

African Integration and Development Review

Revue Africaine de l'Intégration et du Développement

Department of Economic Affairs
In collaboration with AUC Publishing and Reproduction Plant

Département des affaires économiques, en collaboration avec
l'Unité d'impression et de reproduction de la CUA

Printed by AUC Publishing and Reproduction Plant



African Integration and Development Review / Revue Africaine de l'Intégration et du Développement



Vol7, No.2

July / Juillet 2014

**African
Integration and
Development
Review**

**Revue
Africaine de
l'Intégration et
du Développement**

- The potential impact of COMESA-EAC-SADC Tripartite FTA on food security

Albert Makochekanwa

- Analyse de la relation entre consommation d'énergie et croissance économique au Togo

Abdou-Fataou TCHAGNAO

- Financial Development and agricultural performance in Cameroon: an econometric investigation

NEBA Cletus YAH

- Discrimination salariale: une extension de la décomposition d'Oaxaca-Blinder avec application aux données ivoiriennes

Do Ango Simplicio

- An Econometric Study of the Determinants of Foreign Direct Investment (FDI) in SADC Countries

Simon Nyarota, William Kavila and Nebson Mupunga



Orientation et Objectifs

La Revue Africaine de l'Intégration et du Développement est une tribune pluridisciplinaire internationale axée sur la problématique de l'intégration de l'Afrique. Elle est ouverte à toutes les orientations théoriques et publie des recherches portant sur les régions et les pays africains.

Cette Revue s'intéresse particulièrement à la théorie et à la pratique de la problématique de l'intégration. Ses champs d'intérêt comprennent: aide et commerce, disparités régionales et réforme agraire, administration du développement, planification de l'éducation et développement de ressources humaines, industrialisation et transfert de technologie, problèmes environnementaux, droits de la personne et démocratisation, urbanisation, femmes et développement.

La Revue accepte des articles théoriques, surtout s'ils présentent une analyse interdisciplinaire novatrice. Elle accorde cependant la priorité aux articles issus de recherches empiriques et aux études de cas ayant des répercussions sur les expériences d'intégration à travers le Continent et sur la planification et les politiques de développement. La Revue accepte également des articles courts présentant une expérience ou une réflexion personnelle sur un ou plusieurs aspects des pratiques ou des politiques actuelles de développement international.

La Revue Africaine de l'Intégration et du Développement présente également des analyses critiques et des comptes rendus de livres récents traitant de l'intégration économique.

La Revue Africaine de l'Intégration et du Développement est une publication bilingue (français et anglais) qui paraît deux fois l'an, en janvier et juillet.

Aims and Scope

The African Integration and Development Review is an international multidisciplinary journal for the discussion of a wide range of integration issues in Africa. It is open to all theoretical and applied research orientations on the regions and countries of Africa.

This review is particularly interested in the theory of integration and to its application to problems. Areas of interest include: aid and trade, regional disparities and agrarian reform, development administration, education planning and human resource development, industrialization and transfer of technology, environmental issues, human rights and democratization issues, urbanization and women in development.

The Review will consider theoretical papers, particularly if they offer an innovative interdisciplinary analysis. Priority will be given, however, to empirical researches and to case studies having implications on integration encounters throughout the Continent and on the planning and development policies. The review will also accept short articles that present experiences or personal points of view on one or several aspects of the practices or on current policies of international development.

The African Integration and Development Review includes critical analyses and reviews of recent books dealing with integration.

The African Integration and Development Review is a bilingual publication (English and French) which comes out twice a year, in January and July.

AFRICAN INTEGRATION REVIEW
REVUE AFRICAINE DE L'INTEGRATION

www.africa-union.org

©2011, African Union Commission

All rights reserved

Copyright in the volume as whole is vested in the African Union Commission and no part may be reproduced in whole or part without the express permission, in writing, of both the authors and the publishers.

The opinions expressed in this review do not necessarily reflect those of the African Union Commission.

ISSN: 2309-2505

African Integration and Development Review
Revue Africaine de l'Intégration et du Développement

President /Président

Prof. Jean-Marie GANKOU University of Yaounde II-Soa, Cameroon

Vice-president / Vice-président

Prof. Severine M. RUGUMAMU University of Dar Es Salaam, Tanzania

Scientific Committee / Comité Scientifique

Prof. Géro Fulbert AMOUSSOUGA University of Abomey Calavie, Cotonou, (Benin)
Prof. Joseph Ghartey AMPIAH University of Cape Coast, (Ghana)
Prof. Désiré AVOM University of Yaoundé II – SOA (Cameroun)
Prof. Barthélémy BIAO University of Parakou (Benin)
Prof. Moncef BEN SAID Institut National Agronomique de Tunisie, (Tunisia)
Prof. Danièle BORDELEAU University of Senghor, (Egypt)
Prof. Herve DIATA University Marien Ngouabi, (RDC)
Prof. DONTSI University of Douala, (Cameroon)
Prof. Jean-Jacques EKOMIE University of Omar Bongo, (Gabon)
Prof. Jude C. EGGOH University Francois Rabelais de Tours, Paris, (France)
Prof. Jean-Marie GANKOU University of Yaounde II-Soa, (Cameroon)
Prof. Chukwudum Nwaobi GODWIN Quantitative Economic Research Bureau, (Nigeria)
Prof. Jean-Paul MAMBOUNDOU University Omar BONGO, Libreville (Gabon)
Prof. Ahmadou Aly MBAYE University Cheikh Anta Diop, (Senegal)
Prof. Mohamed Ben Omar NDIAYE West African Monetary Agency (WAMA), (Sierra Leone)
Prof. Bamba Lambert N'GALADJO University Félix Houphouët-Boigny, (Côte D'ivoire)
Prof. Gilbert Marie N'GBO University Félix Houphouët-Boigny, (Côte d'ivoire)
Prof. Adams OLOO University of Nairobi (Kenya)
Prof. Adebayo OLUKOSHI African Institute for Economic Development and
Planning (IDEP), (Senegal)

Prof Wautabouna OUATTARA University Félix Houphouët-Boigny, (Côte D'ivoire)
Prof. Severine M. RUGUMAMU University of Dar-es-Salaam, (Tanzania)
Prof. Roche SEKA University Félix Houphouët-Boigny, (Côte D'ivoire)
Prof. Gervasio SEMEDO University of François Rabelais de Tours (France)
Prof. Germina SSEMOGERERE Makerere University (Uganda)

Executive Editor

Dr. Anthony Mothae MARUPING Commissioner for Economic Affairs, AUC

Editor in Chief

Dr René N'Guettia KOUASSI Director of Economic Affairs, AUC

Editorial Board

Dr René N'Guettia KOUASSI Director of Economic Affairs, AUC
Ms. Habiba MEJRI-CHEIKH Director of Communication and Information
Department, AUC

Dr Beatrice NJENGA Head of Education Division, AUC
Mr. Yeo DOSSINA Acting Head Statistic Division, AUC
Mr. Patrick NDZANA OLOMO Investment and Resource Mobilization, AUC
Ms. Barbara AMBELA Editorial Assistant, AUC/ JAES Support Mechanism of
the Africa-EU Partnership

Department of Economic Affairs
in Collaboration with AUC Publishing and Reproduction Plant
African Union Commission
P.O.Box 3243, Addis Ababa, Ethiopia
Tel.: (251-11) 5 519287
Fax. : (251-11) 5 51 92 87
E-mail : Ambelab@africa-union.org;

A grant from the European Union (EU) to support the publication of the *African Integration and Development Review* is gratefully acknowledged.

Nous remercions l'Union Européenne (UE) de son aide financière pour la publication de la *Revue Africaine de l'Intégration et du Développement*

African Integration and Development Review

Revue Africaine de l'Intégration et du Développement

Volume 7, No. 2 July/ Juillet 2014

**African Union Commission
Commission de l'Union Africaine**

**Department of Economic Affairs
In collaboration with AUC Publishing and Reproduction Plant
Département des Affaires Economiques
En collaboration avec la Section de Publication et de Reproduction de la
CUA**

TABLE OF CONTENTS / TABLE DE MATIÈRES
Volume 7, No. 2, July/ Juillet 2014

The potential impact of COMESA-EAC-SADC Tripartite FTA on food security.....	1
<i>Albert Makochekanwa</i>	
Analyse de la relation entre consommation d'énergie et croissance éco- nomique au Togo.....	34
<i>Abdou-Fataou TCHAGNAO</i>	
Financial Development and agricultural performance in Cameroon: an econometric investigation.....	59
<i>NEBA Cletus YAH</i>	
Discrimination salariale: une extension de la décomposition d'Oaxaca-Blinder avec application aux données ivoiriennes.....	79
<i>Do Ango Simplicio</i>	
An Econometric Study of the Determinants of Foreign Direct Investment (FDI) in SADC Countries.....	87
<i>Simon Nyarota, William Kavila and Nebson Mupunga</i>	
Politique rédactionnelle.....	119
Editorial Policy.....	121

The potential impact of COMESA-EAC-SADC Tripartite FTA on food security

Albert Makochekanwa¹

Abstract: *The paper investigated the potential impact of tripartite free trade area (T-FTA) arrangements among the Common Market for Eastern and Southern Africa (COMESA), the East African Community (EAC) and the Southern African Development Community (SADC) on food security. Two methodologies were used to achieve the objective. The analyses focused on trade in eight agrifood products, namely maize, rice, wheat, cassava, sorghum, millet, potatoes and soya between 2005 and 2010. Findings suggests that the T-FTA bloc is projected to have surplus in three products namely maize, potatoes and soybeans in 2016; while there will be expected deficits in the remaining five products.*

Keywords: *COMESA-EAC-SADC Tripartite free trade area; Food security; National food requirements; intra-regional trade.*

JEL: F13, F14, F15

L'impact Potentiel de la ZLE Tripartite COMESA- EAC-SADC sur la Sécurité Alimentaire

Résumé: *Le document a étudié l'impact potentiel des accords tripartites des zones de libre échange (ZLE-T) entre le Marché commun de l'Afrique Orientale et australe (COMESA), la Communauté d'Afrique de l'Est (EAC) et la Communauté de développement d'Afrique australe (SADC) sur la sécurité alimentaire. Deux méthodes ont été utilisées pour atteindre l'objectif. Les analyses ont porté sur le commerce des huit produits agroalimentaires, à savoir le maïs, le riz, le blé, le manioc, le sorgho, le millet, pommes de terre et soja entre 2005 et 2010. Les résultats suggèrent que le bloc (ZLE-T) est projeté d'avoir excédent de trois produits à savoir le maïs, pommes de terre et le soja en 2016; alors il y aura attendu déficits dans les cinq produits restants.*

Mots clés : *COMESA-EAC-SADC tripartite de zone de libre échange; Sécurité alimentaire; Exigences nationales alimentaires; commerce intra-régional.*

JEL: F13, F14, F15

¹ Albert Makochekanwa (Ph.D.), Senior Lecturer, Department of Economics, University of Zimbabwe, Harare, Zimbabwe, Email: almac772002@yahoo.co.uk or amakoche@yahoo.com.

Introduction

Trade in agrifoods at any level of cooperation, from bilateral to regional and from inter-regional to multilateral, remains more complex than any other sector, and varies across agreements (Aksoy, 2004). Thus, when comparing trade in agrifoods and other sectors, it can be noted that even though negotiations at RTAs and World Trade Organization/General Agreement on Tariffs and Trade (WTO/GATT) levels have generally reduced existing tariffs on industrial products, tariffs on agrifoods are still relatively high; thus resulting in subdued trade in such products. The situation is made worse by agriculture protection which still exists at WTO negotiation level, and which has meant that even in countries that are members of a given RTA, average preferential tariffs for agricultural products are still high in most of these trade blocs.

Whilst a number of empirical studies have been done on the impacts of RTAs, most studies were done either at aggregate level or for manufacturing products (for instance, Clausing, 2001; and Krueger, 2000): the effects of RTAs on trade in agrifood products are still to be investigated rigorously, especially in southern and eastern Africa. This void motivates our study which focuses on the proposed tripartite free trade area (T-FTA) and its effects on trade of major agrifood products deemed important for the region's food security. In the eastern and southern Africa regions, the three regional economic communities (RECs) namely the Common Market for Eastern and Southern Africa (COMESA²), the East African Community (EAC³) and the Southern African Development Community (SADC⁴), among others, have over the years tried in their various arrangements to encourage production and trade of food products across their respective regional members.

The efforts of these three RECs to, among other things, improve food security for their citizens are expected to be buttressed by the envisioned COMESA-EAC-SADC tripartite free trade area (T-FTA). The 2008 Kampala, Uganda decision by Heads of States and Governments of COMESA, EAC and SADC member countries to create a tripartite free-trade area (T-FTA) among the three regions was a landmark decision in Africa's regional integration efforts. This proposed COMESA-EAC-SADC FTA, if successful, will result in the largest

² The current COMESA Member States are Burundi, Comoros, Democratic Republic of Congo (DRC), Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Libya, Madagascar, Malawi, Mauritius, Rwanda, Seychelles, Sudan, Swaziland, Uganda, Zambia and Zimbabwe (Those in bold are not part of COMESA FTA).

³ The current EAC Member States are Burundi, Kenya, Rwanda, Uganda and Tanzania.

⁴ The current SADC Member States are: Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe (Those in bold are not part of SADC FTA).

REC in Africa, comprising 26 countries⁵ with a combined population of 527 million persons, GDP of \$624⁶ billion and an average GDP per capita of \$1,184. The T-FTA will account for 58 percent of the GDP and 57 percent of the population of the member states of the African Union membership. (www.trapca.org). Out of a total of 527 million people of the combined region, agriculture activities contributes over 70 percent towards employment and 35 percent towards the gross domestic product (GDP) of the Member countries.

Formulation of the envisioned COMESA-EAC-SADC T-FTA, like history has shown, will have various implications including food security. Although food security is a multi-faceted concept with various definitions used in the literature (van Dijk, 2011), the Food and Agriculture Organization's (FAO, 2003, p. 28) states that "food security is achieved when all people, at all times, have physical and economic access to sufficient safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life security to its citizens". Thus achieving food security means making food available at prices that households can afford.

The main objective of the paper is to assess the implications of the formation of T-FTA on food security for member countries. Although there been movements in the formulation of the T-FTA, no study (to the best knowledge of the author) has been done to investigate the potential impact of this configuration on food security of the member countries. Hence, this is an important contribution of this paper. The study used two quantitative methodologies to achieve its objective. Firstly, the paper employed statistical analysis in which three trade related indices were calculated to see the annual changes in intra-trade among member states of the three RECs under study. Secondly, the research employed a crude estimate of national food requirements. In both cases, eight types of staple agrifood products have been analyzed and these are maize (HS 1005), rice (HS 1006), wheat (HS 1001), sorghum (HS1007), millet (HS 100 820), cassava (HS 071 410), soybeans (HS120 100) and potatoes (0701)⁷. These products have been selected on the basis that most of them (especially maize and rice) are staple crops in the tripartite countries, while some of the products supplement the staple products in consumption (DFID, 2013).

⁵ The 26 Member States are: Angola, Botswana, Burundi, Comoros, Democratic Republic of Congo (DRC), Djibouti, Ethiopia, Eritrea, Egypt, Kenya, Lesotho, Libya, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Rwanda, Seychelles, South Africa, Swaziland, Sudan, Tanzania, Uganda, Zambia and Zimbabwe.

⁶ Unless otherwise stated throughout this paper, '\$' refers to the United States of America dollar (USD/US\$).

⁷ To ensure that the products are precisely defined, some are given at HS 4-digity, while others are indicated at HS 6-digit level.

The organization of the paper is as follows: following the study introduction, the next sub-section provides the link between regional integration and food security. Literature review is presented in Section 2, with the methodology used to achieve the study objective being discussed in Section 3. Section 4 presents the findings and results of the study, with Section 5 concluding the paper.

The links between regional trade and food security are complex and multiple. There are two broad channels through which agricultural trade results in enhanced food security. The first channel is by promoting economic growth, which improves income and, hence, the access to food. Empirical research has shown that agricultural growth contributes more to poverty reduction in developing countries than manufacturing and services (Cervantes-Godoy & Dewbre 2010; United Nations Economic Commission for Africa, 2009; and FAO, 2008). The main reason is that by far most of the poor (in particularly women) are active in agriculture either as farmers or through off-farm employment. Second, agricultural trade has a direct effect on food security by augmenting domestic food supplies and thereby increasing the availability of food. This will push food prices down and reduce food supply variability.

Trade in agriculture is important for three main reasons. First, trade can contribute to stabilizing supply when national fluctuations in production are greater than the fluctuations in the region. Thus, free intra-regional trade among the tripartite countries could be an efficient substitute for national stockpiling and might be used to even-out fluctuations in national production (Karim and Ismail, 2007). According to Johnson (1978, 1981), worldwide free trade in agrifood products has the potential to drastically reduce the need for holding carryover stocks, because fluctuations in world cereal production are minimal compared to fluctuations in national production. The same may hold true if production fluctuation in individual countries is greater than production fluctuation in for the tripartite region as whole. Nevertheless, if production in all tripartite members were perfectly correlated, intraregional trade could not help stabilize consumption. Second, trade in agrifood products can partly substitute for working stocks if the harvesting calendar is different among trading partners. Lastly, trade encourages countries to specialize in products where they have comparative advantage. As such, trade would help to increase national income and improve food security

1. Literature review

Among the studies which empirically analyzed the impact of free trade area (FTA) on food security, most of such studies employed either indices or gravity trade models, and with very few studies using Ohkawa (1956) formulation.

The paper by Karim and Ismail (2007) quantified the potentials of intra-regional agricultural trade in the Common Market for Eastern and Southern Africa (COMESA) region with special emphasis of case studies of Egypt, Kenya and Sudan. Methodologically, the study employed a number of indices including instability index, production similarity index, comparative production performance index, export similarity index and revealed comparative advantage index. The research found that there was potential for intraregional agricultural trade in the region. Specifically, the instability indices of production in cereals, pulses, and roots and tubers were more stable at regional level than at national level. The three countries were shown to have different production patterns according to the results of production similarity index, while export similarity indices results showed that countries were dissimilar in their export patterns.

Bello (2004) analysed the potential of food security in three agrifood products namely rice, maize and wheat for the Asia-Pacific Economic Cooperation (APEC)⁸ region using Ohkawa's equation. Considering the entire 21-member bloc, the study found that APEC member economies will be self-sufficient in the three commodities. With regards to maize In the case of maize, the paper found that the region will post a surplus of 439 million metric tons on account of the huge surpluses to be posted by the United States and China. For wheat, the surplus economies will be the United States, Australia, Canada and the Russian Federation together with New Zealand and Chile. A surplus of 93 million metric tons for the 21 economies is projected. In the case of rice, a more modest surplus of 11 million metric tons will be posted due to the surplus production of China, Vietnam, and Thailand and to some extent by the United States and Australia. Korea will post a surplus of over half a million metric tons.

Makochekanwa et al (2010) empirically investigated whether a regional trade agreement (RTA) promoted welfare of the participating countries through trade creation, or lowered welfare by diverting trade. The research employed the gravity model to analyze the impacts of SADC's Trade Protocol (TP) implementation on intra-trade in six staple agrifood products namely; maize, rice, wheat, sorghum, millet and cassava for the period covering 2000 to 2006. The focus on agrifood products is due to the fact that positive impacts of RTAs from food agriculture in the literature have proved fewer and more controversial than from manufacturing. The paper found that intra-SADC trade in the most agrifood products were below the predicted level of trade. The research provided two recommendations. Firstly, the region was encouraged to simplify its rules of origin (RoO) so as to ensure that member countries can

⁸ The current 21 members are: Australia, Brunei, Canada, Indonesia, Japan, South Korea, Malaysia, New Zealand, Philippines, Singapore, Thailand, United States, Republic of China, Hong Kong, People's Republic of China, Mexico, Papua New Guinea, Chile, Peru, Russia, and Vietnam.

effectively benefit and increase their intra-SADC trade. Secondly, member countries were encouraged to cooperate in research and development (R&D) so as to boost regional production, thus ensuring increased intra-trade, including trade in agrifood products.

