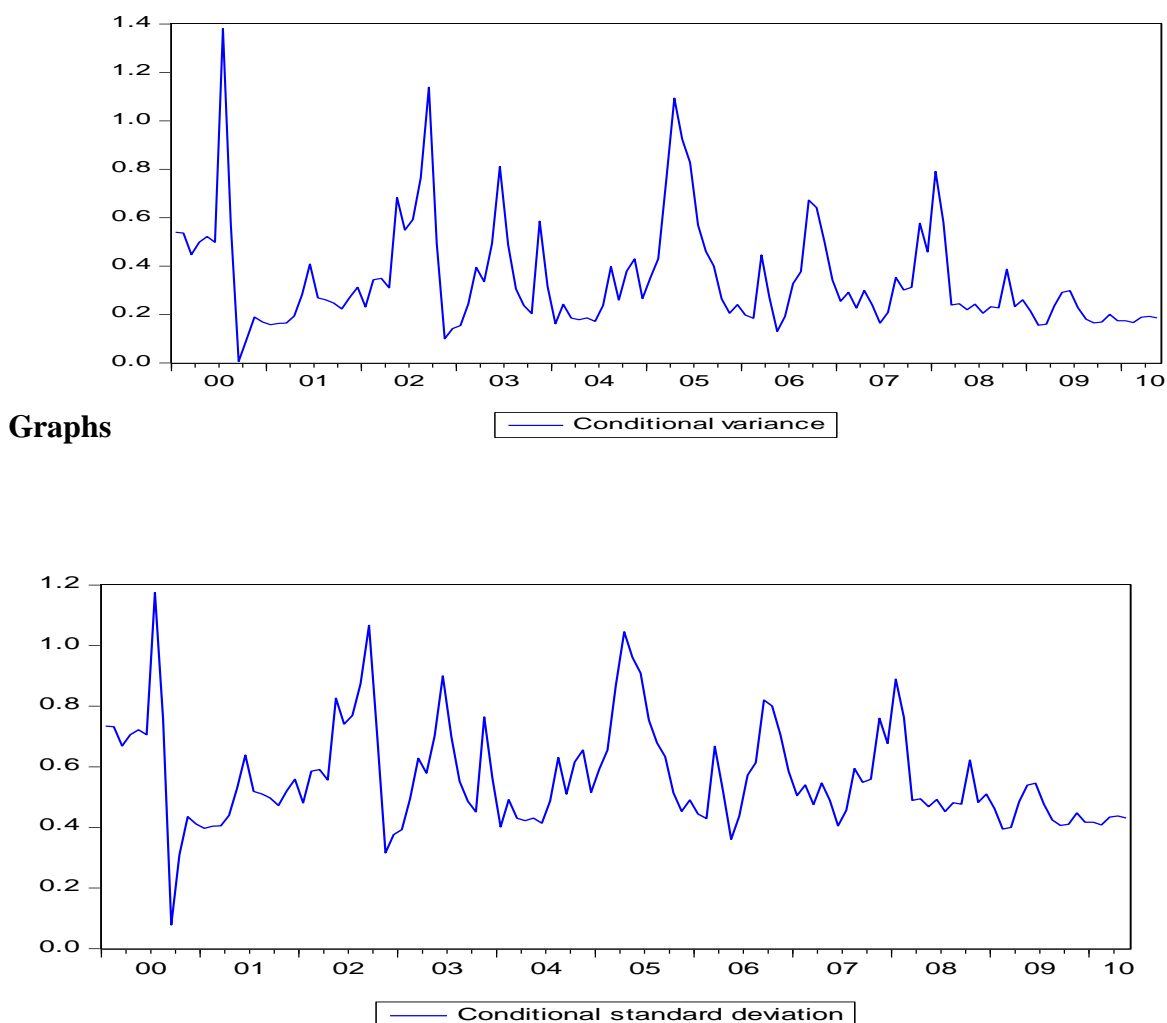
5.4: Discussion and Policy Implications.

Under this chapter, like the previous chapters, the aim was to investigate and forecast the volatilities of the exchange rate of the key currencies in the EAC block. Step by step, we employed different time series techniques which have provided indication that it is optimal for the EAC block to form an exchange rate regime to favour stability and improve the currency value of the block. As noted before, many of the recent studies that investigated and forecasted volatilities in different variables have employed the GARCH process, which has proved to be a strong procedure in measuring volatilities. Despite the fact that most of the financial sector variables in developing countries are symmetrically correlated to external shocks, the procedures to overcome negative shocks remains same and crucial at all times. For instance the recent euro financial crisis has provided a significant lesson in how to deal with external shocks as a regime, since the impact tends to spread throughout the block.

Also as mentioned in the introduction, through the entire analysis in this chapter, the investigation has been based on the behaviour (volatility levels) and future status (Long-Run) of the exchange rates which are planned to be pegged (as noted before) between the years 2013 and 2015. The reverse causality and strong long run correlation of each country's exchange rate have been two of the more convincing points on the fact that EAC is optimal for a currency regime. By forming a currency regime, more volatile and less attractive currencies will be eliminated, while the entire financial sector will be more stable and the new shilling exchange rate will be more valuable and competitive to international exchange rates. As indicated by the stochastic trend tests, at different levels, the adjustments towards long-run equilibrium are stronger, with few trends in all markets across and throughout the EAC. There are many ongoing macroeconomic adjustments in EAC that are aimed at ensuring a smooth transition towards a monetary regime.

However, due to lack of accurate daily or weekly datasets, we failed to include the impacts of the adjusted policies on the volatilities and trends of the exchange rates. Therefore, interpretation biases and policy criticisms can be escaped or reduced by adding the augments generated by the previous chapters which applied totally different datasets and estimation procedures. There are many implications and indications that can be drawn by analysing the exchange rates across the region by using procedures such as GARCH process. For instance, one can thereafter predict and forecast the future status of the exchange rate if they allow integration and how the entire scenario can affect the financial (banking) sector of the participating members. Also, once again, the Johansen's cointegration test and the estimated coefficients of the vector autocorrelation proved to be very strong statistical procedures for forecasting the future trends and movement of time series variables.

In addition, the Granger cointegration test also complemented other procedures for measuring the speed of convergences. In General, all procedures used in this chapter have indicated that in the long-run many variables and key indicators are equally-adjusting with the level of volatilities that can be eliminated or reduced more by allowing deeper integration in variables such as the exchange rate. However, it is important to note that, as in many developing countries, government interventions in determining the exchange rate are very high for various reasons. Not only on the

exchange rates, but also in other key economic adjustment tools which are crucial in stressing deeper market integrations.

Furthermore, the impulse responses and the variance decompositions have also portrayed significant signs on the inter-correlations of exchange rates of the selected currencies. The strongest currency in the region has been found to have positive correlations with the lower exchange rates, entailing the suggestion that it is reasonable to form a fixed exchange rate regime since there is at least one currency that is stronger and less volatile. With regard to the responses to symmetric and asymmetric shocks as shown by the impulse response graphs, the exchange rates for the countries Tanzania and Uganda indicate to be symmetrically correlated to the Kenyan exchange rate. Tanzania to Uganda and Uganda to Tanzania structural shocks has asymmetric correlations even though they are equally converging towards equilibrium. The volatility of the exchange rates (as an indicators of the financial sector) in the EAC economies and their long run behaviours were the key objectives for investigation in this chapter, given the importance of these variables on the process of economic integration. Therefore, the following key points have been obtained and are crucial for policy implications and future researches.

I. Firstly, this chapter highlights and shows the evidence that volatility in the EAC banking industry exists at higher level, especially in the small economies. Movements and trends of the exchange rates are inevitable as it moves along with other economic variables such as imports, exports, inflation and world volatilities. Therefore, we provide some founding points on the measures to eliminate transaction costs and ensure that the free movement of capital and investments in the region are met and supported by stable exchange rates. As for the entire financial sector, EAC has to ensure exchange rates are stable and uniform and the commercial banks interest rates are as low as possible to ensure capital and labour are free-moving and utilised by the extended market.

II. Also, the econometric techniques applied by this chapter have proven to be very strong in forecasting and estimating time-series parameters. Due to that, we were able to forecast the long-run relationships of the shillings (exchange rates) in the region and the results were tested and proven to be robust and useful for economic interpretations. Also, the reactions of the shillings to external and internal shocks were also identified by the impulse responses technique helping

to draw some conclusion on how the currencies (money value) can be impacted by fixing higher exchange rates, medium or lower rates of exchange rate in the regime.

III.   Also, we notice that the policy harmonisation process which has been taking place in the EAC region (since the year 2005) towards higher levels of integration has had fewer impacts on the values and stability of the exchange rates as evidenced by the divergences between higher and lower exchange rates in the block. Despite the being predicted by the Johansen and the Granger cointegration procedures, at the moment the exchange rates are adjusting unequally and very slowly.

IV.   Given the stochastic trends of the shillings, long-run stability and adjustments towards equilibrium and the response of these currencies to internal shocks, we conclude that EAC has currencies that can form an optimum currency regime. This chapter complements the previous chapters which concentrated on investigating the behaviours and significance of the macro and structural variables that are crucial for higher levels of economic integration. Given the fact that EAC countries are natural trading partners, elimination of the exchange rate divergence will encourage trade and free flow of capital and labour within the extended market.