Tembo and Jayne (2009) used the gravity model and 11 years data on Zambia and 12 major intra-SADC trading partners to estimate agricultural trading relationships and home bias ratios (HBRs – these would indicate the extent to which trade: exports or imports, fell below or above potential due to friction within the trade environment brought about by controls and other non-tariff barriers). Their results found that the impact of the SADC Trades Protocol on trade flows was mixed. While trade in agricultural products increased in relation to Malawi and South Africa, Zambia's exports to Angola and Botswana fell below potential during the implementation of the SADC TP as compared to before the SADC TP. On the contrary, Zambia was found to have imported 4.5 percent more agricultural products from non-COMESA countries than it did from COMESA members (maybe because of South Africa).

2. Methodology

2.1. Analytical framework

The methodology adopted in this study is premised on the development assumptions of Lewis (1950) who argues that the underdeveloped economy is composed of two sectors: a traditional overpopulated rural subsistence sector characterized by zero marginal productivity and a high productivity modern urban industrial sector into which labor from the subsistence sector is gradually transferred. According to his dual sector model presumption, food supplies are normally contributed by the agriculture sector. Thus, in this context, the development process in any given country is seen as one of a structural transformation from an economy in which agricultural employment and output dominates to one in which industry takes the leading role. Thus, in this model, if food supplies of the modern sector are not able to keep up with its increasing demand for labour, the modern sector will have to consume a larger volume of its output in feeding its labor force, thus leaving a smaller amount for capital accumulation. In this case, any tendencies for drawing labour force from the agriculture sector to manufacturing or another expanding sector means that these new workers must "take their lunch" with them when they leave the rural sector. The expanding urban labour force thus must be supported by a growing supply of foodstuffs (Meier, 1989).

Lewis' (1950) structural transformation results in changes in population structures. According to his theory, following Stage II of the demographic

transition, it implies that better public-health methods and higher incomes will lead to a marked reduction in mortality, which in turn raises life expectancy. This welcome decline in death rates is, however, not immediately accompanied by a decline in fertility, thus resulting in the growing divergence between high birthrates and falling death rates, leading to sharp increases in population growth. Thus, high rates of population growth or a growing population, a characteristic of most of the world's underdeveloped and developing nations, also contribute to the increase in demand for food. According to Todaro (1997), the sharp population growth and the transformation of the economy is accompanied by urbanization, increase of incomes, the spread of education and changes in attitudes and incentives.

The study used two methodologies to achieve its objectives. The use of two methodologies is informed by the empirical literature reviewed in the preceding section. Firstly, the paper employed statistical analysis in which two trade related indices have been calculated to ascertain the annual changes in intra-trade among member states of the three RECs under study. Secondly, the research employed a crude estimate of national food requirements. In both cases, eight types of staple agrifood products have been analyzed and these are maize (HS 1005), rice (HS 1006), wheat (HS 1001), sorghum (HS1007), millet (HS 100 820), cassava (HS 071 410), soybeans (HS 120 100) and potatoes (HS 0701).

2.1.1. Trade related indices⁹

2.1.1.1. Changes in intra-regional agrifood trade

This statistical index traces changes in movements in intra-regional agrifood trend and intra-regional trade relative to total trade. Since the study analyses a five year period, 2005 was used as a base year while 2010 was used to gauge the degree to which intra-regional trade in agriculture has changed over the years.

2.1.1.2 Product complementarities

The degree to which Eastern and Southern Africa member countries' total trade with other member states complement domestic production/consumption (i.e., from the point of view of importing member countries) provides a barometer of the extent to which intra-regional trade will be beneficial to all member countries, and hence promoted. In a situation where there is high trade complementarity in agricultural product trade within the region, it follows that more trade will be expected to increase especially when the region becomes a

⁹ It is important to note that food security is a dynamic concept, while the two indices are static measures which cannot take into account the dynamic nature of food security. As such, the results from the indices need to be interpreted with this limitation in mind.

fully functional FTA. As pointed by Khandelwal (2005:13), “product complementarities between countries are an important indicator of the potential for expansion of intraregional trade”.

This study therefore calculated bilateral complementarity indices in agrifood trade for the three RECs’ member states. Again, 2005 was used as a base year while 2010 was used to gauge the degree to which intra-regional trade in agriculture has changed over the years. For two trading countries, i and j , the algebraic bilateral product complementarity index for the agricultural products, a , following Tsikata (1999), is give by:

$$C_{aij} = 100 - \sum_i (|M_{aij} - X_{aij}| \div 2) \quad (1)$$

Where X_{aij} represents the share of agricultural good ‘ a ’ in the total exports of country i to country j , and M_{aij} represents the share of agricultural good ‘ a ’ in the total imports of country j from country i . The computed index values will vary between zero and 100, where zero implies no complementarity between countries i and j ’s trade in agrifood products, while a value of 100 would imply perfect match between the exports and imports of the two trading countries. As pointed before, higher index values would imply high potential benefits in intra-regional agrifood trade during the period under study, with lower values implying low potential benefits.

2.1.2. Estimating national food requirements

One of the tools employed in estimating national food requirements is the Ohkawa’s analysis. In terms of the empirical model, and following Johnston and Mellor (1961), and Bello (2004), the study employs Ohkawa’s equation:

$$d = p + ng \quad (2)^{10}$$

In Equation (2), p and g are the rates of growth of population and gross domestic product (GDP) per capita income respectively. Variable n is the income elasticity of demand for agricultural products and it acts as a very simple and crude measure of the annual rate of growth in national food requirements for the above mentioned agrifood products among the T-FTA member economies.

¹⁰ The original equation was $d = p + gn + pgn$. Ohkawa dropped the last term in the final version of his paper because he argued that the last term was of small importance.

2.2 Data sources

The selected commodities are maize, rice, wheat, cassava, sorghum, millet, potatoes and soya beans. Table 1 provides the exact names and HS codes of data analysed in this paper.

Table 1: Description of commodities

Commodity	HS Codes and Description
Maize	1005 : Maize corn
Rice	1006 : Rice
Wheat	1001 : Wheat and meslin
Cassava	071410 : Cassava (manioc, fresh or dried)
Sorghum	1007 : Grain sorghum
Millet	100 820 : Millet
Potatoes	0701 : Potatoes, fresh or chilled
Soya beans	120100 : Soya beans

Source: Harmonized Commodity Description and Coding System (HS) classification

These products were selected on the basis that they constitute staple agrifood products in most of the T-FTA member countries. Production trends, in tonnes were taken from FAO's online database for the period 1999 to 2010. Projected rates of growth of population were taken from IMF's online database. Projected growth rates for GDP per capita were calculated using the GDP per capita figures from IMF's online database.¹¹

Income elasticity tells us the percentage change in quantity demanded for a certain commodity as a result of a one percentage change in income. A positive sign for income elasticity shows that the commodity is normal good while a negative sign implies that the commodity is an inferior good. For instance, ground meat in some countries may be considered an inferior good because consumers switch to better cuts of meat as their incomes goes up. Consumer theory tells us that income elasticities are derived from the income-expansion

¹¹ Population and GDP per capita growth projects for Djibouti, Egypt, Libya and Sudan, the source was <http://www.economywatch.com/economic-statistics/country/>. The source for information contained in this includes IMF, World Bank, UN, OECD, CIA World Fact book, Internet World Statistics, The Heritage Foundation and Transparency International.

path with each income expansion path drawn for a particular set of relative prices that is assumed (Timmer et. al., 1983).

Income demand elasticities were from Rosegrant et al. (2001) and Hossain and Sombilla (1999). Rosegrant et al. (2001) used the Almost Ideal Demand System (AIDS) model to estimate income elasticities. The AIDS uses a two-stage budgeting framework to model household behaviour. In the first stage, the household decides how much of the available income is to be allocated among food and other household needs while in the second stage, the household decides on the allocation of the predetermined expenditure on food among the various commodities depending on prices, the level of incomes and the relevant demographic and locational variables that may influence tastes and preferences.

3. Discussion of results

Before interpreting the results, it is important at this stage to provide a caveat to the interpretation of the results described under *sub-section 4.2* (Changes in food requirements). The results presented and projected in this section, as already indicated before have been arrived using recorded data, that is, only production which reach the formal market place. However, given the subsistence nature of agricultural activities in most T-FTA countries, where most of the rural populations consume the products they would have produced themselves and not bought from the formal market, care has therefore to be taken especially when interpreting results which indicates projected deficits. The deficits will, in most cases be applicable to the section of the population which relies on food purchases from the formal market.

3.1 Trade related indices results

This section presents the results of the study which were estimated using the two trade related indices which have been referred to under the methodology section.

3.1.1. Computed changes in intra-regional agriculture trade

Table 2 shows the shares of each reporting COMESA or EAC or SADC member countries' trade to respective regional bloc(s). The table shows shares for countries that have reported data between 2005 and 2010. Across the rows are reporting country exporters of which the share of what was traded (sum of what was exported and imported) with regional bloc(s) in question is calculated. Along the columns are the eight products for which the analysis is done. Each cell in the table at the intersection of a country and a product contains two numbers. The top number shows the share of trade of a given product of the trading country (on the corresponding row) to respective regional bloc(s) (e.g.,

COMESA, EAC or SADC (SACU) in the total trade of that reporting country for the year 2005. The second number, in parenthesis, is the share in the year 2010. In some cells there are arrows pointing downwards or upwards. These arrows indicate the direction of change in shares between 2005 and 2010. In a cell where there is no arrow, it implies that the share in the two periods was the same. Lastly, a cell figure of zero (0, 0) implies that the reporting country did not trade with the respective region(s) it is a member, though it might have traded with other non- regional trade partners.

The tabulated results show that, for example, in 2005, Zimbabwe's maize trade which was destined to both COMESA and SADC regions (the two regional blocs to which it is a member) accounted for 92% of its total trade. In 2010 its share destined towards these two trading blocs had gone up to 98%. Thus, Zimbabwe's intra-COMESA and intra-SADC trade in maize during the period under review, based on this indicator increased.

Kenya and Uganda are the two countries whose intra-regional trade in at least five of the eight products increased during the period reviewed. These are the countries which have integrated the most as they managed to increase intra-regional trade amongst their respective regional trade blocs in at least five (of the eight) agrifoods products than other countries. For instance, in 2005, Kenya traded 4 percent, 90 percent, 4 percent and 21 percent of total sorghum, millet, potatoes, and soya beans respectively, with COMESA and EAC regions (the two regional blocs to which it is a member), but as of 2010, the respective shares have increased to 65 percent 98 percent, 100 percent and 22 percent.

On the other hand, Madagascar, Namibia and South Africa are some of the countries whose intra-regional trade in at least three of the eight products has declined. For instance, in 2005, Madagascar traded 98 percent, 100 percent, 100 percent and 100 percent of total maize, cassava, sorghum and soya beans COMESA and SADC regions (the two regional blocs to which it is a member), respectively, but as of 2010, the respective shares have declined to 78 percent, 0.04 percent, 34 percent and 4 percent. This implicitly implies that, despite the fact that the country is a member of both COMESA and SADC FTAs, the country's trade with members in these regions in these four products declined. In other words, Madagascar's integration into these regions for these four products, based on this indicator has declined between 2005 and 2010.

In the case of Swaziland, being a member for the three RECs, namely COMESA, SADC and SACU did not have any new effect given that the country had already been trading 100 percent in seven of all the eight agrifood products (with exception of potatoes) with members from these three regions.

The country's performance integration in these products may however be mainly due to the SACU integration effect, as a larger proportion of the country's agrifood products were traded with the SACU region.

Table 2: Changes in Intra-regional trade share 2005 and 2010

	Country/ Product	Regional bloc(s)	Percentage destined for respective regional blocs							
			Maize	Rice	Wheat	Cassava	Sorghum	Millet	Potatoes	Soya beans
1	Botswana	SADC/SACU	100 (100)	99 (97) ↓	100 (100)	98 (32) ↓	100 (100)	74 (100) ↑	98 (100) ↑	100 (100)
2	Burundi	COMESA/EAC	100 (98) ↓	99 (17) ↓	100 (7) ↓	100 (100)	100 (100)	0.0 (0.0)	0.0 (0.0)	100 (100)
3	Comoros	COMESA/SADC	71 (16) ↓	0.3 (26) ↑	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
4	Kenya	COMESA/EAC	42 (29) ↓	20 (11) ↓	0.3 (1.0) ↑	0.1 (0.2) ↑	4 (65) ↑	90 (100) ↑	4 (98) ↑	21 (22) ↑
5	Madagascar	COMESA/SADC	98 (78) ↓	0.04 (2.6) ↑	0.0 (0.9) ↑	100 (0.04) ↓	100 (34) ↓	0.0 (0.0)	50 (100) ↑	100 (4) ↓
6	Malawi	COMESA/SADC	100 (100)	14 (69) ↓	16 (2.0) ↓	0.0 (0.0)	37 (100) ↑	100 (100)	89 (75) ↓	100 (100)
7	Mauritius	COMESA/SADC	0.4 (12) ↑	0.2 (0.2)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.2 (4) ↑	0.4 (1.4) ↑	8 (0.0) ↓
8	Mozambique	SADC	94 (99) ↑	0.8 (4) ↑	1.0 (1.1) ↑	100 (91) ↓	0.0 (99) ↑	100 (100)	78 (8) ↓	89 (90) ↑
9	Namibia	SADC/SACU	95 (97) ↑	71 (90) ↑	28 (47) ↑	99 (0.04) ↓	100 (100)	82 (8) ↓	89 (91) ↑	86 (76) ↓
10	Rwanda	COMESA/EAC	8 (100) ↑	44 (78) ↑	0.0 (12) ↑	100 (100)	72 (100) ↑	100 (70) ↓	94 (4) ↓	100 (96) ↓
11	South Africa	SADC/SACU	73 (17) ↓	1.2 (2.8) ↑	3.0 (2.0) ↑	13 (1) ↓	51 (72) ↑	10 (0.1) ↓	26 (2) ↓	12 (73) ↑
12	Sudan	COMESA	0.4 (0.3) ↓	89 (60) ↓	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	99 (4) ↓	0.0 (0.0)
13	Swaziland	COMESA/SADC/S ACU	100 (100)	100 (100)	100 (100)	100 (100)	100 (100)	100 (100)	100 (29) ↓	100 (100)
14	Tanzania	SADC/EAC	83 (94) ↑	11 (96) ↑	25 (4) ↓	100 (96) ↓	98 (100) ↑	90 (100) ↑	50 (33) ↓	27 (68) ↑

15	Uganda	COMESA/EAC	69 (93) ↑	10 (96) ↑	7.0 (3.0) ↓	0.0 (0.0)	4 (85) ↑	93 (99) ↑	51 (97) ↑	12 (34) ↓
16	Zambia	COMESA/SADC	89 (98) ↑	57 (36) ↓	78 (100) ↑	100 (100)	90 (99) ↑	100 (100)	100 (100)	99 (93) ↓
17	Zimbabwe	COMESA/SADC	92 (98) ↑	22 (32) ↑	20 (26) ↑	0.0 (0.0)	46 (100) ↑	100 (100)	86 (78) ↓	100 (100)

Source: Author

3.1.2. Product complementarities

Table 3 presents product complementarity indices (PCI) for T-FTA countries for which data was readily available. These indices were calculated for individual T-FTA members and also an average index is provided. Given the paucity of data at product level, especially at HS4 or HS6, the section calculated the PCI for agricultural commodities as a whole.

For almost all tabulated countries, the average PCI were concentrated between 40 and 50. However, when one considers the individual reporter countries' indices, the picture becomes different. For instance, Botswana and Rwanda's PCI values were relatively high, and were above 50 for 19 and 20 countries, respectively, out of the 26 countries trading partners. This signifies the fact that these two countries' trade in agriculture commodities complimented (in consumption) with other T-FTA countries in 2010.

Given that regional staple food comprises mainly of the eight commodities analyzed in this paper, it follows that higher PCI presented in Table 3 are thus signifying complementarity in consumption as opposed to complementarity in production. These higher PCI also indicates that these three regions have even higher potential for intra-regional in these agrifood.

Country	Code	A G O	B W A	B D I	C O M	Z A R	D J I	E G Y	E R I	E T H	K E N	L S O	L B Y	M D G	M W I	M U S	M O Z	N A M	R W A	S Y C	Z A F	S D N	S W Z	T Z A	U G A	Z M B	Z W E	A v e	
Botswana	BWA	4 8	-	5 4	6 2	2 5	6 3	5 2	6 2	6 7	5 3	6 0	5 8	5 3	5 6	2 4	5 4	2 4	5 6	5 8	1 8	5 4	5 7	5 5	5 6	4 8	4 6	4 6	5 0
Burundi	BDI	5 3	7 4	-	5 9	5 0	5 0	4 5	5 2	4 8	3 9	7 9	4 9	5 6	5 0	4 3	5 0	5 5	5 1	5 0	4 3	5 2	4 7	4 5	4 9	4 8	5 1	5 3	
Djibouti	DJI	4 3	6 1	4 8	5 5	4 0	-	4 6	4 5	5 1	4 2	6 4	4 2	4 8	4 3	5 1	4 3	4 6	4 1	5 2	4 6	4 4	5 7	4 3	3 9	4 3	4 0	4 7	
Egypt	EGY	3 1	5 3	2 9	4 9	3 5	3 8	3 -	5 0	4 2	3 7	6 2	3 9	3 7	2 8	4 1	3 9	3 5	4 2	4 0	3 4	2 9	4 8	4 1	3 1	2 6	3 1	3 8	
Ethiopia	ETH	2 8	4 5	3 9	4 7	2 9	3 4	3 5	5 5	3 -	5 0	7 9	2 3	3 1	3 2	2 6	3 1	4 0	4 8	4 0	3 0	3 3	5 0	3 2	2 9	3 1	3 3	3 8	
Kenya	KEN	2 8	3 0	3 5	5 3	3 1	3 6	2 9	3 9	3 4	3 -	3 9	2 7	3 7	3 2	3 1	3 4	4 2	4 4	3 3	2 7	2 9	3 2	3 3	3 6	3 7	0 4	3 4	
Madagascar	MDG	3 4	5 4	4 3	5 6	3 6	4 7	4 1	5 1	4 6	3 6	4 8	3 6	-	3 4	3 6	3 9	5 4	5 0	4 0	3 6	3 8	5 1	3 9	3 4	3 0	3 8	4 2	
Malawi	MWI	3 8	3 8	4 5	4 0	3 0	3 4	3 3	6 4	4 3	3 7	4 1	2 9	3 5	-	5 8	3 0	2 8	5 0	3 8	2 7	3 0	4 9	2 9	2 7	2 2	3 2	3 7	
Mauritius	MUS	2 1	2 5	2 9	3 3	2 6	3 5	2 9	3 6	3 3	3 6	2 8	4 6	2 8	2 7	2 -	2 8	3 6	3 5	2 4	2 5	2 9	3 3	2 7	2 4	2 6	2 5	2 9	
Mozambique	MOZ	3 5	6 1	4 1	6 6	2 7	4 7	3 4	7 5	4 6	2 9	8 0	2 8	7 2	3 7	3 9	-	6 7	3 7	4 3	3 2	3 7	4 5	3 1	3 6	2 6	3 2	4 4	
Rwanda	RWA	5 7	6 8	5 1	6 8	5 2	5 8	4 0	5 9	7 2	5 0	7 6	5 4	6 4	5 5	5 4	5 1	6 0	-	6 0	3 3	5 8	4 5	3 3	4 9	5 3	3 8	5 4	
South Africa	ZAF	4 2	4 0	4 3	5 3	3 3	4 9	3 7	5 2	5 3	7 2	4 4	4 2	4 9	4 1	3 9	4 2	4 7	4 1	5 2	-	3 9	5 6	4 3	4 8	4 8	3 6	4 4	
Sudan	SDN	3 7	4 0	4 4	8 9	3 9	4 7	3 9	8 3	8 4	4 1	9 2	4 1	8 6	4 2	7 5	4 3	4 7	4 3	4 4	3 5	4 -	8 8	4 1	4 4	4 2	4 2	5 3	
Tanzania	TZA	4 4	4 3	4 9	5 9	3 6	5 3	3 2	5 6	5 4	5 4	5 7	3 8	4 8	3 9	3 0	3 7	4 4	4 9	4 6	2 7	4 3	5 1	-	3 9	2 9	3 6	4 3	