Appendix

Variance Decomposition of KENYA:

Period	S.E.	KENYA	TANZANIA	UGANDA
1	0.44	100.00	0.00	0.00
2	0.65	99.96	0.01	0.03
3	0.81	99.77	0.10	0.13
4	0.94	99.50	0.22	0.28
5	1.05	99.17	0.36	0.48
6	1.15	98.80	0.51	0.69
7	1.24	98.41	0.65	0.93
8	1.32	98.02	0.79	1.19
9	1.40	97.63	0.93	1.45
10	1.47	97.24	1.04	1.71

Variance Decomposition of TANZANIA:

	S.E.	KENYA	TANZANIA	UGANDA
1	61.65	0.01	99.99	0.00
2	66.62	0.01	99.86	0.13
3	75.29	0.03	99.44	0.53
4	79.39	0.07	98.89	1.03
5	83.35	0.13	98.13	1.74
6	86.16	0.20	97.28	2.52
7	88.62	0.28	96.31	3.41
8	90.63	0.37	95.29	4.34
9	92.40	0.46	94.24	5.30
10	93.94	0.54	93.19	6.27

Variance Decomposition of UGANDA:

	S.E.	KENYA	TANZANIA	UGANDA
1	49.72	0.12	0.05	99.83
2	55.69	0.17	0.19	99.64
3	65.23	0.27	0.54	99.19
4	71.08	0.39	0.88	98.72
5	76.89	0.56	1.30	98.15
6	81.67	0.73	1.71	97.56
7	86.07	0.93	2.13	96.94
8	90.00	1.13	2.54	96.33
9	93.61	1.35	2.92	95.72
10	96.93	1.58	3.28	95.13

Cholesky Ordering: KENYA TANZANIA UGANDA

CHAPTER SIX

Conclusion

6.0: General Discussions and Policy Implications

This project focused at assessing if East African community qualifies or possesses the criterion suggested by the Maastricht treaty and Robert Mundell as the measures for a successful monetary union (optimum currency area). The idea of optimal currency areas was initially used to assess the European and the United States markets, whereby, for instance, some areas in North America were identified as not fit to adapt a fixed exchange rate. The Mundell criterion became even more famous and important in assessing an optimal currency area during the campaign to establish an exchange rate regime (euro) throughout Europe, whereby many countries were identified as non-qualifiers for a successful optimal currency union in the region. The theory and the criteria for a currency union regime were initially seem as not applicable in developing economies, hence concluding that it was impossible to form or have a successful currency union in a group of least developing countries.

That suggestion, however, has been proven wrong by different studies, especially the ones conducted from the beginning of the 21st century, including this study, where it is evidence that many countries in the sub-Sahara region for instance can successfully form optimum currency areas. Despite being originally conducted in the first world countries,, the Mundell's criteria for optimum exchange rate regimes are still relevant in assessing not only a group of countries but also the intra-business links between blocks, continents, regions and neighbouring economies. The Mundell hypotheses are still valid today despite being introduced in the early 1960s and despite the changes and adjustments that have been done on the measurements for the size and cyclical changes in the economies. Therefore, as applied by this study, the criteria allow one to use multiple and different methods to measure if the conditions can be met during the process of integration in the selected countries, such as those in the EAC block.

The empirical results presented by the four main chapters have intensively learnt the status of the Mundell's criteria and it is evident that the EAC will form a powerful and very successful monetary union. This is evidenced by the speed of adjustment of some

of the macroeconomic indicators which, by using time series procedures, it is evidenced that they are adjusting at the same pace (especially in the long run) hence affecting growth and development of the region in a positive direction. The harmonisation of trade policies throughout the region have also played a significant role in the recent increased flow of FDIs in the EAC countries and many other that were assessed by this study. This is portrayed by the empirical results presented by chapter four, which mainly examined whether the policies' harmonisation process have favoured the EAC participating countries to gain more FDIs. We also measure the speed and magnitude of the FDI inflow into the region and the results were similar, suggesting that the harmonisation procedure has been beneficial to the EAC block. We fail to isolate the main sources and major trade partners around the world due to unavailability of enough data sources to support the analysis.

Additional evidence is presented by the empirical results in chapter three, whereby the block members are seen to respond similarly to structural shocks. This is unlike the suggestions of the previous studies that mentioned that small economies tend to have asymmetric responses to external/internal shocks, hence cause problems to the large economies in the group and to the rest of the region (the most mentioned example is the euro zone economic turnarounds). Most of the SSA economies included in this study are observed to have same speed of growth and development and that might be one of the reasons why they have symmetric responses to economic shocks. In chapter three, the project identifies neighbouring countries that can be part of the proposed EAC exchange rate regime and still qualify the conditions for an optimum currency area that can benefit all the targeted economies. In addition to that, none EAC member countries with variables such as sharing same language, same borders and sharing similar history are found to have symmetric response with the EAC member states. This is evidenced by the speed of adjustments of the macro variables from any structural shocks which are found to be similar throughout the cross section when short-run and long-run restrictions are imposed on the Vector error correction model.