Uganda	UGA	3 5	4 9	4 2	5 1	3 6	4 1	3 6	3 6	4 4	3 5	5 8	3 5	4 0	3 1	3 8	3 6	4 6	4 6	4 3	3 1	3 2	4 5	3 5	-	2 8	3 4	3 9	
Zambia	ZMB	4 2	6 9	4 6	6 4	2 4	4 7	2 4	6 6	5 4	2 3	6 7	4 5	5 4	4 3	2 7	4 7	6 6	6 0	1 0	5 9	6 6	4 2	5 7	4 0	5 -	2 7	4 6	
Zimbabwe	ZWE	4 8	4 9	4 9	6 5	4 6	5 6	4 2	6 5	5 5	4 5	6 6	4 4	4 4	4 4	4 8	4 8	4 7	4 2	5 0	5 6	3 1	5 4	4 0	4 8	4 8	3 6	-	4 9

Source: Author calculations

Key: AGO = Angola; COM = Comoros; ZAR = Democratic Republic of Congo (DRC); ERI = Eritrea; LSO = Lesotho; LBY = Libya; NAM = Namibia; SYC = Seychelles; SWZ = Swaziland;

3.2. Change in food requirements

The Ohkawa model, as presented in Equation (2) was estimated for the COMESA-EAC-SADC tripartite free trade area (T-FTA) member economies using published secondary data¹² In the case of maize, projected production increases can range from as high as 268% in Botswana to a decrease of four percent in Libya. Rice production is expected to decline by as much as 5.6% for Egypt or increase by 34.3 in the case of Malawi. Wheat production can again grow by 40.8% in Rwanda or show a decline of 15.7% for Zimbabwe. The highest production growth of 29.9% in cassava is projected in Rwanda while the highest decline will be recorded in Burundi to the value of 19.3%. Highest projected increases in sorghum, millet, potatoes and soybeans are expected in Malawi (43%), Botswana (nearly double), Zambia (more than double) and Sudan (27%), respectively. Projected declines for the immediate four products mentioned above are going to be highest in Sudan (-10%), South Africa (-9%), Eritrea (-44%) and Kenya (-5%), respectively.

3.3. Projected production and consumption levels in 2016

Table 4 provides summarised projected production, consumption and supply-demand gap in tonnage, with Table A1 in Annex presenting projected production, consumption and supply-demand gap at country level. It is important to note that all the production and consumption figures in Table 4 (and Table A1) are projected additional tonnage values for 2016 and not total values. For all the eight agrifood products, the 2005 to 2010 average production figures from the FAOSTAT online agriculture database were used. The results of Ohkawa's equation and the projected production growth rates were then applied to these base figures to arrive at the estimates for the 2016 level. At the end of each of the eight commodity tables are total figures for production, consumption and supply-demand gaps, with the supply-demand gap column indicating whether the T-FTA member countries as a group has a surplus (coloured green) or deficit (coloured red) in the agrifood product in questions. Again, the zeros indicate no production.

As expected, there will be countries exhibiting either surpluses or deficits in 2016. If we consider the 26 T-FTA member countries as one big group, however, the T-FTA member economies will be self-sufficient in the three commodities namely maize, potatoes and soybeans. On the other hand, the 26-member bloc will likely face deficits in the remaining five agrifood products namely rice, wheat, cassava, sorghum and millet.

¹² The exact calculations have been deliberately been skipped for presentation in this paper in the interest of saving space.

In the case of maize, the region will post a surplus of two million tonnes on account of the huge surpluses to be posted by Malawi (890,153), South Africa (510,371), Zambia (443,597) and Tanzania (153,337). There will be deficits in eight economies, with the shortages being severe in Egypt (341,775) and Ethiopia (102,807).

Projected additional increase in rice production for 2016 is by far to be outstripped by projected consumption to such an extent that there will be a total deficit amounting to 660, 118 tonnes for the whole tripartite region. The deficits will be most severe in Egypt (721,559) and then in Tanzania (around 67,617). On the other hand, significant surpluses will be expected in Madagascar (72,702), Malawi (35,911) and Mozambique (28,115), among other countries.

Table 4: T-FTA Project production and consumption levels 2016 (Tonnes)

	Product	Production	Consumption	Supply-Demand Gap
1	Maize	3,785,808	1,762,101	2,023,707
2	Rice	60,145	720,263	-660,118
3	Wheat	71,069	1,033,932	-962,863
4	Cassava	1,384,633	2,675,309	-1,290,676
5	Sorghum	-28,577	533,302	-561,879
6	Millet	77,749	137,462	-59,713
7	Potatoes	1,447,008	673,416	773,592
8	Soyabeans	135,784	68,935	66,850

Consumption of wheat is expected to outstrip the combined production of the T-FTA member states in 2016. The region is estimated to experience a shortfall of around 962,863 tonnes, with Egypt (739,791) and South Africa (163,511) being the largest contributors towards the region's deficit. Only five countries (Eritrea, Kenya, Lesotho, Malawi and Swaziland) are projected to have surpluses, while the remaining 21 countries (15 wheat producing and 6 non-wheat producing) are expected to experience deficits.

In the case of cassava, the region will post a deficit of around 1.3 billion tonnes with DRC (758 000), Tanzania (408 000), Mozambique (367 000) and Uganda (304 000) experiencing the largest shortfalls. Cassava surpluses are expected in Rwanda, Angola and Malawi, with production tonnage outstripping consumption by 345 000, 212 000 and 200 000 in each of these countries, respectively.

Sorghum is expected to have a deficit of around 561,879, with the major contributor to that deficit being Sudan (614,442) followed by Egypt (75,567). Mozambique, Ethiopia and Malawi are among the countries which are projected

to have surpluses, with each of them expected to have positive production-consumption gap of 83,392; 24,984 and 23,784, respectively.

Out of the eighteen millet producing countries, eight are expected to experience deficits while ten are projected to post surpluses, with an overall deficit of 59,713 tonnes in the year 2016. Ethiopia will be leading the surplus producing countries with an estimated surplus of 13,858, while Sudan will be the country expected to post largest production-consumption gap of negative 86,948 tonnes.

The region will have a surplus of 773,592 tonnes in potatoes on account of the huge surpluses to be posted by Malawi, with Angola, Ethiopia and Rwanda also projected to have significant surpluses. A number of T-FTA member states will experience deficits, with Kenya, Egypt and Sudan forecasted to have larger deficits when compared to other economies projected to experience deficits.

Although production and consumption of soybeans within the 26-member region is relatively low, the region will however be self-sufficient with a projected surplus of around 66,850 tonnes on account of huge surpluses to be posted by South Africa. Countries which are projected to have significant surpluses are Rwanda and Malawi. Other countries are however expected to have soybeans deficits with Zimbabwe leading that pact followed by Uganda and then Zambia.

The surpluses expected in Maize, potatoes and soybeans point to a potential role for trade to promote food security in the T-FTA member economies. That is, if the envisioned T-FTA results in enhanced intra-T-FTA trade, the regional member economies will be able to provide for the food needs of their citizens in these three products. In such a scenario, the surplus producing economies can export their produce to the deficit nations. On the other hand, projected deficits in the remaining five products implies the need for the regional bloc (or member states) to work closely in implementing policies aimed at increasing productivity and production output.

3.4. Possible solutions to food security challenges and recommendations

In as much as food security means making food available and affordable to citizens of a country, tackling the food security issue necessarily involves more than one strategy. In fact, the perennial food shortages experienced by most African countries, especially some of the T-FTA countries means that a host of factors and challenges are at play in exacerbating this problem. Thus, a number of policies and strategies have to be implemented (individually and regionally) to deal with these challenges and improve food security for the region. An obvious strategy is increasing food production and improving yields. Another strategy is

improving access to food, which means providing markets, investing in infrastructure and providing employment opportunities. Further, sound macroeconomic policies including a clearly defined food security policy are also essential.

Thus, for the T-FTA countries, the pertinent question is how best they can achieve food security? The solution lies in increasing food availability, food access and food adequacy for all. Because the food insecurity in Africa (T-FTA countries included) is directly correlated with poverty, it is necessary to not only alleviate poverty but also create wealth for the target population. The following strategies follow from the definition of food security and its key elements of availability, access and utilization. They may be interpreted as policies that purely promote domestic food security but there is room for cooperative action in some like in the areas of promoting technological change and expanding markets.

3.4.1 Enhancing Food Supplies

Enhancing food supplies can be done via encouraging technological change, increasing the efficiency of irrigation, and improving natural resource management.

3.4.1.1 An underdeveloped agricultural sector

It is well known that one of the major challenges to food security in Africa is its underdeveloped agricultural sector that is characterized by over-reliance on primary agriculture, low fertility soils, minimal use of external farm inputs, environmental degradation, significant food crop loss both pre- and post-harvest, minimal value addition and product differentiation, and inadequate food storage and preservation that result in significant commodity price fluctuations. Rosegrant et al (2005) claims that ninety five percent of the food in Sub-Saharan Africa is grown under rain fed agriculture. This simply means that food production in T-FTA states is vulnerable to adverse weather conditions. There is an overall decline in farm input investment including fertilizers, seeds, and technology adoption. Kherallah (2002) further points to the fact that access to fertilizer use in Africa is constrained by market liberalization and trade policies that increase fertilizer prices relative to commodity prices, limited access to markets and infrastructure, limited development of output, input and credit markets, poverty and cash constraints that limit farmer's ability to purchase fertilizer and other inputs. The soils continue to degrade leading to a reduction in the productivity of the farms. Some of the causes of soil fertility depletion in Africa include the limited adoption of fertilizer replenishment strategies and soil and water conservation measures; the decline in the use and length of fallow periods; expansion of agricultural production into marginal and fragile areas;

and the removal of vegetation through overgrazing, logging, development, and domestic use. Other causes include rapid population growth, limited access to agriculture-related technical assistance, and lack of knowledge about profitable soil fertility management practices leading to expansion into less-favorable lands. A significant amount of the food is lost through pre- and post-harvest losses. The tropical climate makes foods produced in these regions prone to pests and diseases. Poor handling and storage further increase the post-harvest losses. Management of the African agricultural system is further complicated by the existence of diverse heterogeneous systems.

3.4.2 Improving Access to Food

Strengthening and expanding of markets and agribusinesses, investing in infrastructure, fostering broad participation and provision of education and health services are some of the ways to improve the people's access to food.

3.4.2.1 Barriers to market access

Access to markets is the other major hurdle that many smallholders in T-FTA countries have to overcome every time when they decide to offer their agrifood products on the markets. In the case of the countries under study, the problem is even manifold and includes: poor infrastructure and barriers in penetrating the market caused by their limited resource base, lack of information, lack of or inadequate support institutions and poor policies in place among other factors. Poor infrastructure literally limits the markets to which farmers can profitably take their produce by increasing the cost of transportation, and hence also acts as a barrier to market penetration. Other barriers include market standards, limited information, requirements for large initial capital investments and limited product differentiation. While almost any of the farm produce sells at the village level market, consumers are quick to discriminate against produce that is comparatively inferior, hence farmers have, over time, adapted to selling only that which will sell. This is a highly subjective process that has worked traditionally. However, when the same farmer wants to sell the produce to high-end markets, then subjective standards no longer work. The farmer is forced to meet objective standards such as size, quantity, and quality. The quality aspect of the standards is of major concern and gets more rigid where the food crop is for export. It is as detailed as the nutritional content per serving size, allowable bacterial load, and residual pesticide. Some markets have zero tolerance on the latter. The other aspect of the problem is the variation in the standards between markets. They are so varied that they necessitate the farmer to identify the market before production. Yet, the markets are not static. The volumes required and sometimes the standards vary. The farmers' risk is increased. Apart from the fact that standards in themselves provide a bottleneck as to the crop and amount thereof that a farmer can produce, standards also put a strain as to who

can produce. Lastly, Africa's high export costs limit farmer's access to the international markets. In order to meet the standards there is need for information, capital, technology and expertise that the smallholder farmers have no capacity to meet without external assistance.

3.4.3 Improving food utilization

Integrating household food security and nutrition policy into rural development operations will assist in reducing hunger and malnutrition. T-FTA countries are encouraged to utilise the FEWSNET¹³ agricultural portal. By linking relevant databases being maintained by international agencies and other institutions, the international community will be able to better monitor food security trends at a global level and facilitate the mobilization of resources for all countries, paying particular attention to countries facing an inadequate and deteriorating food security and nutrition situation.

Conclusion

The research paper analysed the impact of free trade area (FTA) arrangements in three regional economic communities (RECs), namely the Common Market for Eastern and Southern Africa (COMESA), the East African Community (EAC) and the Southern African Development Community (SADC). The analyses focused on trade in eight agrifood products, namely maize, rice, wheat, cassava, sorghum, millet, potatoes and soya beans for the period covering 2005 to 2010. The study relied both on trade related indices and a crude estimate of national food requirements.

Changes in intra-regional trade shares shows that Kenya and Uganda are the two countries whose intra-regional trade in at least five of the eight products increased during the reviewed period. These are the countries which have integrated the most as they managed to increase intra-regional trade amongst their respective regional trade blocs in at least five of the eight agrifoods products than other countries. On the other hand, Madagascar, Namibia and South Africa are some countries whose intra-regional trade in at least three of the eight products has declined.

The analysis done with regards to changes in nation food requirements suggests that the T-FTA bloc is projected to have surplus (production less consumption) in three products namely maize, potatoes and soybeans in 2016; while there will be expected deficits in the remaining five products in the same year. The surpluses expected in maize, potatoes and soybeans point to a potential role for trade to promote food security in the T-FTA member economies. That is, if the

¹³ <http://www.fews.net>

envisioned T-FTA resulted in enhanced intra-T-FTA trade, the regional member economies will be able to provide for the food needs of their citizens in these three products. In such a scenario, the surplus producing economies can export their produce to the deficit nations. On the other hand, projected deficits in the remaining five products implies the need for the regional bloc (or member states) to work closely in implementing policies aimed at increasing productivity and production output.

References

1. W. Ayres, McCalla A. (1996) Rural Development, Agriculture, and Food Security, *Finance & Development*, 8-11.
2. Bello. (2004) *Food security, agriculture efficiency and regional integration*, University of the Philippines at Los Baños College, Laguna
3. Department for International Development (DFID). (2013) *Can trade improve food security?* Trade and Investment Analytical Paper 9 of 18.
4. International Food Policy Research Institute (IFPRI). (2002) *Reaching sustainable food security for all by 2020: Getting the priorities and responsibilities right*, Washington, D.C:IFPRI
5. M. Hossain, Naher F, Shahabuddin Q. (2005) Food security and nutrition in Bangladesh: progress and determinants, *Journal of Agricultural and Development Economics* 2(2), 103-132.
6. F. Johnston, Mellor J W. (1961) The role of agriculture in economic development, *American Economic Review* 5, 566-593.
7. P. Khandelwal. (2005) *COMESA and SADC: Prospects and Challenges for Regional Trade Integration*, UNU-CRIS Occasional Papers, 0-2005/1.
8. J. Kherallah. (2002) *Reforming Agricultural Markets in Africa*, IFPRI. The Johns Hopkins University Press
9. U. Kracht, Schulz M. (1999) *Food Security and Nutrition at the Threshold of the Third Millennium: Conclusions, Outlook and the Emerging Policy Agenda*. In Kracht, Uwe and Manfred Schulz (eds.) *Food Security and Nutrition, The Global Challenge*. c. 1999. New York: St. Martin's Press, Inc.
10. A.Lewis. (1950) The Industrialization of the British West Indies, *Caribbean Economic Review*, 38, 16-17.
11. A.F. McCalla. (1994) *Agriculture and Food Needs to 2025: Why We Should Be Concerned*, Sir John Crawford Memorial Lectures. The Consultative Group on International Agricultural Research.
12. G. M. Meier (1989) *Agriculture's Contribution to Development-Note*. In Meier, Gerald M. *Leading Issues in Economic Development*. Oxford University Press.

13. J.W. Mellor, Johnston B. F. (1984) The World Food Equation: Interrelations among Development, Employment, and Food Consumption, *Journal of Economic Literature*, 22, 531-574.
14. Mellor, J.W. (1976). *The New Economics of Growth*, Ithaca, NY: Cornell University Press.
15. Ohkawa, K. (1956) Economic Growth and Agriculture, *Annals Hitotsubashi Academy*, 45-60.
16. M.W. Rosegrant, Agcaoili. M. (1994) *Global and Regional Food Demand, Supply, and Trade Prospects to 2010*, Paper presented at roundtable meeting. International Food Policy Research Institute.
17. M.W. Rosegrant, Paisner M, Meijer S. and Witcover J. (2001) *2020 Global Food Outlook, Trends, Alternatives, and Choices*, International Food Policy Research Institute (IFPRI).
18. M.W. Rosegrant, Sombilla M, Perez N. (1995) *Global Food Projections to 2020: Implications for Investment*, Food, Agriculture and the Environment Discussion Paper IFPRI, Working Paper no. 5. Washington, D.C.
19. A.Timmer, Peter, Falcon W, Pearson S. (1983). *Food Policy Analysis A World Bank Publication*. Baltimore: The Johns Hopkins University Press.
20. M. Todaro. (1997). *Economic Development*. Massachusetts: Addison-Wesley Reading.
21. Y. Tsikata. (1999) *Southern Africa: Trade, Liberalization and Implications for a Free Trade Area*, TIPS Annual Forum, available on the web at
22. http://www.acp-eustrade.org/documents/113_tsikata_tips.pdf.

Annex 1: 2016 projected production and consumption levels**Table A1: Project production and consumption levels 2016 (Tonnes)****A: Maize**

	T-FTA Member	Production	Consumption	Supply–Demand Gap
		Projected 2016 (Tonnes)	Projected 2016 (Tonnes)	Projected 2016 (Tonnes)
1	Angola	61,824	47,129	14,694
2	Botswana	25,820	302	25,518
3	Burundi	-1,290	5,596	-6,886
4	Comoros	534	191	343
5	DRC	230	58,667	-58,437
6	Djibouti	0	0	0
7	Egypt	26,629	368,403	-341,775
8	Eritrea	10,413	1,105	9,309
9	Ethiopia	117,354	220,162	-102,807
10	Kenya	101,780	150,816	-49,036
11	Lesotho	17,377	3,395	13,982
12	Libya ⁺	-122	134	-256
13	Madagascar	4,534	19,499	-14,965
14	Malawi	1,017,232	127,079	890,153
15	Mauritius	276	38	238
16	Mozambique	278,579	69,244	209,335
17	Namibia	5,235	1,835	3,399
18	Rwanda	82,692	10,464	72,228
19	Seychelles	0	0	0
20	South Africa	849,808	339,438	510,371
21	Sudan	123,431	3,552	119,879
22	Swaziland	9,209	1,021	8,188
23	Tanzania	307,308	153,971	153,337
24	Uganda	42,626	64,360	-21,734
25	Zambia	531,266	87,669	443,597
26	Zimbabwe	173,063	28,031	145,032
	Total	3,785,808	1,762,101	2,023,707

B: Rice

	T-FTA Member	Production	Consumption	Supply-Demand Gap
		Projected 2016 (Tonnes)	Projected 2016 (Tonnes)	Projected 2016 (Tonnes)
1	Angola	2,123	647	1,476
2	Botswana	0	0	0
3	Burundi	3,081	4,055	-975
4	Comoros	422	792	-371
5	DRC	351	17,816	-17,466
6	Djibouti	0	0	0
7	Egypt	-343,070	377,489	-720,559
8	Eritrea	0	0	0
9	Ethiopia	4,731	1,277	3,454
10	Kenya	10,779	3,045	7,733
11	Lesotho	0	0	0
12	Libya ⁺	0	0	0
13	Madagascar	284,600	211,898	72,702
14	Malawi	41,082	5,171	35,911
15	Mauritius	0	0	0
16	Mozambique	35,013	6,898	28,115
17	Namibia	0	0	0
18	Rwanda	4,310	4,302	8
19	Seychelles	0	0	0
20	South Africa	-97	108	-205
21	Sudan	1,382	1,469	-87
22	Swaziland	-1	2	-3
23	Tanzania	-8,138	59,479	-67,616
24	Uganda	13,703	18,823	-5,120
25	Zambia	9,878	6,851	3,027
26	Zimbabwe	-4	139	-143
Total		60,145	720,263	-660,118

C: Wheat

	T-FTA Member	Production	Consumption	Supply–Demand Gap
		Projected 2016 (Tonnes)	Projected 2016 (Tonnes)	Projected 2016 (Tonnes)
1	Angola	114	392	-278
2	Botswana	0	6	-6
3	Burundi	23	541	-518
4	Comoros	50	413	-362
5	DRC	0	0	0
6	Djibouti	0	0	0
7	Egypt	-157,662	582,129	-739,791
8	Eritrea	14,455	1,942	12,513
9	Ethiopia	182,613	211,722	-29,109
10	Kenya	62,048	23,708	38,340
11	Lesotho	2,870	475	2,396
12	Libya ⁺	-3,114	6,352	-9,466
13	Madagascar	0	672	-671
14	Malawi	631	136	495
15	Mauritius	0	0	0
16	Mozambique	63	156	-93
17	Namibia	439	584	-146
18	Rwanda	21,344	3,497	17,846
19	Seychelles	0	0	0
20	South Africa	-78,213	85,298	-163,511
21	Sudan	32,363	42,958	-10,595
22	Swaziland	74	10	64
23	Tanzania	-6,654	4,812	-11,466
24	Uganda	1,494	2,114	-619
25	Zambia	13,938	32,992	-19,055
26	Zimbabwe	-15,808	33,024	-48,832
Total		71,069	1,033,932	-962,863

D: Cassava

	T-FTA Member	Production	Consumption	Supply-Demand Gap
		Projected 2016 (Tonnes)	Projected 2016 (Tonnes)	Projected 2016 (Tonnes)
1	Angola	902,807	691,034	211,773
2	Botswana	0	0	0
3	Burundi	-82,370	20,352	-102,722
4	Comoros	-265	2,149	-2,414
5	DRC	15,014	772,599	-757,585
6	Djibouti	0	0	0
7	Egypt	0	0	0
8	Eritrea	0	0	0
9	Ethiopia	0	0	0
10	Kenya	102,384	31,775	70,608
11	Lesotho	0	0	0
12	Libya ⁺	0	0	0
13	Madagascar	9,080	142,321	-133,242
14	Malawi	336,046	135,974	200,072
15	Mauritius	58	9	49
16	Mozambique	-104,591	262,064	-366,655
17	Namibia	0	0	0
18	Rwanda	413,560	68,388	345,172
19	Seychelles	-2	3	-5
20	South Africa	0	0	0
21	Sudan	619	581	38
22	Swaziland	0	0	0
23	Tanzania	-181,042	227,242	-408,284
24	Uganda	-46,935	256,992	-303,927
25	Zambia	21,018	57,673	-36,655
26	Zimbabwe	-748	6,152	-6,900
Total		1,384,633	2,675,309	-1,290,676

E: Sorghum

	T-FTA Member	Production	Consumption	Supply-Demand Gap
		Projected 2016 (Tonnes)	Projected 2016 (Tonnes)	Projected 2016 (Tonnes)
1	Angola	0	0	0
2	Botswana	6,287	1,031	5,256
3	Burundi	3,680	4,083	-402
4	Comoros	-30	237	-267
5	DRC	0	0	0
6	Djibouti	0	0	0
7	Egypt	-29,735	45,832	-75,567
8	Eritrea	-5,962	10,028	-15,990
9	Ethiopia	177,889	152,904	24,984
10	Kenya	20,223	6,611	13,613
11	Lesotho	2,400	559	1,840
12	Libya ⁺	0	0	0
13	Madagascar	5	59	-53
14	Malawi	26,287	2,504	23,784
15	Mauritius	0	0	0
16	Mozambique	96,179	12,788	83,392
17	Namibia	80	145	-64
18	Rwanda	-9,603	8,519	-18,122
19	Seychelles	0	0	0
20	South Africa	17,856	6,742	11,114
21	Sudan	-396,191	218,251	-614,442
22	Swaziland	3	7	-4
23	Tanzania	26,087	35,086	-8,999
24	Uganda	10,460	24,410	-13,950
25	Zambia	3,623	991	2,633
26	Zimbabwe	21,882	2,515	19,368
Total		-28,577	533,302	-561,879

F: Millet

	T-FTA Member	Production	Consumption	Supply–Demand Gap
		Projected 2016 (Tonnes)	Projected 2016 (Tonnes)	Projected 2016 (Tonnes)
1	Angola	-3,328	5,364	-8,693
2	Botswana	1,081	36	1,045
3	Burundi	1,068	557	512
4	Comoros	283	1,447	-1,164
5	DRC	0	0	0
6	Djibouti	0	0	0
7	Egypt	0	0	0
8	Eritrea	1,798	1,994	-197
9	Ethiopia	43,868	30,010	13,858
10	Kenya	10,009	3,829	6,180
11	Lesotho	0	0	0
12	Libya ⁺	504	320	184
13	Madagascar	0	0	0
14	Malawi	4,559	1,208	3,351
15	Mauritius	0	0	0
16	Mozambique	11,210	1,630	9,580
17	Namibia	-1,206	1,397	-2,604
18	Rwanda	809	283	526
19	Seychelles	0	0	0
20	South Africa	-617	240	-857
21	Sudan	-51,044	35,905	-86,948
22	Swaziland	0	0	0
23	Tanzania	1,598	9,526	-7,928
24	Uganda	37,726	40,096	-2,370
25	Zambia	8,554	2,130	6,424
26	Zimbabwe	10,876	1,488	9,388
Total		77,749	137,462	-59,713

G: Potatoes

	T-FTA Member	Production	Consumption	Supply-Demand Gap
		Projected 2016 (Tonnes)	Projected 2016 (Tonnes)	Projected 2016 (Tonnes)
1	Angola	169,761	37,241	132,520
2	Botswana	0	0	0
3	Burundi	-3,293	1,009	-4,303
4	Comoros	69	27	42
5	DRC	338	4,965	-4,627
6	Djibouti	0	0	0
7	Egypt	151,395	179,077	-27,682
8	Eritrea	-1,181	188	-1,369
9	Ethiopia	79,763	32,760	47,003
10	Kenya	-76,271	34,209	-110,480
11	Lesotho	852	4,180	-3,328
12	Libya ⁺	-3,588	13,958	-17,546
13	Madagascar	2,053	10,779	-8,726
14	Malawi	884,775	134,329	750,447
15	Mauritius	1,261	469	792
16	Mozambique	4,452	4,912	-460
17	Namibia	1,656	331	1,325
18	Rwanda	111,632	66,532	45,101
19	Seychelles	0	0	0
20	South Africa	67,475	66,169	1,306
21	Sudan	-6,553	15,438	-21,991
22	Swaziland	111	130	-20
23	Tanzania	20,195	30,060	-9,866
24	Uganda	23,507	34,318	-10,811
25	Zambia	14,577	756	13,821
26	Zimbabwe	4,020	1,579	2,441
Total		1,447,008	673,416	773,592

H: Soyabeans

	T-FTA Member	Production	Consumption	Supply–Demand Gap
		Projected 2016 (Tonnes)	Projected 2016 (Tonnes)	Projected 2016 (Tonnes)
1	Angola	0	0	0
2	Botswana	0	0	0
3	Burundi	120	138	-18
4	Comoros	690	645	44
5	DRC	0	0	0
6	Djibouti	0	0	0
7	Egypt	2,319	1,613	707
8	Eritrea	0	0	0
9	Ethiopia	1,486	431	1,055
10	Kenya	-113	116	-229
11	Lesotho	0	0	0
12	Libya ⁺	0	0	0
13	Madagascar	-1	2	-3
14	Malawi	7,347	2,736	4,612
15	Mauritius	0	0	0
16	Mozambique	0	0	0
17	Namibia	0	0	0
18	Rwanda	9,239	2,347	6,892
19	Seychelles	0	0	0
20	South Africa	106,964	13,438	93,527
21	Sudan	0	0	0
22	Swaziland	0	0	0
23	Tanzania	462	146	316
24	Uganda	3,824	17,701	-13,878
25	Zambia	16	2,781	-2,765
26	Zimbabwe	3,432	26,841	-23,409
Total		135,784	68,935	66,850

Analyse de la relation entre consommation d'énergie et croissance économique au Togo

Abdou-Fataou TCHAGNAO¹⁴

Résumé : Cette étude a pour objectif de tester la thèse conservatrice selon laquelle la croissance économique explique le niveau de consommation d'énergie et non l'inverse. En estimant le modèle à correction d'erreur (ECM) sur des séries cointégrées, l'analyse montre une relation positive et significative entre la croissance économique et la consommation d'énergie confirmant ainsi la thèse conservatrice. Un tel résultat infirme les conclusions de neutralité obtenue par Wolde-Rufael (2005) et Akinlo et al. (2008) pour le Togo. En termes d'implication, les résultats suggèrent que le Togo doit impérativement s'attendre à une augmentation de la consommation d'énergie à moyen et long terme au regard de la dynamique de croissance économique actuelle et des orientations de développement en cours. Ceci nécessite des investissements soutenus pour accroître l'offre et la recherche de nouvelles sources d'énergie à côté de celles existantes.

Mots clés : Croissance économique, Consommation d'énergie – Modèle à Correction d'erreur

Classification JEL: O13; P28; Q43

Energy consumption and economic growth in Togo

Abstract: This study aims to test the conservative thesis that Economic Growth explains the level of Energy Consumption and not the reverse. By estimating the Error Correction Model (ECM) on cointegrated series, the analysis shows a positive and significant relationship between Economic Growth and Energy Consumption, confirming the conservative thesis. This result reverses the neutrality thesis findings by Wolde-Rufael (2005) and Akinlo et al. (2008) for Togo. In terms of involvement, the results suggest that Togo must always expect an increase in Energy Consumption in the medium and long term in view of the current Economic Growth momentum and ongoing development guidelines. This requires sustained investment to increase the supply and finding new sources of energy alongside existing ones.

Keywords: Economic Growth, Energy Consumption - Error Correction Model (ECM)

JEL Classification: O13; P28; Q43

¹⁴ Enseignant-chercheur à la Faculté des Sciences Economiques et de Gestion à l'Université de Kara (TOGO), BP. 43- Kara – Tel : (00228) 90 29 76 87 Email : tchagnao2004@yahoo.fr

Introduction

Depuis le Sommet de la Terre de Rio de Janeiro en 1992 et le Protocole de Kyoto en 1997, qui stipulent que la dégradation de l'environnement et les changements climatiques sont liés à la consommation d'énergie fossile, certains experts suggèrent de réduire la consommation mondiale d'énergie. Cette proposition a engendré des inquiétudes au niveau des différentes économies. De leur côté, les pays développés craignent une baisse du niveau de vie de la population en raison de la consommation plus faible d'énergie. Les pays en développement quant à eux, perçoivent cette décision comme une menace pouvant freiner leur croissance économique. Ainsi, la croissance économique est vue comme le facteur important à prendre en compte dans la prévision des changements en matière de consommation mondiale d'énergie. À cet égard, l'analyse de la relation entre consommation d'énergie et croissance économique a reçu une attention particulière au cours de ces dernières décennies. La question qui a suscité l'intérêt chez les économistes et qui continue de nourrir les débats est de savoir si la croissance économique favorise la consommation d'énergie ou c'est l'énergie qui est un stimulus pour la croissance économique. Autrement dit, quel est le sens de causalité entre ces deux grandeurs? Plusieurs études ont tenté d'apporter une réponse à cette interrogation (Wolde-Rufael, 2005; Odhiambo, 2009, 2010; Belloumi, 2009). Cependant, en dépit de l'importance des travaux consacrés à la relation entre ces deux agrégats économiques, les études empiriques ne sont pas parvenues jusqu'à ce jour à un consensus quant à la direction de cette causalité surtout dans les pays en développement. Par exemple, une étude réalisée dans quatre pays d'Afrique subsaharienne montre une relation unidirectionnelle allant de la consommation d'énergie à la croissance économique uniquement dans le cas du Kenya et une absence de causalité entre la consommation d'énergie et la croissance dans trois pays, le Bénin, le Congo et le Zimbabwe (Dogan, 2014). De leur côté, Adhikari et Chen (2012) examinent cette même relation dans trois groupes de pays en développement. Ils trouvent une forte relation allant de la consommation d'énergie à la croissance économique pour les pays à revenus moyens supérieurs et les pays à revenus moyens inférieurs et une forte corrélation allant de la croissance économique à la consommation d'énergie pour les pays à faibles revenus.

Certes, identifier le sens de causalité entre la consommation d'énergie et la croissance économique a d'importantes implications en matière de politiques économiques. Formellement, si la consommation d'énergie est un élément essentiel de la croissance économique, les politiques visant les « économies d'énergie » qui en réduisent la consommation peuvent affecter négativement la croissance du produit intérieur brut (PIB). Pour un pays comme le Togo, cette

connaissance fournirait une orientation visant à mieux cibler les investissements porteurs de croissance économique.

En effet, à l'instar de nombreux pays d'Afrique subsaharienne, le Togo fait face à un problème énergétique très alarmant dû à la forte croissance démographique et à la dépendance du pays en énergie avec une importation estimée à 63% en 2013 (Ministère des Mines et de l'Énergie, 2014). La couverture nationale en énergie n'est que de 28%. Les politiques de développement en cours conjuguées à la forte croissance démographique estimée à 2,84% par an ont occasionné ces dernières décennies, une forte demande en énergie non seulement de la part des entreprises mais aussi des ménages. Selon les statistiques du Ministère, la demande énergétique connaît une croissance de l'ordre de 8% par an. Cependant, cette demande indispensable à la réalisation des activités économiques n'est satisfaite qu'en partie ou de façon discontinue dans le temps. Les contraintes liées à l'offre énergétique créent des délestages qui poussent certaines entreprises à ralentir leurs activités de production et parfois à délocaliser. Elles empêchent d'autres entreprises, surtout les plus grandes à s'installer en raison des capacités très réduites de l'offre énergétique. Du côté des ménages, l'absence des installations contraint ceux-ci à assurer eux-mêmes le financement desdites installations. Cette situation engendre non seulement une paupérisation des ménages à faible revenu mais aussi provoque l'essor d'autres formes d'installations souvent qualifiées de « *toiles d'araignée*¹⁵ » dans les bidonvilles avec leurs conséquences socio-économiques.

De plus, le secteur énergétique est aussi responsable en partie de l'acidification de l'air, des sols et des eaux, de l'accumulation des déchets solides et de la pollution à l'échelle locale comme planétaire. En conséquence, dans une stratégie de développement durable, la question énergétique est une priorité, ce qui explique que la plupart des pays adoptent aujourd'hui, des politiques visant les économies d'énergies ainsi que des politiques d'encouragement et de développement des technologies faisant appel à des énergies renouvelables. De telles politiques s'appuient normalement sur des analyses de la relation liant la consommation d'énergie à la croissance économique.

Ainsi l'objectif du présent article est de tester la *thèse conservatrice* qui établit une relation allant de la croissance économique à la consommation d'énergie. Cette étude basée sur un pays en développement contribuera à alimenter les débats et surtout à affiner la nature des liens qui existent entre ces deux grandeurs économiques dans le cas d'un pays à faible revenu.

La suite de l'article est organisée de la manière suivante. La deuxième section est consacrée à la revue de la littérature sur la relation entre l'énergie et la croissance

¹⁵ Entassement de fil électrique reliant les poteaux de la compagnie d'électricité aux domiciles des ménages. Sur un même poteau il peut y avoir entre 50 et 60 fils conducteurs.

économique ; la troisième section fournit la méthodologie de l'étude ; la quatrième section expose les résultats de l'étude. Enfin, la conclusion synthétise les résultats et fournit quelques pistes de recherches.

1. Energie et croissance économique : point des débats théoriques et empiriques

1.1. Les débats théoriques

Depuis l'article fondateur de Kraft et Kraft (1978), qui a établi une causalité unidirectionnelle allant de la croissance du PIB à la consommation d'énergie aux Etats-Unis pour la période allant de 1947 à 1974, la relation de cause à effet entre la consommation d'énergie et la croissance économique est devenue un vaste champ d'étude dans la littérature économique. Plusieurs méthodes ou techniques ainsi que différents échantillons ont été utilisés pour tenter d'établir une relation entre ces deux grandeurs. Cependant, les résultats empiriques de ces études ont été disparates et parfois très contradictoires. Actuellement, quatre points de vue se dégagent en ce qui concerne le sens de causalité entre la consommation d'énergie et la croissance économique. Le premier point de vue connu sous le nom d'« *hypothèse de croissance* » montre que la consommation d'énergie joue un rôle important dans la croissance économique. Une telle hypothèse implique que la croissance économique est tributaire du niveau de consommation d'énergie. En conséquence, une diminution de cette consommation peut freiner le taux de croissance économique. Sous cet angle, on peut considérer l'énergie comme un facteur de production au même titre que le capital et le travail. Le second point de vue, qu'on peut qualifier d'« *hypothèse conservatrice* », affirme une causalité unidirectionnelle allant de la croissance économique à la consommation d'énergie. Il suggère que les politiques de conservation d'énergie peuvent n'avoir que peu ou pas d'impact sur la croissance économique. L'hypothèse conservatrice est soutenue dans le cas où, c'est plutôt l'augmentation du PIB qui entraîne une augmentation de la consommation d'énergie. Le troisième point de vue, qu'on peut qualifier d'« *hypothèse de neutralité* », estime qu'il n'y a aucun lien de causalité entre la consommation d'énergie et la croissance économique. En d'autres termes, la consommation d'énergie et la croissance économique sont indépendantes l'une par rapport à l'autre. Enfin, le quatrième point de vue ou l'« *hypothèse de rétroaction* » conclut qu'il existe une relation bidirectionnelle entre la consommation d'énergie et la croissance économique reflétant l'interdépendance et la possibilité d'une complémentarité associée aux politiques d'énergie et de la croissance économique. Ces différents points de vue contradictoires ont eu comme effet de susciter des travaux empiriques pour tenter de trouver la relation entre ces deux grandeurs économiques.