The entire analysis, therefore, advocates that the introduction of the currency union policies will influence rapid economic growth and development given the free movement of capital and investments, while the society benefits from the freedom of finding employment and job opportunities throughout the region. Also, the entire analysis portrays results that are contrary to the suggestion by development economists such as (Collier, 2007) that suggests that it is dangerous for small economies to adopt

higher levels of economic integration, rather there should be a wider trade window between these countries. This study therefore suggests that wider trade windows are not enough unless labour and capital are freely allowed to move and integrate within the entire market of developing economies such as those in the SSA. In addition, this study went a step further by examining the behaviour of the exchange rates which are suggested to be dropped so that the EAC group can have a single exchange rate. That analysis is conducted in chapter five where we find that the levels of volatilities and the speed of adjustments are quietly similar and equally adjusting in the long run[52]. Within chapter five, the impulse responses of the shillings (exchange rates) indicate a strong correlation between the exchange rates suggesting that further integration of the currency may assist stabilisation of the exchange rate in the region.

The impulse responses followed after the measure for long-run equilibrium correlations (cointegration test) between the shillings and indicated that the currency values throughout the region are adjusting similarly in the long run and thus they are converging towards equilibrium. From the general point of view, the values of the currencies across the region are almost the same in terms of the bundle of goods or services that can be bought for the same amount of goods/services throughout the region. Many results and much evidence were drawn from the data set and some unreported results, such as the Granger Causality test also indicated that the shillings are highly correlated and in the long run their values are found to be almost equal, to show that it is viable for the region to fix its exchange rate. While reviewing the literature and conducting empirical examinations, we realise that the choice of the style and type of the exchange rate regime is a very complex matter and it really depends upon the commitment and vision of the factors forcing a deeper economic integration.

In least developing countries, where the economic situations are even more difficult, the process is even slower and more complicated due to high market uncertainties and specific stabilisation constraints. The EAC block through the EAC commission has considered multiple measures to ensure the transitions are smooth and not affecting the participating member countries. Various structural-specific characteristics of the countries have been considered by the entire process so as to strategically ensure policy goals and timing of each stage is met without causing market disequilibrium. Therefore,

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[52] The empirical examination conducted by chapter five basically was measuring how the exchange rates are volatile and how long they take to adjust back to the average points

the commission have continued to stress faster convergences are met, the EAC commission and other committees are continuing to adjust policies that will encourage more factor mobility, growth, diversity of the production, skills of the labour force, price and wages structures, similar responses to shocks, structure of the financial system and openness of the participating member countries. Also, as noticed from other regional blocks such as the euro, as the economies starts to deepen integration and interdependence, economic and political tensions increases which can lead to a collapse of the market unless there is a mutual commitment to the proposals. The recent Congo, Sudan and Somalia conflicts have posed a question on the political roles of the region in the entire eastern Africa.

From a general point of view, the recent world economic meltdown has had impacts on growth and development of the LDCs at different magnitude and each country responded and experienced the shocks at different time period. Some countries started to feel the pain within a year while some countries experienced the impacts after one and two years between before and after the crises while some countries such as South Africa and Nigeria experienced the shock within the first six months of the crises. In chapter five, we realised that the exchange rates in the EAC were not much affected between the years 2008 to 2010, but from late 2010 (after the crises) to the present time, the values of the currencies have shrunk and fallen by almost 20%, implying the EAC countries experienced the world economic crises in the Long run. This is also proven by the time-series techniques applied by chapter five, which estimated short-run and long-run behaviours of the exchange rates in the EAC block.

However, in all our empirical chapters, we failed to obtain appropriate data sets that could have been useful to analyse how the process of deeper integration in the EAC group has been interrupted by the world economic meltdown and how other future blocks can learn from that experience. The current financial and macroeconomic variables were compared at descriptive levels between developed and least developing countries and there was a small divergence between the shapes of the macro indicators. Also, in chapter two and four we notice that, one of the current biggest challenges of the entire SSA region is the highly increasing demand for power (energy) due to recent innovations in technology, increasing population (home of more than one billion people) and the expanding market (demand for energy) in general. There is a strong correlation between availability of power, flow of FDIs and trade integration and thus the availability of power sources is a crucial point for these types of discussions. All these

factors and many other omitted on the list, are forcing the decision-making bodies to find solutions that will ensure availability of reliable power sources on the continent. However, while assessing the flow of FDIs and the intra-volume of trade, we failed to obtain enough proxies for power supply, consumption, production and funding to support our analysis.