1.2. Les études empiriques

Les études empiriques sur la relation entre la consommation d'énergie et la croissance économique pour les pays développés et surtout en développement fournissent des résultats très mitigés. Amanpour et Massamba (2005) démontrent l'existence de *l'hypothèse de conservation* pour le Congo en utilisant l'approche de cointégration et le mécanisme à correction d'erreur sur la période 1960 à 1999. Akinlo (2009) teste empiriquement la relation de causalité entre la consommation d'énergie et la croissance économique et révèle que *l'hypothèse de croissance* a lieu au Nigeria en utilisant l'approche de Johansen et la méthode d'Engle-Granger entre 1980-2006. Ziramba (2009) aboutit à *l'hypothèse de neutralité* dans une étude de cas portant sur l'Afrique du Sud sur la période 1980 à 2005. Adom (2011) trouve une relation allant de la croissance économique à la consommation d'énergie au Ghana en utilisant les tests de causalité de Granger. Contrairement aux travaux de Akinlo (2009) l'étude de Akinwale et al. (2013) montre l'existence de l'hypothèse de conservation au Nigeria en utilisant les tests de racine unitaire de Dickey-Fuller Augmenté (ADF), l'analyse VAR, le mécanisme à correction d'erreur, et le test de causalité au sens de Granger au cours de 1970 à 2005. Wandji (2013) révèle une relation unidirectionnelle allant de la consommation d'énergie à la croissance économique au Cameroun en utilisant plusieurs techniques notamment le test de racine unitaire de Dickey-Fuller, le test de causalité de Granger et l'ECM pour la période 1971-2009.

En dehors de ces travaux réalisés sur les pays africains, plusieurs études se sont également intéressées à cette causalité dans d'autres pays ou groupes de pays. Par exemple, en utilisant l'approche de causalité au sens de Granger sur la période 1954 à 1993, Cheng et Lai (1997) aboutissent à *l'hypothèse de conservation* pour le Taiwan. Lee et Chang (2007) montrent pour leur part que l'hypothèse de croissance existe lorsque la quantité d'énergie utilisée est faible et celle de neutralité apparaît si le niveau de consommation d'énergie est élevé. Warr et Ayres (2010) trouvent que la consommation d'énergie a un impact positif sur la croissance économique aux Etats-Unis. Lotfipour et al. (2010) montrent la présence de l'hypothèse de conservation en Iran au cours de 1967-2007. Par contre, Pao et al. (2011), et Pao et Tasai (2011) révèlent que la causalité va de la croissance économique à la consommation d'énergie dans le cas de la Russie et du Brésil.

Une étude plus ancienne d'Ebohon (1996) s'est concentrée sur les pays d'Afrique subsaharienne et trouve une causalité bidirectionnelle entre la consommation d'énergie et la croissance en Tanzanie et au Nigeria en utilisant les Tests de causalité de Granger. En outre, Wolde-Rufael (2005) dans ses travaux soutient *l'hypothèse de conservation* pour l'Algérie, la République Démocratique du Congo, l'Egypte, le Ghana, la Côte-d'Ivoire, le Maroc et le

Nigeria, celle de *croissance* pour le Cameroun et *l'hypothèse de neutralité* pour la République du Congo, le Kenya, le Sénégal, l'Afrique du Sud, le Soudan, le Togo, la Tunisie et le Zimbabwe. Akinlo (2008) montre qu'il existe une causalité dans les deux sens entre la consommation d'énergie et la croissance économique pour la Gambie, le Ghana, le Soudan, le Sénégal et le Zimbabwe ; une relation allant de la croissance à la consommation d'énergie au Cameroun ; *l'hypothèse de croissance* au Congo et aucune relation de causalité en Côte d'Ivoire, au Kenya, au Nigeria et au Togo. Odhiambo (2010) trouve une causalité allant dans le sens de la consommation d'énergie à la croissance économique dans le cas du Kenya et de l'Afrique du Sud. Ezzo (2010) examine la relation de long terme et le lien de causalité entre la consommation d'énergie et la croissance économique pour sept groupes de pays africains. Il conclut à l'existence de *l'hypothèse de rétroaction* en Côte d'Ivoire, à *l'hypothèse de conservation* au Congo et montre également qu'il existe une relation de long terme entre ces deux variables au Cameroun, au Congo, en Côte d'Ivoire et en l'Afrique du Sud.

Ozturk et al. (2010) examinent le lien de causalité entre la consommation d'énergie et la croissance économique dans les pays à faibles revenus et les régions à revenus élevés de 1971-2005. Ils aboutissent à la présence des hypothèses de *conservation* et de *rétroaction* pour les pays à faibles revenus et les pays à revenus élevés respectivement. Eggoh et al. (2011) concluent à une causalité bidirectionnelle entre la consommation d'énergie et la croissance économique pour 21 pays africains au cours des années 1970-2006. Al-Mulali et Sub (2012) soutiennent également l'hypothèse de rétroaction pour 30 Pays d'Afrique subsaharienne en appliquant la méthode de cointégration en panel et la méthode à correction d'erreur entre 1980 et 2008. Enfin, une étude récente de Behmiri et Manson (2013), en utilisant la méthode de causalité au sens de Granger entre les pays exportateurs et importateurs de pétrole d'Afrique subsaharienne pour la période 1985-2011, montre une relation allant dans le sens de la consommation d'énergie à la croissance pour les premiers et l'hypothèse de rétroaction pour les seconds.

Comme on peut bien le remarquer, il n'existe pas jusque-là de consensus sur la relation entre la consommation d'énergie et la croissance économique dans les pays. Cependant, une analyse des études empiriques permet de s'apercevoir que *l'hypothèse conservatrice* tend à être soutenue pour la majorité des pays en développement surtout ceux à faibles revenus. Paradoxalement, les travaux antérieurs portant sur le Togo concluent à une absence de relation entre la consommation d'énergie et la croissance économique. Autrement dit ces études tendent à soutenir la *thèse de neutralité* pour le Togo.

Formellement, si les résultats de ces travaux antérieurs sont confirmés, on pourrait se demander de savoir à quoi serviraient les politiques énergétiques au Togo ? Autrement dit, le Togo a-t-il intérêt à investir dans le secteur

énergétique ? Les résultats de cette étude contribueront à mieux clarifier la relation qui existe entre la consommation d'énergie et la croissance économique au Togo.

2. Méthodologie de l'étude

2.1. Spécification du modèle d'analyse

Notre travail ambitionne de contribuer au débat existant sur la place de l'énergie dans la croissance par l'analyse de la relation entre la consommation d'énergie et la croissance économique au Togo. Il s'agit dans cette étude de tester l'hypothèse qui soutient que la relation entre les deux va de la croissance économique à la consommation d'énergie ; une relation qui a été suffisamment établit dans certains pays surtout à faibles revenus par de nombreux auteurs [Amanpour et Massamba, 2005 ; Adhikari et Chen, 2012 ; Akinwale et al., 2013]. Formellement, l'hypothèse conservatrice est soutenue si la consommation d'énergie est une fonction du niveau de la croissance économique. Dans cette relation, la consommation d'énergie apparaît comme la variable expliquée et la croissance économique la variable explicative. Cette relation peut être traduite par l'équation suivante :

$$E_t = f(PIB_t) \quad (1)$$

Dans cette relation (1), E désigne la consommation d'énergie en Kwh, PIB , le Produit intérieur brut et t indique le temps.

Certes, le niveau de consommation d'énergie dans un pays peut être influencé par le taux de croissance économique mais aussi par d'autres grandeurs économiques. En général, la taille de la population, l'accumulation du capital et le prix de l'énergie sont des variables susceptibles d'influencer le niveau de consommation d'énergie dans un pays. En effet, lorsque la population d'un pays croît, la demande énergétique augmente pour les besoins de consommation domestique. De même, l'accumulation du capital peut être à l'origine d'une consommation élevée d'énergie. En particulier, dans les pays à faibles revenus cette consommation d'énergie liée à l'accumulation du stock de capital peut être élevée pour la simple raison que ceux-ci n'ont pas suffisamment de moyens pour adopter des technologies moins consommatrices d'énergie.

S'agissant de l'évolution du prix de l'énergie, elle peut avoir un effet ambigu sur la croissance économique et cet effet peut dépendre de la nature du pays qu'il soit importateur ou exportateur net d'énergie.

Pour un pays exportateur d'énergie, l'augmentation du prix de l'énergie améliore la balance courante et peut être source d'une croissance économique. Sous l'hypothèse conservatrice, la croissance qui en résulte contribuera à une

consommation plus importante de l'énergie. Il apparaît sous cet angle, une relation positive entre l'évolution du prix de l'énergie et la consommation qui en découle. Par contre, dans le cas d'un pays importateur d'énergie, une hausse du prix de l'énergie affecte négativement la balance courante dans la mesure où, pour satisfaire le niveau souhaité de consommation d'énergie, le pays sera contraint de dépenser plus. Ce qui se traduit par une sortie massive de devises pouvant affecter négativement le taux de croissance économique. Certes, si le pays a la possibilité de développer d'autres sources alternatives, il peut réduire ses importations. Ce qui contribuera à annuler ou atténuer les effets de la hausse des prix sur la consommation d'énergie.

Ainsi, la relation (1) peut être réécrite sous la forme d'une fonction de demande¹⁶ d'énergie suivant les travaux de Masih (1998), Asafu-Adjaye (2000), Fatai et al. (2004) et Oh et Lee (2004). Cette fonction est de la forme suivante :

$$\text{Log}E_t = b_0 + b_1 \text{Log}PIB_t + b_2 \text{Log}K_t + b_3 \text{Log}L_t + b_4 \text{Log}Inf_t + \eta_t \quad (2)$$

Avec $b_1 > 0$, $b_2 > 0$, $b_3 > 0$, $b_4 < 0$ Cette équation (2) permet de régresser la consommation d'énergie sur le produit intérieur brut (PIB), le stock de capital (K), la taille de la population (L) et l'indice des prix de l'énergie approximé par l'indice des prix à la consommation (Inf).

2.2. Données et méthode d'estimation

Pour analyser la relation entre la consommation d'énergie et les variables spécifiées, cette étude utilise les données de la Banque mondiale (*World Development Indicators*). Ces données couvrent différentes sources d'énergie pour la plupart des pays. Cependant, la variable pour laquelle les données sont disponibles pour le Togo est l'énergie électrique qui est en grande partie importée des pays voisins. Les énergies renouvelables telles que le solaire, l'éolienne, le biogaz et les micro-centrales hydroélectriques, le nucléaire ne connaissent pas encore l'essor suffisant pour peser sur la production et la consommation nationale. S'agissant de énergie primaire (biomasse), elle est utilisée par près de 66% de la population vivant en zone rurale. Mais en raison de la non disponibilité des données sur cette forme d'énergie, l'étude n'intègre pas cette forme d'énergie dans l'analyse. La période d'étude s'étend de 1980 à 2013 en raison du manque de données sur les périodes antérieures à 1980. La méthode d'estimation est celle des moindres carrés ordinaires (MCO). Toutefois, nous utilisons des tests économétriques qui nous permettent d'identifier la technique d'estimation la plus adaptée aux données de l'étude.

¹⁶ Ces auteurs ont utilisé des fonctions de demande d'énergie avec trois variables : l'énergie, le PIB et le prix de l'énergie mesuré par l'indice des prix à la consommation. Dans cette étude nous avons pris en compte l'accumulation du capital outre ces trois variables.

3. Présentation et discussion des résultats

Cette section est essentiellement consacrée à la présentation des différents résultats de l'analyse. Toutefois, dans la mesure où nous utilisons les données en séries temporelles, il est important de s'assurer de la qualité de ces données en réalisant quelques tests économétriques.

3.1. Caractéristiques statistiques des données

Les relations linéaires entre les séries n'ont de sens que si les variables supposées explicatives ne sont pas liées entre elles. Les conséquences de la colinéarité statistique entre les variables explicatives sont énormes. La colinéarité conduit à des coefficients de régression très élevés en valeur absolue, à des signes contraires à l'intuition et à des variances des estimateurs très élevées. De plus les coefficients de régression et le coefficient de corrélation multiple sont instables en présence de colinéarité entre les variables. La colinéarité statistique crée donc des difficultés importantes dans l'interprétation des résultats. Il convient d'examiner les séries avant leur utilisation dans le modèle. Ainsi, l'analyse de la corrélation (*voir Tableau 1*) entre les séries montre qu'elles sont faiblement corrélées entre elles. Autrement dit, la nature des séries ne permet pas de présupposer l'existence d'une colinéarité entre les variables explicatives.

Tableau 1 : Analyse de la corrélation entre les différentes variables

	E	K	L	INF	PIB
E	1.000000				
K	-0.275144	1.000000			
L	0.225586	0.155499	1.000000		
INF	-0.290521	0.239558	0.006603	1.000000	
PIB	0.176274	0.254245	0.234639	0.343828	1.000000

Source : Auteur, données de la Banque Mondiale.

3.2. Caractéristiques dynamiques des données

Les travaux de Granger (1983), Engel et Granger (1969) ont montré que la relation de long terme entre deux séries n'a de sens que lorsque ces séries sont stationnaires et cointégrées. Puisque la plupart des séries macroéconomiques ne sont pas stationnaires, il s'avère nécessaire de déterminer l'ordre d'intégration des séries avant de les utiliser dans les régressions. Les tests de Dickey-Fuller et de Phillips-Perron effectués sur les données sont consignés dans le tableau ci-dessous :

Tableau 2 : Test de racine unitaire

Variabes	ADF	Test de Phillips-Perron	Seuil de 5%	Ordre d'intégration
PIB	-9,022405	-10.36810	-1,95	1
K	-5,437792	-8.544101		1
L	-7,573178	-7.413954		1
INF	-5,975150	-8.667166		1
E	-6,989746	-7,193209		1

Source : Estimations de l'auteur, données de la Banque mondiale.

L'observation du *tableau 2* montre qu'au seuil de 5%, toutes les variables sont intégrées d'ordre 1 car les statistiques sont inférieures à la valeur seuil. Ainsi, il est possible d'établir une relation entre ces variables à court terme. Cependant, une telle analyse ne permet pas d'établir une relation de long terme entre les variables. Pour ce faire nous devons tester l'hypothèse de la cointégration entre les séries. Le test sur le résidu du modèle de long terme conduit aux résultats suivant.

Tableau 3 : Test du résidu du modèle de long terme

Variable	ADF	Valeur seuil (5%)	Ordre d'intégration
Résidu	-7,257025	-3,557759	I(0)

Source : Calculs de l'auteur.

Les résultats du tableau montrent que le résidu de long terme est stationnaire. Nous pouvons alors admettre l'hypothèse de cointégration entre les séries. Certes, l'inconvénient de la méthode de Engle et Granger (1969) est qu'elle ne permet pas de distinguer plusieurs relations de cointégration. En effet, si on étudie simultanément k variables avec $k > 2$, on peut avoir jusqu'à $(k - 1)$ relations de cointégration. La méthode de Engle et Granger ne nous permet d'obtenir qu'une seule relation de cointégration. Afin de pallier cette difficulté, Johansen (1988) a proposé une approche multivariée de la cointégration fondée sur la méthode du maximum de vraisemblance. L'application du test de cointégration de Johansen (1988) confirme la présence de cointégration entre les séries car la statistique est supérieure à la valeur critique au seuil de 5% (*voir annexe A.6*).

3.3. Résultats des estimations

D'après ce qui précède, la relation de long terme entre la consommation d'énergie et les différentes variables peut être estimée par un modèle à correction d'erreur (ECM). Cette estimation peut se faire en deux étapes [Engle & Granger (1969)]. La première consiste à estimer l'équation (2) qui traduit la relation de long terme. Les résultats de l'estimation du modèle de long terme par

la méthode des moindres carrés ordinaires se présentent comme suit (voir *tableau4*) :

Tableau 4 : Résultats des estimations du modèle de long terme

Variabiles	Coefficients (Modèle non stable)	Coefficients (Modèle stabilisé ¹⁷)
PIB	0,415994** (2,168)	0,419815** (2,140)
L	0,672518 (0,411)	0,633325 (0,378)
K	0,911980** (2,319)	0,900285** (2,229)
Inf	-0,400312** (-2,421)	-0,403890** (-2,382)
Constante	82,61876*** (7,587)	82,36148*** (7,493)
Dummy	-	1,541997 (0,223)
R ²	0,821	0,822
DW	2,316	2,292
F_statistic	24,847	19,986
Prob(F_Statistic)	0,000000	0,000000

Source : Estimation de l'auteur. ** ; *** ; traduisent la significativité respectivement à 5% et 1%. Les valeurs (.) sont les t_student.

Les résultats du *tableau 4* montrent que la statistique de Fisher du modèle stabilisé est égale à 19,98 et sa probabilité est nulle. On peut donc conclure que le modèle estimé est globalement significatif. De plus le $R^2 = 0,82$ indique que 82% des variations de la consommation d'énergie sont expliquées par les variables du modèle. De plus les t_statistics montrent qu'à l'exception de la variable (L), dans l'ensemble toutes les variables sont significatives. Les signes des coefficients obtenus sont également conformes à nos attentes dans les deux estimations. De plus leur similitude confirme la robustesse des résultats.

Les modèles ci-dessus estimés traduisent la dynamique de long terme entre la consommation d'énergie et les variables du modèle. Ils ne rendent pas compte des ajustements de court terme. Ainsi pour tenir compte de la dynamique de court terme, nous devons dans une seconde étape, estimer par les MCO, le modèle sur les différences premières des variables et le terme d'erreur du modèle de long terme. Cette équation de court terme se présente comme suit:

$$DLogE_t = b_0 + b_1 DLogPIB_t + b_2 DLogK_t + b_3 DLogL_t + b_4 DLogInf_t + b_5 RES_t + \eta_t \quad (3)$$

¹⁷ Le modèle a été stabilisé par l'introduction de la variable « Dummy » qui est une variable muette. Pour plus de détails sur cette méthode voir Doucouré (2008).

Dans cette relation, $D(.)$ désigne l'opérateur de différence première. Pour toute variable, $DLogX_t = LogX_t - LogX_{t-1}$. La variable RES est le résidu du modèle de long terme décalé d'une période.

Les résultats de cette estimation sont fournis dans le *tableau 5* ci-dessous :

Tableau 5 : Résultats de l'estimation du modèle de court terme

Variabiles	Coefficients	t_statistics	Significativité
D(PIB)	0,378073	3,460	***
D(L)	0,758206	0,935	
D(K)	1,030665	5,544	***
D(INF)	-0,580538	-6,699	***
RES	-0,592909	-8,521691	***
Constante	1,064946	1,722	
R ²	0,844		
DW	1,43		
F_statistic	28,229		
Prob(F_Statistic)	0,000000		

Source : Estimations de l'auteur, *** traduit la significativité à 1%. D(.) désigne l'opérateur de différence.

Les résultats de l'estimation (*tableau 5*) montrent que nous pouvons admettre l'hypothèse d'un ECM. En effet, l'observation des résultats montre que le coefficient associé à la force de rappel est négatif (-0,593) et significativement différent de zéro au seuil de 1%. Il existe donc un mécanisme à correction d'erreur. Autrement dit, à long terme, les déséquilibres entre la consommation d'énergie et les variables du modèle se compensent de sorte que les séries ont des évolutions synchroniques. De plus, le test¹⁸ d'autocorrélation mené sur le modèle estimé de court terme conduit à rejeter l'hypothèse d'autocorrélation des erreurs car les probabilités obtenues sont supérieures à 5%. Le modèle de court terme reste globalement significatif. Et toutes les variables à l'exception de la variable (L) sont significatives au seuil de 1%.