Therefore, the problem of energy, which lacks empirical historical data, has rarely been discussed in this study, but its contribution to growth, convergence and development remain significant. Then we recommended further investigations to be conducted on the contribution of power supply on ensuring faster and deeper integration by specifically suggesting the cheapest sources of power and energy that can promote integration. Also, we recommend joint funding programmes that will lead to a launch of a project that will ensure future stable supplies of electricity (power) and energy in general throughout the region, so that to encourage more production, industrialisation and diversity of products in the extended market.

It is also necessary, we note, that the second, third and fifth chapters tried to analyse the actual value of capital diverting from the EAC region to other parts of the sub-Sahara region and both the reported and the unreported results identified a significant intra-flow of capital and trade between the EAC region and some of the neighbouring countries especially those shares same borders, language and history. All the listed countries (including none EAC states) are also noticed to have higher volatilities in the key economic indicators, poorly structured banking/financial systems, poor technology, poor infrastructures, poor roads, railways, contradicting trade policies and lack of commitment to transforming the continent are some of the common factors identified throughout the SSA as barriers to trade, both with other neighbouring countries and the rest of the world.

Also, while assessing the steps and achievements of the EAC so far, we noticed that there are many variables (some listed above) that have not been given proper attention by the participating countries while conducting reforms towards higher and deeper integration. In addition, the mechanisms to overcome economic shocks due to business cycles are not well addressed and they may cause some problems in the long run. Therefore, we recommend continuous review of the market clearance mechanisms so as to escape any obstacles in the long run, as it is very easy for a block to collapse if the mechanisms are not well presented. Therefore mechanisms that will ensure a stable

labour market, an effective banking system, an effective stock market, productive fiscal policies, democracy and human rights and availability of enough market information throughout the market need to be reviewed frequently, to ensure the mechanisms are updated to cope with changes in technology and human skills.

This project has been a great learning and vital observation of the behaviour of different economic variables that are key to planning and decision-making for the future of the least developing markets. For instance, we observe a slight fall in exports within the region for the past decade throughout the SSA and the African continent in general while FDIs are booming especially those originating from the rest of the world. Also we notice that if barriers are removed, exports from within the SSA block are cheaper than those from the rest of the world and we therefore insist that deeper economic integration is crucial to the continent to expand internal markets that will encourage growth and long-term development of different indicators. Many blocks in SSA such the SADEC and COMESA are hesitating to move into the highest stages of integration, and therefore since this study has proven that some countries within these blocks can form and qualify for the criteria of adapting deeper integration.

Also, while reviewing the literatures we notice that one of the ongoing discussions in development issues is the structure of the population in the sub-Sahara region in terms of the percentage of population participating in economic activities. For instance, the survey conducted in Tanzania and Uganda (by the World Bank) between the years 2007 – 2012 indicates that, more that 50% (half) of their total population are 20 years old or younger. That also implies more that 50% of the total population in Uganda and Tanzania are children who are (technically) not involved in production and economic activities. That has also raised the demand for schools, healthcare and security in the continent. An increased demand in the areas of education, healthcare and housing has forced the quality of education and healthcare to drop sharply, despite being in bad condition even before the number became in such bad shapes.

Therefore, as economies in the SSA continue to grow and the population continue to increase, more investment in education and major employing sectors (agriculture) is required to boost the growth and extend the market and future demands. Currently SMEs are playing a significant role in contributing to employment and income per capita in the developing world and therefore the need to extend the market and continuing to adjust other supporting variables is inevitable. Regarding the status of the

financial sector, there are still some divergences in terms of speed of adjustment even though some financial variables included in this study especially the exchange rates are indicating to adjust equally in the long run. The key finding from the analysis of the exchange rates in the region that has been examined in chapter five is that all the exchange rates have similar volatility levels.

During the investigations in chapter five, we also notice that despite having similar levels of volatilities, the framework guiding the exchange rates is still not effective across the region. That also means the financial institutions are still disintegrated and the adjustments of the monetary policies are much slower as compared to the fiscal policies adjustments. On the other hand, some of the unreported results indicated that the nature of volatility of the exchange rates across the entire SSA region is different in each country whereby economies that are integrated such as the EAC have similar levels of volatilities. In addition, like how it was identified in chapter two and chapter four, countries that are none EAC members but share similar border and economic history with the EAC, have similar nature and levels of volatilities but the speed of adjustment is different in each country's exchange rate.

Both time series and panel econometric procedures can be a bit difficult and controversial to interpret depending on the objectives of the analysis. Our results have been tested by multiple procedures, hence we were satisfied that they are consistent and significant to produce the results to answer the key questions of this study. Also, by using different data sets and different econometric procedures, this has been a wonderful experience and brought knowledge to the researchers as they were able to learn how different procedures can be used to answer similar research questions and meet the objectives of the research. In his founding paper on optimal currency areas, (Mundell, 1961) did not propose an appropriate method for measuring an optimal currency area, and instead listed the key requirements for an OCA. We conclude that EAC is an optimal currency area and further integration will encourage more trade and free flow of capital and labour from one state to another state to look for employment and investment opportunities. We also call for more studies to be conducted throughout the entire sub-Sahara region to continue exploring what can be done, what is missing and how the economies can move to the highest stages of economic integration.

6.1: Contributions of the study

This study has examined if the East Africa community, consisting of five countries, meets the criteria for a successful currency union. As compared to many previous studies, this study applied multiple statistical techniques to analyse and answer the key questions for and against the integration process (policy harmonisations). By reviewing a large amount of literature, this study was able to establish a case that there are many countries across the sub-Sahara region that meet the criteria for an optimum currency area. The isolation of different trade unions in the sub-Sahara region geared the importance of advocating for an expanded exchange rate regime within the region to stimulate growth, stabilise inflation and expand the market in general. This study, unlike many reports suggest, found strong inter-linkages between the trade unions of SADEC, EAC and COMESA countries, hence suggesting the importance of inviting countries that share the same borders to join into one block to enhance trade throughout the continent.

Unlike many theories suggests, the EAC countries particularly which are subjected to risks of external shocks, are found to have symmetric responses to any structural shocks. As noticed by many results of this study and also shown by the world map, EAC countries are natural trading partners and thus show similar responses to external shocks, implying the macroeconomic settings inter-depend throughout the region. Mostly, this study has applied time series and panel econometric procedures aiming at forecasting the future trends and behaviour of the macro economic variables. The measures of the stochastic trend of time series as well as the long-run equilibrium behaviours of the selected variables were very valuable for interpretations and they can be useful in policy formulation. Therefore, this study was able to examine the short run against long-run behaviours of the key variables that are crucial in integrating economies.

As concluded many times in different chapters of this study, all macro variables are adjusting equally in the long run. The speed of adjustment, however, is lower throughout the all cross sections included and that can be evidenced by the current status of different variables, such as infrastructures, technology, and performance of the agriculture sector, budget deficits and the commitment of politicians to move into the highest stages of regional integration. The speed of integration will improve in the long run as all variables are expected to be equally adjusting throughout the region hence will provide even more space for all economies to inter-depend and reach full integration. Therefore, as a contribution to literature, full integration and achieving freedom of

movement of goods, services, labour and capital is a long-run process and may take years or maybe decades.

The entire study is based on quantitative approaches, which unlike qualitative approaches; it was easier to isolate different trends of the major variables and indicators that are useful in forming deeper integrations. Quantitative approaches are less biased than qualitative ones as there are many techniques which help to measure the significance and consistency of the data set used and the results obtained by the estimation procedures. For instance, in chapter two and chapter four, the gravity model was tested by multiple approaches before estimating the final results. Also, as observed from the previous literature, qualitative approaches and their final results may not provide relevant results that can answer the questions of an optimum currency union and the OCA criteria cannot be tested by qualitative techniques at all Therefore, this study contributes some evidence that can be used in the future by policy makers and researchers in different fields, that may wish to investigate further in the area of currency union.

The Gravity model is used to measure the speed and volume of trade between countries, while the results indicated to be significant both for the literature (further studies) and policy formulations. In addition, the study applied the VAR, VECM and SVAR to measure the responses of the macro variables to internal and external shocks. The response of the economy to shock and the impact on the rest of the block is a key determinant of a strong currency union. In addition, the GARCH approach was specifically measuring the volatility and the speed of adjustment of the exchange rates across a group of countries. Other time series testing techniques especially the cointegration tests have been used to forecast the future trends and behaviour of different variables in the group. Therefore, both time series and Panel estimation procedures are very powerful tools in assessing the short run and long run performance of an economy or a group of economies.