3.4. Commentaires des résultats des différentes estimations

Les résultats obtenus à l'issue des différentes estimations montrent que la consommation d'énergie au Togo est influencée par la plupart des variables retenues dans le modèle. Ainsi à court terme aussi bien qu'à long terme, les résultats montrent que le PIB, le stock de capital et l'indice des prix de l'énergie approximé par le taux d'inflation ont un impact très significatif sur la consommation d'énergie au Togo. En particulier le taux de croissance économique et le stock de capital affectent positivement et significativement le

¹⁸ Voir le résultat de ce test en annexe A.5.

niveau de consommation d'énergie. Alors que l'inflation agit négativement sur la consommation d'énergie. Dans les deux estimations, l'effet de la croissance démographique quoique positif n'est pas significatif.

Les résultats montrent qu'à court terme une croissance économique de 1% se traduit par un accroissement de la consommation d'énergie de 0,38% ; alors qu'à long terme cette consommation d'énergie s'accroît de 0,42%. Ainsi la consommation d'énergie est inélastique par rapport au taux de croissance économique. Ce résultat infirme donc ceux obtenus par Wolde-Rufael (2005) et Akinlo et al. (2008) qui n'ont pas pu établir une relation entre la consommation d'énergie et la croissance économique au Togo. De plus, il reflète les observations faites récemment sur les relations entre la consommation d'énergie et la croissance dans nombre de pays. D'après une étude publiée par le cabinet d'études grenoblois Enerdata, les BRICS à savoir Brésil, Russie, Inde, Chine, Afrique du Sud consomment autant d'électricité que ceux du G7 (États-Unis, Japon Allemagne, France, Royaume-Uni, Canada, Italie). Les BRICS ont consommé 6.800 TWh¹⁹ en 2012, contre seulement 3.000 TWh en 2002. Selon le rapport de l'Agence International de l'Energie, l'augmentation de la consommation énergétique mondiale est principalement imputable à la croissance économique des pays émergents. Avec un PIB qui augmenterait en moyenne de 4,7% par an entre 2010 et 2040, les pays non-membres de l'OCDE comme la Chine et l'Inde, vont voir leur consommation énergétique augmenter de 90% d'ici 2040 (IEO, 2013).

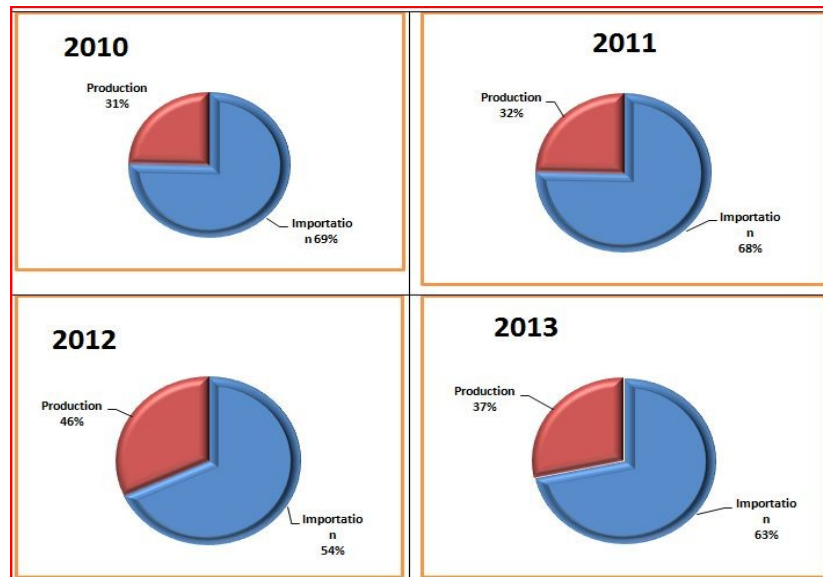
L'accumulation du capital affecte également le niveau de consommation d'énergie à court comme à long terme. A court terme, les résultats montrent qu'un accroissement du stock de capital de 1% se traduit par un niveau de consommation de 1,03% alors qu'à long terme elle est de 0,90%. Autrement dit la consommation d'énergie est élastique par rapport au capital à court terme et inélastique à long terme. Le résultat obtenu à court terme peut s'expliquer par l'incapacité des pays en développement comme le Togo à adopter des équipements moins consommateurs d'énergie. Cependant lorsque le pays atteint un niveau de développement plus élevé, il peut dégager des revenus conséquents et pourra remplacer les équipements traditionnels par ceux modernes et « économiseurs » d'énergie. Ce qui peut contribuer à réduire significativement sa consommation d'énergie.

L'évolution du taux d'inflation agit négativement sur la consommation d'énergie au Togo. A court terme, une augmentation de taux d'inflation de 1% se traduit par une baisse de la consommation d'énergie de 0,58%. A long terme, les résultats indiquent que la baisse de la consommation d'énergie résultant d'un accroissement du taux d'inflation est de 0,4%. Ces résultats sont liés au fait

¹⁹ Terawatt heure = 10¹² Watt heure.

qu'une part importante, soit près de la moitié de la consommation d'énergie au Togo est importée des pays étrangers (Côte d'Ivoire, Ghana et Nigéria). De ce fait, lorsque le prix du baril augmente par exemple, la facture d'achat augmente réduisant ainsi la fourniture et donc la consommation d'énergie au Togo.

Graphique 1 : Structure de l'approvisionnement d'énergie au Togo



Source : Auteur, données du Ministère des Mines et de l'Energie (2014)

Enfin, la croissance de la population engendre une consommation accrue d'énergie. Ce résultat est cependant non significatif à court terme comme à long terme. Certes, l'augmentation de la population crée une demande additionnelle en énergie en raison de nouveaux abonnés. De plus, au fur et à mesure que le niveau de vie s'élève les populations tendent à consommer plus d'énergie en raison de l'acquisition de nouveaux équipements qui sont indicatifs du standing de vie des populations dans les pays en développement. Cependant, même si la demande des ménages en énergie augmente elle est souvent très faible par rapport à celle provenant des sociétés ou des grandes entreprises locales. Cette non significativité peut également s'expliquer par l'usage importante de la biomasse par une grande partie de la population togolaise.

Conclusion

L'analyse de la relation entre consommation d'énergie et croissance économique reste un exercice très complexe. Cette complexité a conduit plusieurs auteurs à explorer différentes méthodes et démarches pour tenter d'établir une corrélation

entre ces variables. Dans plusieurs cas, l'*hypothèse conservatrice* est celle qui paraît plausible dans le cas des pays à faibles revenus. Les résultats obtenus dans cette analyse montrent une corrélation allant de la croissance économique à la consommation d'énergie confirmant ainsi une telle *hypothèse*. Ainsi, à court terme comme à long terme, la consommation d'énergie se révèle inélastique par rapport au taux de croissance économique. Outre la relation entre la consommation d'énergie et la croissance économique, l'étude permet d'établir d'autres types de relations. En particulier, l'accumulation du capital agit positivement sur la consommation d'énergie. A court terme, les résultats obtenus montrent que l'élasticité de la consommation d'énergie par rapport au capital est supérieure à l'unité. Elle est cependant inférieure à un (1) à long terme. Enfin les deux autres variables affectant la consommation d'énergie sont le taux d'inflation qui agit négativement et la croissance démographique dont l'effet positif n'est pas significatif.

Il ressort de cette étude que la consommation d'énergie croît sensiblement au rythme de la croissance économique. En termes d'implications, cette analyse suggère que le Togo doit s'attendre dans les années à venir, à une consommation accrue d'énergie au regard de la dynamique de croissance actuelle et des stratégies de développement engagées par le pays. En vue d'assurer la fourniture d'énergie de qualité et à moindre coût à la population, il est nécessaire de promouvoir des investissements pour accroître le potentiel énergétique et réduire la dépendance du pays en énergie.

Formellement, si la croissance économique s'accompagne de la consommation croissante d'énergie, il n'est pas exclu que cette consommation puisse avoir des effets sur d'autres paramètres tels que l'environnement et la production agricole dans la mesure où l'énergie est source de rejet de CO₂ et de nombreuses déréglementations. De plus l'effet de la consommation d'énergie sur les conditions de vie et la pauvreté reste un domaine peu exploré. Enfin, une analyse non encore explorée est celle de la dépendance énergétique sur la consommation et la croissance économique d'un pays. Ces différentes thématiques pourront faire l'objet de nos recherches futures.

Bibliographie

1. Adhikari D. et Chen Y. (2012), "Energy Consumption and Economic Growth: A Panel Cointegration Analysis for Developing Countries", *Review of Economics & Finance*, 1(2), 28-44.
2. Adom P. K. (2011), "Electricity Consumption-Economic Growth Nexus: The Ghanaian Case". *International Journal of Energy Economics and Policy*, 1(1), 18-31.

3. Akinlo, A.E. (2009). “Electricity consumption and economic growth in Nigeria: evidence from Cointegration and co-feature analysis”. *Journal of Policy Modeling*, 31, 681–693.
4. Akinlo, A.E. (2008), “Energy Consumption and Economic Growth: evidence from 11 Sub-Sahara African countries”. *Energy Economics*, 30, 2391–2400.
5. Akinwale, Y., Jesuleye, O., Siyanbola, W. (2013), “Empirical Analysis of the Causal Relationship between Electricity Consumption and Economic Growth in Nigeria”. *British Journal of Economics, Management & Trade*, 3(3), 277-295.
6. Al-mulali, O., Sab, C.N.B.C. (2012), “The impact of Energy Consumption and CO2 Emission on the Economic Growth and Financial Development in the Sub Saharan African countries”, *Energy Economics*, 39, 180–186
7. Ambapour S., Massamba C. (2005), “Croissance économique et consommation d'énergie au Congo: Une analyse en termes de causalité”. Document de Travail DT 12/2005, Bureau d'application des méthodes statistiques et informatiques, Brazzaville.
8. Asafu Adjaye J. (2000), “The relationship between energy consumption, energy prices and economic growth: time series evidence from Asian developing countries”, *Energy Economics*, vol. 22, p. 615–625.
9. Behmiri, N., Manso, J.R.P. (2013), “How crude oil consumption impacts on economic growth of Sub-Saharan Africa? *Energy Economics*, 54(1), 74–83.
10. Belloumi, M., (2009), “Energy consumption and GDP in Tunisia: Cointegration and Causality Analysis”, *Energy Economics*, 37 (7), 2745-2753.
11. Cheng, S.B., Lai, T.W. (1997), “An investigation of co-integration and causality between Energy Consumption and Economic Activity in Taiwan Province of China”, *Energy Economics*, 19, 435–444.
12. Dogan, E. (2014), “Energy Consumption and Economic Growth: Evidence from Low-Income Countries in Sub-Saharan Africa”, *International Journal of Energy Economics and Policy*, Vol. 4, No. 2, 2014, pp.154-162
13. Doucouré F. B. (2008), “Méthodes économétriques + programmes, Cours – Applications –Corrigées : Logiciels Eviews, STATA et SPSS”, 5ème édition, Dakar, Sénégal.
14. Ebohon, O.J. (1996), “Energy, Economic Growth and causality in Developing Countries: a case Study of Tanzania and Nigeria”, *Energy Policy*, 24, 447–453.
15. Eggoh, C., Chrysost, B., Christophe, R. (2011), “Energy Consumption and Economic Growth revisited in African countries”. *Energy Policy*, 39, 7408–7421.

16. Engel R. E. et Granger C. W. J. (1987), "Cointegration and Error-correction: Representation, Estimation, and Testing". *Econometrica*, vol.55.
17. Ezzo, J. L. (2010), "The Energy Consumption-Growth Nexus in Seven Sub-Saharan African Countries". *Economics Bulletin*, 30(2), 1191-1209.
18. Fatai K., Oxley L., Scrimgeour F.G. (2004), "Modeling the causal relationship between energy consumption and GDP in New Zealand, Australia, India, Indonesia, the Philippines and Thailand", *Mathematics and Computers in Simulation*, vol. 64, p. 431-445.
19. Granger C. W. J. (1983), "Cointegration Variables and Error-correction Models", Document de travail, Université de San Diego.
20. Granger C. W. J., (1969), "Investigating Causal Relations by Econometrics Models and Cross Spectral Methods", *Econometrica*, vol. 37.
21. Jacobs R. L., Leamer E. E., Ward M. P. (1979), "Difficulties with testing for causation", *Economic Inquiry*, Vol. 17, July.
22. Johansen S. (1988), « Statistical analysis of Cointegration Vector », *Journal of Economic Dynamic and Control*, Vol. 12, pp. 231-254.
23. Kennedy P. (1998), "A Guide to Econometrics", 4ème édition, The MIT Press, Cambridge MA
24. Kraft, J., Kraft, A. (1978), "On the relationship between energy and GNP", *Journal of Energy and Development*, 3, 401-403.
25. Lee, C., Chang, C., (2007), "The Impact of Energy Consumption on Economic Growth: evidence from linear and nonlinear models in Taiwan. *Energy Economics*, 32, 2282-2294.
26. Lotfalipour, M., Falahi, M., Ashena, M. (2010), "Economic growth, CO2 emissions, and fossil fuels consumption in Iran", *Energy*, 35, 5115-5120.
27. Masih A.M.M., Masih R. (1998), "A Multivariate Cointegrated Modeling Approach in Testing Temporal Causality between Energy Consumption, Real Income and Prices with an Application to two Asian LDCs", *Applied Economics*, vol. 30 (10), p. 1287-1298.
28. Ministère des Mines et de l'Energie (2014), site <http://www.mme-togo.com>
29. Odhiambo, N.M. (2010), "Energy consumption, prices and Economic Growth in Three SSA Countries: A Comparative Study", *Energy Policy*, 38, 2463-2469.
30. Odhiambo, N.M. (2009), "Energy consumption and economic growth nexus in Tanzania: An ARDL bounds testing approach", *Energy Policy*, 37(2): 617-622.
31. Oh W. and Lee K. (2004), "Energy Consumption and Economic Growth in Korea: Testing the Causality Relation", *Journal of Policy Modeling*, vol. 26, p.973-981.

32. Ozturk I., Aslan A., Kalyoncu H., (2010), “Energy consumption and Economic Growth relationship: Evidence from panel data for low and Middle Income Countries”, *Energy Policy*, 38, 4422–4428.
33. Pao, H.T., Yu, H.C., Yang, Y.H. (2011), “Modeling the CO2 emissions, Energy use, and Economic Growth in Russia”, *Energy Policy*, 36, 5094–5100.
34. Pao, H.T., Tsai, C.M. (2011), “Multivariate Granger causality between CO2emissions, energy consumption, FDI and GDP: evidence from a panel of BRIC (Brazil, Russian Federation, India, and China) countries”, *Energy Policy*, 36, 685–693.
35. Wandji, Y.D.F. (2013), “Energy consumption and Economic Growth: Evidence from Cameroon”. *Energy Policy*, 61, 1295–1304.
36. Warr, B.S., Ayres, R.U. (2010), “Evidence of Causality between the quantity and quality of Energy Consumption and Economic Growth”, *Energy Policy*, 35, 1688–1693.
37. Wolde-Rufael, Y. (2005), “Energy demand and Economic Growth: the African experience”, *Journal of Policy Modeling*, 27, 891–903.
38. World Energy Outlook (2014), « “Africa Energy Outlook: Une étude sur les perspectives énergétiques de l’Afrique subsaharienne”, édition spéciale, Paris – France, pp.1-10.
39. Ziramba, E. (2009), “Disaggregate energy consumption and industrial production in South Africa”. *Energy Policy*, 37 (6), 2214-20.

Annexes

A.1- Tests de stationnarité de Dickey-Fuller

Null Hypothesis: D(PIB) has a unit root Exogenous: None Lag Length: 0 (Automatic based on SIC, MAXLAG=8)			Null Hypothesis: D(L) has a unit root Exogenous: None Lag Length: 0 (Automatic based on SIC, MAXLAG=8)		
	t-Statistic	Prob.*		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			Augmented Dickey-Fuller test statistic		
	-9.022405	0.0000		-7.573178	0.0000
Test critical values:	1% level	-2.639210	Test critical values:	1% level	-2.639210
	5% level	-1.951687		5% level	-1.951687
	10% level	-1.610579		10% level	-1.610579
*MacKinnon (1996) one-sided p-values.			*MacKinnon (1996) one-sided p-values.		
Null Hypothesis: D(K) has a unit root Exogenous: None Lag Length: 2 (Automatic based on SIC, MAXLAG=8)			Null Hypothesis: D(INF) has a unit root Exogenous: None Lag Length: 1 (Automatic based on SIC, MAXLAG=8)		
	t-Statistic	Prob.*		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			Augmented Dickey-Fuller test statistic		
	-5.437792	0.0000		-5.975150	0.0000
Test critical values:	1% level	-2.644302	Test critical values:	1% level	-2.641672
	5% level	-1.952473		5% level	-1.952066
	10% level	-1.610211		10% level	-1.610400
*MacKinnon (1996) one-sided p-values.			*MacKinnon (1996) one-sided p-values.		
Null Hypothesis: D(E) has a unit root Exogenous: None Lag Length: 0 (Automatic based on SIC, MAXLAG=8)					
	t-Statistic	Prob.*		t-Statistic	Prob.*

Augmented Dickey-Fuller test statistic		-6.989746	0.0000
Test critical values:	1% level	-2.639210	
	5% level	-1.951687	
	10% level	-1.610579	

*MacKinnon (1996) one-sided p-values.

A.2 Tests de Stationnarité de Phillips-Perron

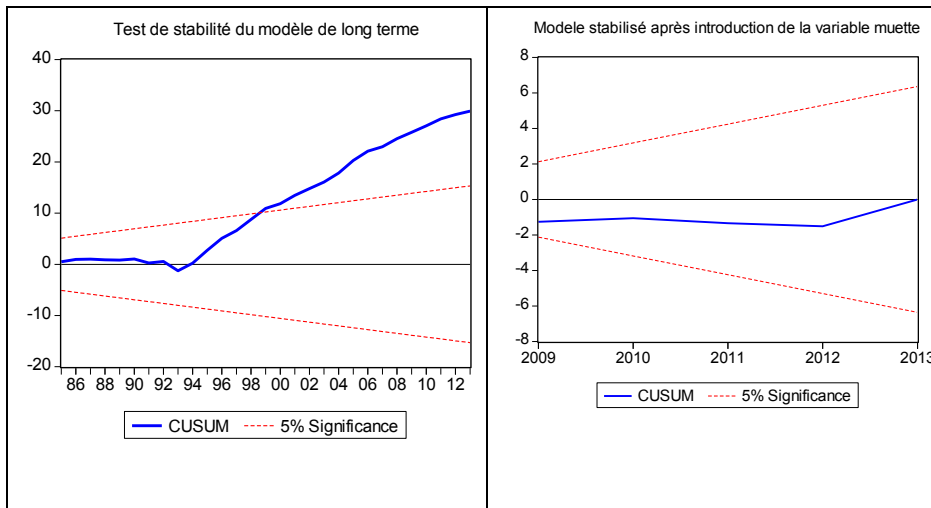
<p>Null Hypothesis: D(PIB) has a unit root Exogenous: None Bandwidth: 3 (Fixed using Bartlett kernel)</p>	<p>ull Hypothesis: D(E) has a unit root Exogenous: None Bandwidth: 3 (Fixed using Bartlett kernel)</p>																																				
<table border="1"> <thead> <tr> <th></th> <th>Adj. t-Stat</th> <th>Prob.*</th> </tr> </thead> <tbody> <tr> <td>Phillips-Perron test statistic</td> <td>-10.36810</td> <td>0.0000</td> </tr> <tr> <td>Test critical values:</td> <td></td> <td></td> </tr> <tr> <td> 1% level</td> <td>-2.639210</td> <td></td> </tr> <tr> <td> 5% level</td> <td>-1.951687</td> <td></td> </tr> <tr> <td> 10% level</td> <td>-1.610579</td> <td></td> </tr> </tbody> </table>		Adj. t-Stat	Prob.*	Phillips-Perron test statistic	-10.36810	0.0000	Test critical values:			1% level	-2.639210		5% level	-1.951687		10% level	-1.610579		<table border="1"> <thead> <tr> <th></th> <th>Adj. t-Stat</th> <th>Prob.*</th> </tr> </thead> <tbody> <tr> <td>Phillips-Perron test statistic</td> <td>-7.193209</td> <td>0.0000</td> </tr> <tr> <td>Test critical values:</td> <td></td> <td></td> </tr> <tr> <td> 1% level</td> <td>-2.639210</td> <td></td> </tr> <tr> <td> 5% level</td> <td>-1.951687</td> <td></td> </tr> <tr> <td> 10% level</td> <td>-1.610579</td> <td></td> </tr> </tbody> </table>		Adj. t-Stat	Prob.*	Phillips-Perron test statistic	-7.193209	0.0000	Test critical values:			1% level	-2.639210		5% level	-1.951687		10% level	-1.610579	
	Adj. t-Stat	Prob.*																																			
Phillips-Perron test statistic	-10.36810	0.0000																																			
Test critical values:																																					
1% level	-2.639210																																				
5% level	-1.951687																																				
10% level	-1.610579																																				
	Adj. t-Stat	Prob.*																																			
Phillips-Perron test statistic	-7.193209	0.0000																																			
Test critical values:																																					
1% level	-2.639210																																				
5% level	-1.951687																																				
10% level	-1.610579																																				
<p>*MacKinnon (1996) one-sided p-values.</p> <table border="1"> <tr> <td>Residual variance (no correction)</td> <td>44.66232</td> </tr> <tr> <td>HAC corrected variance (Bartlett kernel)</td> <td>27.20158</td> </tr> </table>	Residual variance (no correction)	44.66232	HAC corrected variance (Bartlett kernel)	27.20158	<p>*MacKinnon (1996) one-sided p-values.</p> <table border="1"> <tr> <td>Residual variance (no correction)</td> <td>60.82632</td> </tr> <tr> <td>HAC corrected variance (Bartlett kernel)</td> <td>48.97576</td> </tr> </table>	Residual variance (no correction)	60.82632	HAC corrected variance (Bartlett kernel)	48.97576																												
Residual variance (no correction)	44.66232																																				
HAC corrected variance (Bartlett kernel)	27.20158																																				
Residual variance (no correction)	60.82632																																				
HAC corrected variance (Bartlett kernel)	48.97576																																				
<p>Null Hypothesis: D(INF) has a unit root Exogenous: None Bandwidth: 3 (Fixed using Bartlett kernel)</p>	<p>Null Hypothesis: D(K) has a unit root Exogenous: None Bandwidth: 3 (Fixed using Bartlett kernel)</p>																																				
<table border="1"> <thead> <tr> <th></th> <th>Adj. t-Stat</th> <th>Prob.*</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table>		Adj. t-Stat	Prob.*				<table border="1"> <thead> <tr> <th></th> <th>Adj. t-Stat</th> <th>Prob.*</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table>		Adj. t-Stat	Prob.*																											
	Adj. t-Stat	Prob.*																																			
	Adj. t-Stat	Prob.*																																			

Phillips-Perron test statistic	-	8.667166	0.0000
Test critical values:	1% level	-	2.639210
	5% level	-	1.951687
	10% level	-	1.610579
*MacKinnon (1996) one-sided p-values.			
Residual variance (no correction)		79.16663	
HAC corrected variance (Bartlett kernel)		51.28547	
Phillips-Perron test statistic	-	8.544101	0.0000
Test critical values:	1% level	-	2.639210
	5% level	-	1.951687
	10% level	-	1.610579
*MacKinnon (1996) one-sided p-values.			
Residual variance (no correction)		11.87557	
HAC corrected variance (Bartlett kernel)		6.933632	
Null Hypothesis: D(L) has a unit root Exogenous: None Bandwidth: 3 (Fixed using Bartlett kernel)			
		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.413954	0.0000
Test critical values:	1% level	-2.639210	
	5% level	-1.951687	
	10% level	-1.610579	
*MacKinnon (1996) one-sided p-values.			
Residual variance (no correction)			0.523998
HAC corrected variance (Bartlett kernel)			0.628311

					AR Roots				
Résultats des estimations du modèle de long terme stabilisé					Résultats de l'estimation du modèle de court terme				
Dependent Variable: E					Dependent Variable: DE				
Method: Least Squares					Method: Least Squares				
Sample (adjusted): 1981 2013					Sample (adjusted): 1982 2013				
Included observations: 33 after adjustments					Included observations: 32 after adjustments				
Convergence achieved after 9 iterations									
Variable	Coefficient	Std. Error	t-Statistic	Prob.	Variable	Coefficient	Std. Error	t-Statistic	Prob.
L	0.6333	1.6743	0.3782		DPIB	0.3780	0.1092	3.4603	
PIB	0.4198	0.1961	2.1401	0.0419	DL	0.7582	0.8105	0.9354	0.0019
K	0.9002	0.4037	2.2297	0.0346	DK	1.0306	0.1859	5.5437	0.3582
INF	0.4038	0.1695	2.3815	0.0249	DINF	0.5805	0.0866	6.6991	0.0000
DUMM	1.5419	6.9131	0.2230		RES	0.5929	0.0695	8.5216	0.0000
Y	82.361	10.991	7.4934	0.8252	C	1.0649	0.6183	1.7223	0.0000
C	0.7876	0.0823	9.5610	0.0000					
AR(1)	0.09	0.77	0.31	0.0000					
R-squared	0.8218	Mean dependent var	93.853	10	R-squared	0.8444	Mean dependent var	1.2702	74
Adjusted R-squared	0.7807	S.D. dependent var	14.593	02	Adjusted R-squared	0.8145	S.D. dependent var	8.0201	04
S.E. of regression	6.8338	Akaike info criterion	6.8674	76	S.E. of regression	3.4538	Akaike info criterion	5.4842	39
Sum squared resid	1214.28	Schwarz criterion	7.1849	17	Sum squared resid	310.1628	Schwarz criterion	5.759064	
Log Likelihood	-	F-statistic	19.986		Log Likelihood	81.74782	F-statistic	28.22991	

likelihood	106.31		58	Durbin	-		
od	34			Watson	1.4288	Prob(F-stat)	0.0000
Durbin				stat	24	statistic)	00
-							
Watson	2.2924	Prob(F-stat)	0.0000				
stat	21	statistic)	00				
<hr/>							
Inverted AR							
Roots	.79						

A.4- Tests de stabilité des modèles



A.5- Test de l'autocorrélation des erreurs du modèle de court terme

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.099197	Probability	0.349332
Obs*R-squared	2.685227	Probability	0.261162

A.6 Test de cointégration de Johansen

Sample (adjusted): 1983 2013

Included observations: 31 after adjustments

Trend assumption: No deterministic trend

Series: DE DK DL DINF

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.593659	72.74862	40.17493	0.0000
At most 1 *	0.462289	44.83121	24.27596	0.0000
At most 2 *	0.377580	25.59777	12.32090	0.0002
At most 3 *	0.296435	10.89944	4.129906	0.0011

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Financial development and agricultural performance in Cameroon: an econometric investigation²⁰

NEBA Cletus YAH²¹

Abstract: *This study investigates the causality relationship that exists between the development of the financial sector and the growth of the agricultural sector in Cameroon. A theoretical framework based on the model of Gourinchas and Jeanne (2003) is developed. This model is then tested using the VAR based granger causality testing techniques on Cameroon data for the period 1973 - 2011. We find that there exist no long run equilibrium and causality relationship between financial development and economic growth. This implies that the agricultural sector has not developed much so as to be efficient in attracting the financing of the financial sector. We therefore recommend that measures to modernize the agricultural sector should be adopted and that agricultural sector financing mechanism should be developed by the state.*

JEL: E44, O1, Q14

Keywords: *financial development, agricultural sector performance, causality, Cameroon, unit root,*

Développement financier et performance Agricole au Cameroun : Une évidence empirique

Résumé : *Cet article a pour but d'étudier la relation de causalité entre le développement financier et la performance du secteur agricole au Cameroun. Nous employons la méthodologie VAR du test de causalité sur les données annuelles camerounaises de la période 1973-2011. Les résultats montrent qu'il n'existe pas de relation de causalité entre le développement financier et la performance du secteur agricole au Cameroun. Ainsi, nous recommandons que le secteur agricole soit modernisé et que des mécanismes de financement de l'agriculture soient développés par l'Etat camerounais.*

JEL: E44, O1, Q14

Mots-clés : *Développement financier, performance du secteur agricole, causalité, Cameroun, racine unitaire,*

²⁰ We greatly acknowledge important comments from anonymous referees on a previous version of this paper
²¹ NEBA Cletus YAH, University of Douala, Faculty of Economics and Applied Management, Research Group in Theoretical and Applied Economics (GRETA), P.O. BOX 4032 Douala-Cameroon, Email: yah_neba@yahoo.fr

Introduction

Agriculture plays a prominent role in the economy and society in every country in sub Saharan Africa. Most countries in the region have the natural and human resources needed for strong and sustainable agricultural development and African governments generally put agriculture at the top of their development priorities. Yet agriculture is widely seen as underperforming (World Bank, 2007). In most developing countries including Cameroon, the agricultural sector accounts for a greater part of economic growth. Before the economic crisis that hit Cameroon in the mid-80s, agriculture accounted on average for about 30% of GDP and 80% of total exports, and after the crisis it contributed for about 27% of GDP and 53% of exports (Gbetnkoum and Khan, 2002). Despite some improvements in recent years large percentages of people who depend on farming for a living are in poverty. Income gaps between farm and non-farm households are wide and a too-high percentage of both rural and urban populations suffer from malnutrition and food insecurity. It is an open question, however, whether these problems can be blamed on poor agricultural sector performance or whether they, and stagnant agricultural growth itself, are the consequence of other factors like the under development of the financial sector that constrain economic growth more generally.

Under Structural Adjustment Programs (SAPs) supported by the World Bank and the IMF, most developing countries reformed their real and financial sectors. These reforms aimed at removing the interventionist policies that existed in these countries. It was believed that the market would increase efficiency in the allocation and use of resources thereby improving economic growth and development. The agricultural sector of developing countries not only contributes to economic growth, but is also the sector that employs a greater part of the work force. In Cameroon for example, the agricultural sector employs about 75% of the active labor force and 85% of the total population of the country depend on it for livelihood. Therefore, for countries that suffer growth and poverty problems, it is very important to determine strategies which contribute to the development of their agricultural sector. This study aims to establish the effects of financial development on the growth of the agricultural sector in Cameroon. This study is important as Cameroon under the SAPs reformed its financial and agricultural sector in 1987.

Before the financial reforms, the agricultural sector was considered a priority sector by the government and as such, the sector benefitted from preferential loans with reduced interest rates. Banks were obliged to allocate a given share of their resources to the agricultural sector. They could do this by extending loans directly to the farmers or by putting the funds at the disposition of specialised institutions which would then allocate them to the final users. The specialized

institutions that existed included *Crédit Agricole* of Cameroon, Cameroon Development Bank, National Fund for Rural Development (FONADER), and the Guarantee Fund for Small Business (FOGAPE). Alongside, there were also agricultural savings and loans cooperatives that were under the tutelage of the Ministry in charge of agriculture. During this period then, the agricultural sector benefitted from the financing it needed for its development.

With the financial reforms of 1990, most of the privileges enjoyed by the agricultural sector were removed and farmers had to compete with others in the funds market for financing. Since the allocation of credit was henceforth handled by market forces; only the most efficient and productive sectors could attract funds. In order to be competitive in this market, the agricultural sector which was mostly peasant had to modernize its productive structures. During the agro-pastoral show organized in Ebolowa in 2011, most farmers blamed their poor production output on the lack of sufficient financing. This was surprising as the banking sector has long been observed to be over liquid. This means that they prefer to hold their resources in low liquid interest earning money market assets than to finance the agricultural sector. This obviously raises the question of the causality relationship between financial development and agricultural sector performance in Cameroon.

1. Cameroon's Financial and Agricultural Sector Review

1.1 Financial Sector Evolution

At independence in 1960, the country was in great need of development and so the government put into place instruments to promote economic and social development. It is in this light that five year development plans were drawn up so as to meet and promote social and economic development. The whole economy was thus highly planned with the government intervening in practically all sectors of the economy. Until 1985, the economy performed very well with agriculture supporting the economy from 1961 to 1977 and petroleum from 1978 to 1985. This let the economy to be regarded as well managed (Amin, 2002). During this period (1961-1985) Cameroon enjoyed a stable macroeconomic environment and an average growth rate of about 7% and it seemed not to be affected by the external shocks of the 70s and early 80s (Amin, 2002).

The financial sector during this period (1960 to 1985) developed under the umbrella of monetary and regulatory policies aimed at supporting the state orchestrated development strategies. The financial sector became an instrument of planned industrialisation policies and operated under a framework characterised by controlled interest rates, directed credit programmes, high reserve requirements and other restrictions on financial intermediation as well as

restricted entry into the market. This situation has been termed financial repression by the proponents of financial liberalisation. All banks were owned by the state and credits were directed to sectors deemed important.

By 1987, due to the down turn in the world economy, the demand and the prices of the main exports of Cameroon declined. At the same time, the real exchange rate of the franc appreciated sharply, while the US dollar depreciated by 40% against the CFA and the terms of trade deteriorated by 47%. Oil output also started declining (Amin, 2002). All these led to a drastic collapse of the economy after practically two decades of good performance. The decline in GDP was sudden and drastic from 8% to -5 % per year (Amin, 2002). This situation revealed the fragile nature of an economy that was seemingly well managed and robust to external shocks. The Bretton Woods institutions attributed the problem to poor and mismanaged external and domestic economic policies. They then proposed the structural adjustment programmes (SAPS) that Cameroon adopted in 1987. In these programmes, the role of the state was redefined and a set of policies were undertaken to liberalise the economy in all its sectors. As such public enterprises were privatised, and many monopolies dismantled.

The financial sector was not spared by the crisis in the real sector. The collapse of the real sector made companies not to meet their financial obligations. This, together with other factors such as the incompetence of managers, poor management techniques, competition from the informal financial sector, and state intervention led to serious crises in the financial sector (Wamba, 2001). Many banks went bankrupt and others became illiquid not being able to meet the withdrawals of depositors. Under the structural adjustment programmes, the restructuring of the financial sector was undertaken in which some banks were liquidated and others recapitalised. There was also a change in monetary and financial policies with the liberalisation of financial markets in 1990. A new banking regulatory agency (COBAC) was also established. As such, there was the deregulation of interest rates, the removal of directed credit schemes, the privatisation of banks, the creation of the money market, the liberalisation of the capital account and the creation of the Douala Stock Exchange (DSX) that has remained in the embryo. It was believed that such a system would support better an economy that was henceforth to be regulated by market forces. These reforms marked the end of a Keynesian inspired planned economy and repressed financial system and the beginning of a classical market based system. The freeing of the financial sector from its constraints had the aim of enhancing its development. Though this reforms actually led to the development of the financial sector, it has however been observed that certain sectors do not benefit from these improvements. This can be observed by the fact that, while the banking system is over liquid, certain key sectors such as agriculture and small

and medium enterprises face financing difficulties (Fouda Owoundi, 2009). It should be noted that, since the reform of the economy as a whole, the priority sectors of the past system had to compete with others for funds now and since they had not developed the expertise in doing so, they were less competitive. As such, institutions developed to take care of their needs. This was through the proliferation of various microfinance institutions that took care of the needs of different sectors and segments of the economy. As such in the agricultural sector, one can find microfinance institutions as agricultural credit unions or savings and loan cooperatives. In other sectors you have self-help groups or cooperatives to help them solve their financial difficulties.

However, these institutions have not been able to help the less efficient sectors to develop to a level that could help them compete for larger funds in the banking sector. This made the government to decide on the creation of two development banks in 2011: the Cameroon Agriculture Financial Rural Corporation (CAFRUC) to take care of the needs of the agricultural sector and the Bank of Small and Medium Enterprises (BSME) to finance small and medium enterprises in Cameroon.

1.2 Agricultural Sector Review

Government intervention in agriculture has a long history in Cameroon. Starting from independence, the reasons for intervention included raising public revenue, ensuring food supplies, stabilizing farmer incomes and exploiting market power. These policies started with high taxation and government intervention in the first two decades after independence to the reforms in the 1990s.

From 1960 to date, three approaches to agricultural development can be distinguished. The first approach was experienced from independence up to 1987. During this period, government interventions and taxation of the agricultural sector progressively increased, and the sector became the main source of government revenue to finance both public consumption and investment needs. In the five year development plans, the agricultural sector had an enviable share. This approach, coupled with external shocks plunged the agricultural sector and the rest of the economy into a deep economic crisis which necessitated important reforms not only in agriculture but in the economy as a whole (Gbetnkom and Khan, 2002).

The second approach started with the adoption of Structural Adjustment Programs (SAPs) in 1988 whose basic objectives were to redefine the role of government and reduce government intervention in the economy. In the agricultural sector, many functions formerly handled by government agencies have been liberalized and the role of these agencies has been limited to research,

data gathering, quality control and regulatory functions. In 1994, the cocoa and coffee subsector, formerly controlled in terms of price fixing by the government and marketing of the commodities by the monopsonist parastatal National Produce Marketing Board, was liberalized. The producer prices of these crops were partially linked to the world prices and the Board retreated to the role of buyer of last resort, releasing the bulk of trade to private buyers. As a mechanism of stabilization, the Board continued up to 1996. This abandonment of the agricultural sector to the mercy of market forces did not yield the expected outcomes of competitiveness and efficiency. Recognizing this, the government driven by the zeal of becoming an emergent nation by the year 2035, decided to implement policies adapted for a modern, efficient, competitive and export oriented agriculture.

This third period was termed that of third generation agriculture by Cameroonian authorities. It was enshrined in the Poverty Reduction Strategy Paper (PRSP) prepared by Cameroon in the framework of its admission in the Highly Indebted Poor Countries Initiative in the year 2000 and had the objectives of modernizing the production system, the promotion of institutions, building of an appropriate and attractive framework, and the sustainable management of natural resources. In each of these four areas of intervention, the agricultural strategy adopted three approaches, namely: the promotion of sustainable income-generating activities for the most vulnerable people; participation of the beneficiaries; and consideration of the gender approach.

In March 2005, a review of past and current strategies was conducted and it revealed that the following principles, contained in the strategy paper, were more or less respected: the empowering of stakeholders; private sector promotion through contracting of activities; and technical, organizational, management and capacity-building. However, the institutional design of most projects and programs transformed them into parallel administrations with no functional relations with the Ministerial organs responsible for implementing their various components and there was no coordination body for these projects and programs (including those that work on the same strategic objective).

With the attainment of the completion point of the HIPC initiative in 2006, these shortcomings were corrected in the new rural sector policy (GESp, 2009). The objectives of the agricultural and rural development component, as presented in the updated Rural Sector Development Strategy Paper, relate to: a sustainable increase in crop yields and agricultural supply, in order to double current production levels by 2015; the sustainable management of productive resources; the promotion of local and community development; the development of adapted financing mechanisms; the development of employment and training; the management of food insecurity risks in order to

stave off the recurrent spectre of famine in ecologically fragile areas; and the development of the institutional framework.