6.2: LIMITATIONS ENCOUNTERED

6.2.1: General Limitations

Like any scientific study, this research encountered a number of hindrances both technical, theoretical, time and budget constraints. The researcher intended to investigate the status and significance of many variables as possible which were to answer the key questions of the study. From the quantitative approaches point of view, the larger the number of variables in terms of time, the more the results and interpretations. The objective was to disintegrate the data sets (macro variables) in terms of before independence, post independence, during the first EAC (1967 – 1977), before the structural adjustment policies, before the new EAC (early 2000) and change in government regimes. In most developing countries, SSA specifically, there are no series in any of the databases that were widely used, covering before the year 1970, except in a few indicators (such as GDP and Population) dating back to 1960 (before independence). Therefore, this study was not able to estimate results under different categories as mentioned above, rather the only category that was investigated deeply was on the number of trade unions each country participates. Therefore, we were able to identify which countries within the other two trade unions (COMESA and SADEC) are more integrated with the EAC.

In addition, consistency of the data sets is another issue found in many countries that were investigated and included in our empirical chapters. This led to some countries being dropped from the investigation due to unavailability of significant amount of indicators variables, especially GDP, inflation and infrastructures indicators. Another reason for dropping some countries in the analysis is the limitation on the time duration of the variables whereby, in most cases the data available are dating from the year 2000 to 2011 (eleven years) which makes a short time lags for deeper and more specific time series and panel estimation procedures. Furthermore, most of the local institutions, such as Central Banks, government agencies and leading research institutes, did not have data banks apart from normal information such as address and other short documents of the institutions.

Data collection, storage and easy access to the information were found by the researcher to be very serious limitations to conducting studies in developing countries (SSA specifically). It is evident that historical data (information) is there somewhere in the

government records but researchers have not yet explored and published them for the future studies (poor promotion of Research and Development). Future studies that can be properly funded should explore all the data available before and after independence in different variables of the sectors of the economies. In addition, openness to data and information encourages more studies and research; therefore it is a challenge to the SSA governments and their agencies to allow free access to information and data so as to encourage research and development.

Also, there is a limited scope of literature in general conducted in the sub-Sahara region, specifically in the area of market integrations. This is due to a number of factors, including a limited number of research institutes and universities in many countries in the SSA region as compared to other less-developing regions. Of the few studies reviewed by this research conducted in the SSA region, most were conducted in the Western Africa region, while the Central, Eastern and some part of Southern Africa region have a very small number of studies in the international research archives. Again, there are many limitations to researchers to have good access to historical data sets from the government depositories due to poor technology, poor collection methods, poor data storage techniques and limitation to access some information as they are regarded as classified for internal users only. Therefore a greater effort was done to acquire a significant amount of datasets from international based databases and the information have been very useful and produced significant results.

6.2.2: Technical limitations

As explained by chapters two and four, the major method (gravity model) used to estimate the speed and volume of trade is lacking econometric theoretical foundation, which makes it difficult to validate and prove the results estimated. Basically, the gravity model depends on the consistency, efficiency and validity of the time series outcomes of the model while paying less attention to the cross section related outcomes. That also means, as applied by this study, the validity and consistency of the gravity model depends highly on the cointegration and unit root results and also on the consistency of the fixed and random effects of the panel arrangements. Also given the definition of the gravity equation, the few cross section statistical estimations that were included are suspected by the literature that they are likely to produce inefficiency results that can help to validate the major gravity equation. Another technical limitation of the gravity model is the fact that, traditionally the equation explicitly assumes that

distance reduces the flow of bilateral trade without considering that distance can be reduced or expanded depending on many factors that explain free movement of capital and labour between countries.

Therefore, the gravity model does not have clear theoretical grounds suggesting on how to deal with factors such as technology and modern infrastructures, which reduces the distance between countries rather the statistical tests are used to validate the results.. Another limitation of the gravity model is the fact that it measures the size of the market in terms of income and population only, rather than including capital and total wealth of the markets being assessed. Recent debates have led to some conclusion that income per capita (GDP/Population) cannot necessarily reflect the size of the market rather GDP/working population can reflect the actual performance and size of the market. The gravity model, therefore, can be criticised for many weaknesses but the arrangement and flexibility of the equation still makes it a very powerful measure of openness of the market, speed and volume of trade. Also the previous studies have failed to conclude which of the panel (fixed and random effects) estimation procedures is more powerful and consistent. Most of the previous literatures have estimated both RE and FE and then finally chose which one is consistent and more significant.

This study also adapted the same traditional way of estimating a panel equation whereby both FE, RE, GMM and a pooled regression were estimated and applied to the Hausman test to select the one that appeared to be more significant and consistent. Like any other panel estimations, the gravity model have to follow all time series measures for stochastic trends of the arrangement and then decide whether the tradition estimation techniques can be followed. Therefore, it is time consuming and even contradicting sometimes while trying to analyse and present the final results of the panel. One has to be very careful in explaining and analysing the final results. Another technical limitation to the researcher was the use and application of the more advanced statistical software. The researcher spent more than six months learning how to employ the statistical software(s) and then interpret the final results. In this study, mostly we employed STATA, EViews, GiveWin and WinRATS. Therefore, despite being time consuming and difficult to understand, these turned out not to be challenges but good lessons on how different techniques and statistical procedures can be applied to answer some economic question.

6.3: Final Remarks on the future of EAC Common Market

In the fifty one years since the publication of the theory of optimum currency areas by (Mundell, 1961), economists and researchers in the areas of international trade have suggested many other determinants of bilateral trade flows between pair of countries. In general, most of the studies have indicated that the advantages of a currency union (fixed exchange rate regime) outweigh the disadvantages. Despite the fact that the founding studies of an optimal currency areas suggested that both USA and EURO were not optimal for currency (exchange rate) union, those markets still went onto adopt the higher stages of integration but the outcomes have been different. The euro zone was showing success for the past ten years (2002 – 2012), but until further agreement are signed, the euro may end up breaking down. The US (North America) on the other hand, has been very successful and many states became even more successful after joining the US dollar exchange rate regime.

Generally in this study, we first examined the speed of income convergences in the region by using the traditional time series procedures of estimating the stochastic trend of income in the region. That was followed by measuring the speed and volume of intra-trade within the zone using the augmented gravity model of international trade. After that we were able to measure the responses of the participating economies to external and internal shocks by following the unrestricted and restricted Vector auto-correlation procedures. Some restrictions were imposed in chapter three so as to isolate short- and long-run responses of the macro variables applied by the procedures. The results did not only supplement the cases established by chapters one and two, but also helped to explore more knowledge and information that have been useful in the rest of the report.

Chapter four was specifically introduced aiming at measuring whether EAC is attracting or discouraging FDIs in the region, since the harmonisation of trader policies began in the early years of 2000s. This chapter noticed that a fixed exchange rate is one of the factors that can significantly attract more FDIs given the stability outcomes of fixing the exchange rates which were found to be equally converging towards equilibrium. Also, infrastructures and other structural policies encourage more FDIs to flow in a group of countries that have similar trade policies and the final conclusion was that by fixing the exchange rate, EAC will entertain more FDI inflows. During the analysis in chapter four, we also noticed that countries with abundant natural minerals such as oil, gas, diamonds, gold, tanzanite and coal are attracting more FDIs than countries without natural

minerals. Therefore, we argued that the higher flow of FDIs in countries such as Ghana, Tanzania and Nigeria is not due to good policies rather it is due to abundant of natural minerals. Therefore, the mining sector is attracting more FDIs than any sector especially those employs majority of the population such as agriculture and tourism.

Therefore, we welcome future studies to investigate further the correlations between availability of natural minerals, fixed exchange rates regimes, total flow of FDIs in a group of countries and the responses of other sectors. Finally, chapter five examined the volatilities of the exchange rates in the EAC region, given the intention of having a fixed exchange rate throughout the East Africa region. Three exchange rates out of five (due to data limitations) were examined using the GARCH model, which not only helped to measure the volatility levels of the exchange rate but also helped to measure the speed of adjustments of the exchange rates due to volatilities in the market. In addition chapter five was able to notice that, while responding the volatilities and shocks of the exchange rates, the three exchange rates were adjusting at similar levels and magnitudes overtime. Moreover, the levels of exchange rate volatility cannot necessarily be used as determining factors of higher levels of regionalisation; rather it is an important variable that requires intensive and keen investigations.

Therefore the key objective was to examine how the exchange rates of the countries expecting to have a single currency are responding and adjusting to volatilities and shocks. Therefore, one should not reach a conclusion by referring to the GARCH results. Rather, multiple statistical techniques are a secret ingredient while assessing optimality of a prospective currency union. Clearly there remains substantial scope and gaps for further research, first on appropriate statistical approaches that can evaluate the significance level of a group of countries that intend to adopt a single currency. Mostly, this study has applied panel and time series techniques to draw conclusions with regards to the behaviours of the selected economic indicators. In addition, some of the EAC participating countries were dropped from some of the analysis especially in chapter five due to unavailability of the data required and therefore if future researcher can acquire enough data, that can be a starting point.

Also, some variables that were suggested by previous studies as indicators for fast integration and convergence of the key economic variables (such as the volume of oil imports per year, corruption and bureaucracy indicators) were also dropped, as they were not available in most of the selected countries. Finally we sign-out by suggesting

that, given our findings and analyses, the East African Community Common Market (EAC) constitute economies that form an optimal currency area. Therefore apart from encouraging a single currency (fixed exchange rate), more investment should be encouraged in the areas of infrastructures (transport and communication), education (RND), sources of power energy and technology to encourage deeper integration that will encourage free movement of goods, services, capital and people in the region.

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