In 2011, an agricultural show was organised in which the actors in this sector discussed the difficulties they faced. Prominent among them was the lack of financing. This led government authorities to announce the creation of two development banks, one for the agricultural sector and the other for small and medium enterprises. Also, the government opened a tractor assembly in Ebolowa with the aim of easing the modernisation of agriculture through mechanisation. All this with the aim of shifting the agricultural sector from one of subsistence to a strong, modern and export oriented sector that would better contribute to the socioeconomic development of the country.

2. Literature Review and Theoretical Framework

2.1 Theoretical Literature

Financial services have very important implications for agricultural development and small household farms (FAO, 1998). Major segments of agriculture cannot modernise without the support of a strong financial system; an increasingly capital intensive agriculture requires access to working capital and seasonal loans along with medium- and long-term credit for on-farm investments. Likewise, many poor people in rural areas are disadvantaged by financial markets that perform poorly. They have less opportunity to climb out of poverty by accumulating financial savings and they have no access to formal credit because the financial system is not innovative or sufficiently efficient to reduce transaction costs and to provide small clients with access to affordable and durable financial services. A more efficient financial system would help accomplish the dual objectives of boosting production and easing rural poverty.

Studies on the sectoral impact of financial development do not abound in the literature. Most studies on financial development take a holistic approach and analyze the overall effect of financial development on economic growth or development. As regards the effects of the development of the financial sector on agricultural growth, not much has been done.

Sukanya (2004) studied the effects of financial liberalisation on the agrarian sector in India and Kenya. He argued that the impact of financial liberalisation on the pattern of agrarian development can be seen as belonging to two distinct categories: macro-financial policies that are a part of the structural adjustment and stabilisation package and have linkages to the development of the overall economy and therefore to the agricultural sector; and financial policies that are specifically designed for the agricultural sector. Liberalisation in both types of

policies must be evaluated for its impact on agricultural development. Examples of the former include policies in respect to public investments and public expenditures; exchange rate and interest rate policies, etc.; whereas rural banking policies would comprise the latter.

His analysis of the two country cases revealed that financial sector liberalisation has adversely affected the agricultural sector in these economies in a number of ways. The movement away from directed regimes left an institutional vacuum that could not be replaced by market forces. By curtailing the flow of institutional credit and the channels through which it flowed, both investments and outputs in the agricultural sector have been adversely affected. The liberalisation of the agriculture sector, i.e., opening the sector to external competition, was very drastic in the case of Kenya and the forces from within the agriculture sector have weakened the rural credit delivery mechanism, which was struggling without state support. The macro-financial management added to the hardships through higher rates of interest, particularly in case of Kenya. Public investments in agriculture, a major determinant of agricultural growth and also of private investment, have declined in both economies further worsening the chances of the agricultural sector and the livelihoods of people dependent on it.

Perivash and Tarkomani (2008) studied the impact of the development of the financial sector on agriculture in Iran. They used a three-variate VAR model and found that the financial sector positively and significantly influences the agricultural sector in Iran. They also found that there existed a causality running from financial development to agricultural sector growth. They then proposed that policies to develop the financial sector in Iran should be undertaken so as to boost its agriculture.

Yanga (2011) examined the relationship between financial sector development and output growth in the agricultural, mining and manufacturing sectors in South Africa. His analysis was based on the hypothesis that financial development was essential for promoting production growth in an economy. To test the hypothesis, in the South African context, the vector autoregressive model (VAR) framework and Granger causality test were applied to a quarterly data set starting from 1970 to 2009. The results suggest that financial intermediary development (bank based measure) and stock market development (market based measure) have a positive impact on output growth in the agriculture, mining and manufacturing sectors in South Africa. There is evidence of a one way causal relationship between financial sector development and sectoral output growth. Particularly, there is evidence that financial intermediary development and stock market development causes output growth in the agriculture, mining and manufacturing sectors in South Africa. However, there is no evidence showing causality running from sectoral output growth to

financial sector development. The results provide evidence supporting the theory which states that financial development is essential to promote output growth in a country. Thus an efficient financial system which promotes the efficient channelling of resources towards the agricultural, mining and manufacturing sectors should be encouraged.

Shahbaz, Shabbar and Butt (2011) investigated the effects of financial development on the agricultural sector in Pakistan during the period 1971-2011 using a Cobb Douglas production function which incorporates financial development. They used the ARDL bounds testing approach to cointegration to examine the long run relationship between the variables. The direction of causality is detected by VECM Granger causality test and the robustness of the causality results are tested through the innovative accounting approach (IAA). Their findings confirm that the variables are cointegrated for the equilibrium's long run relationship between agricultural growth, financial development, capital and labour. The results indicate that financial development has a positive effect on agricultural growth. This implies that financial development plays a significant role in agricultural production and hence agricultural growth. The capital use in the agricultural sector also contributes to agricultural growth. Granger causality analysis revealed bidirectional causality between agricultural growth and financial development. They therefore recommended policy makers to stimulate agricultural growth by improving on the efficiency of the financial sector.

For the case of Cameroon, no such study exists though the work of Roesch, Wampfler, and Mounkama (2003) indicates that micro-credit was important in determining the performance of cotton producers in northern Cameroon. This study therefore attempts to cover this gap in the literature by studying the relationship between the financial and agricultural sectors in Cameroon.

2.2 Analytical Framework

We draw from the model developed by Gourinchas and Jeanne (2003) to propose the following framework for the analysis of the sectoral effects of financial development.

The main hypothesis of the model is that most of the inequality between nations is due to differences in Total Factor Productivity (TFP) and not factor endowment. This implies that financial development can only reduce differences in output per capita by significantly reducing differences in TFP. This suggests that countries that have poorly developed financial systems tend to have lower rates of TFP and be poorer.

We consider a three-period model with two different types of technology for a given country: an efficient technology and an inefficient one. TFP is higher in

the sector with efficient technology ($A_E > A_I$). The two production functions are Cobb Douglas of the form:

$$\begin{aligned} Y_E &= A_E K^\alpha L^{1-\alpha} \\ Y_I &= A_I K^\alpha L^{1-\alpha} \end{aligned} \quad (1)$$

Other assumptions of the model are the following:

- Both technologies have the same factor elasticity.
- Capital income can be taxed in the efficient sector but not in the inefficient sector.
- The country is populated by capitalists and workers and capitalists choose to specialize into one of the sectors at period 0 while workers are endowed with one unit of labor at period 1 and 2.
- Capital income is taxed in periods 1 and 2 and redistributed to workers while the capital account can be closed or open. When closed, capital cannot cross the borders (underdeveloped financial systems), if opened, capital can be rented from abroad freely (financial development).

These imply that, in the case of financial underdevelopment, the capital account is closed in periods 0 and 1. Thus the efficiency of output depends on technology at period 0. In periods 1 and 2,

$$L_E = \left[(1-\alpha) \frac{A_E}{\omega} \right]^{\frac{1}{\alpha}} K_E \quad (2)$$

$$L_I = \left[(1-\alpha) \frac{A_I}{\omega} \right]^{\frac{1}{\alpha}} K_I \quad (3)$$

$$L_E + L_I = L \quad (4)$$

$$W = (1-\alpha) L^{-\alpha} \left(A_E^{\frac{1}{\alpha}} K_E + A_I^{\frac{1}{\alpha}} K_I \right) \alpha \quad (5)$$

The sector “S” equals the sum of the efficient and the inefficient sub-sectors and its return per unit of capital is given as the maximization of:

$$A_s k^\alpha l^{1-\alpha} - wl = k A_s^{\frac{1}{\alpha}} \omega^{\frac{1-\alpha}{\alpha}} k \quad (6)$$

Where, $k = \alpha (1-\alpha)^{\frac{1-\alpha}{\alpha}}$ and the gross rental price of capital $R_s = k A_s^{\frac{1}{\alpha}} \omega^{\frac{1-\alpha}{\alpha}}$

Given the fact that government imposes a tax t in the efficient formal sector and does not tax the inefficient informal sector, investment goes to the formal sector only and only if;

$$(1-t_1)R_E + (1-t_2)R_E > 2R_I \quad (7)$$

We can simply assume t' as the average rate of tax over the lifetime of K and then get:

$$t < t' = 1 - \left(\frac{A_I}{A_E} \right) \left(\frac{1}{\alpha} \right) \quad (8)$$

The outcome in financial underdevelopment is that beyond a certain threshold, it does not longer matter for capitalists to invest in the formal and efficient sector whatever the level of efficiency and TFP growth. The higher the efficiency in the sector with high Total Factor Productivity in comparison with the inefficient sector, the higher is the tax rate to discourage entrepreneurs to invest in the formal sector.

In the case of financial development, we assume that capital account is opened in period 1, but closed in period 0. Although the tax rate t_2 is still predetermined in the previous period, it is no longer the case for the capital stock because at period 1 there is an arbitrage between domestic and international capital flows. From the basic assumptions of the model this means that:

$$(1-t_2)R_2 = R^*, \quad (9)$$

$$R_2 = kA_E^{\frac{1}{\alpha}} w_2^{\frac{1-\alpha}{\alpha}} \quad (10)$$

If capitalists do not invest in the informal sector, the real wage in the second period is given by:

$$w_2 = (1-\alpha)A_E \left(\frac{K_2}{L} \right)^{\alpha} \quad (11)$$

Since the government taxes consumption of workers at period 2 to maximize consumption at period 2:

$$C_2^w = \left(\frac{A_E K_2^{\alpha} L^{1-\alpha} - R^* K_2}{L} \right) \quad (12)$$

So with financial development, when the capital account is opened in period 1 and closed in period 0, capital is still taxed in period 1 and capitalists receive a return per unit of capital in the following period. The incentive to invest in the formal sector is now:

$$\left(\frac{(1-t_1)R_E + R^*}{2R_E} \right) = \left(\frac{t' + (R^* - R_E)}{2R_E} \right) \quad (13)$$

When there is scarcity of capital $K (R^* < R_E)$, the tax rate will be lower than under financial underdevelopment; when financial underdevelopment is an obstacle to the high TFP sector development $\left(t' = \frac{1}{2} \right)$, then financial

development in period 1 is Pareto-efficient in the sense that the working class gets higher incomes while the income of the capitalists remains at the underdevelopment level (no one wins at the expense of the other). In other words, under financial development, when property rights are respected and government regulation low (low taxes), the economy faces a switch of resources from the inefficient to the modern sector.

From the above we can conclude that financial development favors the efficient sector in an economy. This therefore implies that if financial development is found not to improve the growth of the agricultural sector in a country, this signifies that the agricultural sector is less efficient and policies should be undertaken so as to modernize the sector.

3. Methodology and Data Framework

3.1 Unit Root Test Model

The starting point of the analyses is to test the unit root properties of the variables. A time series is considered to be stationary if its mean and variance are independent of time. If the time series is non-stationary, i.e., having a mean and or variance changing over time, it is said to have a unit root. If a time series is non-stationary, the regression analysis carried out in a conventional way will produce spurious results. A spurious regression occurs when after regressing a time series variables on others, the tests statistics show a significant relationship between these variables even though no such relationship exist. A non-stationary time series can be converted into a stationary time series by differencing. If a time series becomes stationary after differencing one time, then the time series is said to be integrated of order one and denoted by I(1). Similarly, if a time series has to be differenced d times to make it stationary, then it is called integrated of order d and written as I (d). As the stationary time series needs not to be differenced, it is denoted by I (0).

We test for the order of integration using the augmented dickey- fuller test (ADF). The test is based on the following three models;

$$\Delta X_t = \rho X_{t-1} + \sum_{j=2}^p \Phi \Delta X_{t-j} + \mu t \quad (14)$$

$$\Delta X_t = \rho X_{t-1} + \sum_{j=2}^p \Phi \Delta X_{t-j} + bt + \mu t \quad (15)$$

$$\Delta X_t = \rho X_{t-1} + \sum_{j=2}^p \Phi \Delta X_{t-j} + bt + c + \mu t \quad (16)$$

The principle of this test is, if the H_0 hypothesis that $\rho=1$ is accepted in any of the three equations, then, the process is not stationary.

The value p of lags is determined with the aid of the Akaike information criterion. The lag chosen correspond to the one that minimises this criterion.

3.2 Cointegration Test Model

Cointegration signifies the existence of one or many equilibrium long run relationship(s) that can be combined with the short term dynamics of the other variables in an error correction model. This relationship is the following;

$$\Delta Y_t = \Pi Y_{t-1} + \sum_i^k \Gamma_i \Delta Y_{t-i} + \mu_t \quad (17)$$

Y_t : Vector of variables that we need to study their dynamics. In this case they are financial development (FD) and value added in the agricultural sector (GA).

Γ_i : a matrix number and

Π : a matrix whose rank determines the number of Cointegration Relationships. The number of optimal lags is determined using the Akaike and Schwarz criteria.

Cointegration is the statistical implication of the existence of long run relationship between the variables which are individually non-stationary at their level form but stationary after differencing. The theory of cointegration can therefore be used to study series that are non-stationary but a linear combination of which is stationary. Two main procedures are used to test for cointegration: the Engle and Granger (1987) test and the Johansen (1988) cointegration test. The cointegration in multiple equations can be examined only by the Johansen and Juselius (1990) approach. Johansen procedure of co integration gives two statistics. These are the value of LR test based on the maximum Eigen – value and on the trace value of the stochastic matrix. The Johansen test uses the likelihood ratio to test for cointegration. Up to $(r-1)$ cointegrating relationships may exist between a set of r variables. The hypothesis of cointegration is accepted if the number of cointegrating relationships is greater than or equal to one. The decision rule compares the likelihood ratio to the critical value for a hypothesised number of cointegrating relationships. If the likelihood ratio is greater than the critical value, the hypotheses of cointegration is accepted, if not it is rejected.

3.3 VAR-Based Causality Test

We investigate the relationship between the development of the financial sector and the growth of the agricultural sector using Vector Autoregressive (VAR)

causality testing techniques. The standard procedure of testing for causality is the Granger causality test specified as:

$$\begin{aligned} y_t &= \mu_1 + \omega_1(L)x_{t-i} + \psi_1(L)y_{t-i} + \varepsilon_{1t} \\ x_t &= \mu_2 + \omega_2(L)x_{t-i} + \psi_2(L)y_{t-i} + \varepsilon_{2t} \end{aligned} \quad (18)$$

In this system, x_t causes y_t if $\omega_1(L)$ is statistically not equal to zero. Similarly, y_t causes x_t if $\psi_2(L)$ is statistically not equal to zero. If none of the two scenarios is true then there is no causality between x_t and y_t . However, if both are true there exists feedback or bidirectional causality between x_t and y_t .

The bivariate VAR can be written as:

$$X_t = \mu + \Theta(L)X_{t-1} + \varepsilon_t \quad (19)$$

Where $X_t = \begin{pmatrix} x_t \\ y_t \end{pmatrix}$

However, this conventional Granger causality test becomes valid only if the variables are stationary (Granger, 1988). In the event that the variables involved are non-stationary then several options are open to the analyst depending on whether such variables are cointegrated or not. If the non-stationary variables are not cointegrated, they enter (14) in differenced form.

If on the other hand they are cointegrated, then the alternative procedure is the VECM representation of the VAR used in the conventional test. This approach has been used in the finance – growth causality studies, among others, by Kar and Pentecost (2000) and Mohapi and Motelle (2006).

The mathematical representation of the latter is:

$$\begin{aligned} \Delta y_t &= \zeta_1 + \phi_1(L)\Delta x_{t-i} + \varphi_1(L)\Delta y_{t-i} + \alpha_1 ECM_{t-1} + \varepsilon_{1t} \\ \Delta x_t &= \zeta_2 + \phi_2(L)\Delta x_{t-i} + \varphi_2(L)\Delta y_{t-i} + \alpha_2 ECM_{t-1} + \varepsilon_{2t} \end{aligned} \quad (20)$$

In this specification, ECM is the error correction term $\beta^T X$ in which $\beta^T = (\beta_1, \beta_2)$ is the cointegrating vector. The parameters α_1 and α_2 are elements of the adjustment vector²². In this specification, there are two sources of causality. System (3) exhibits unidirectional causality from x_t to y_t if $\varphi_2(L) \neq 0$ and $\alpha_2 \neq 0$ in the statistical sense. Non causality in either direction

²² This is the adjustment vector α that combines with the cointegrating vector β^T to form the matrix of long run parameters $\Pi = \alpha\beta^T$.

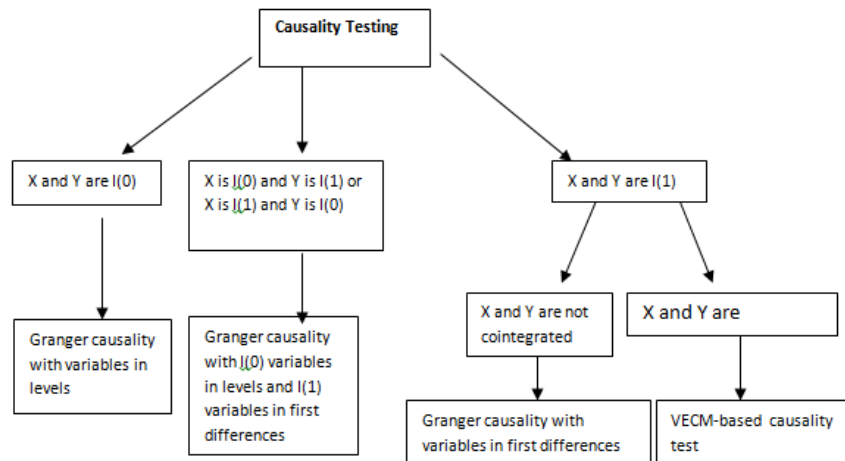
is defined by $\phi_1(L) = 0$, $\phi_2(L) = 0$ and $\alpha_1 = \alpha_2 = 0$ (Kouassi et al., 2005). The relevant testing procedure in systems (14) and (16) is the Wald test.

The compact representation of system (3) is:

$$\Delta X_t = \zeta + \Gamma(L)\Delta X_{t-1} + \alpha\beta^T X_{t-1} + \varepsilon_t \tag{21}$$

The critical distinction between the treatment of non-stationary, non-cointegrated variables and non-stationary, cointegrated variables is the inclusion of the ECM term $\Pi X_{t-1} = \alpha\beta^T X_{t-1}$ in the latter to take into account the equilibrium relationship of the variables implied by the presence of cointegration. The following figure characterizes the modeling philosophy used for the analysis in this study.

Figure 1: philosophy of causality testing



Source: Mohapi and Motelle (2006)

3.4 Data Needed and Sources

Financial development is measured by bank credit to the private sector divided by GDP. This measure has also been used by Tabi et al. (2011), Mohapi and Motelle (2006) and King and Levine (1993) to capture the development of the financial sector. This measure is particularly appropriate for this study as in the process of economic liberalization in Cameroon, state owned agricultural farms were privatized and priority credits and rates that were offered the agricultural sector abolished. This sector therefore had to compete for funds together with others. Therefore, it is the development of the credit activity to the private

sector that influences most the development of this sector. This variable is denoted by FD.

Growth of the agricultural sector is measured by its share in GDP. This is measured by dividing the value added of the agricultural sector by nominal GDP. This is denoted by GA.

The data for FD is collected from the International Financial Statistics 2012 CD ROM of the International Monetary Fund and the GA collected from the African Development Database 2012 CD ROM of the World Bank. The period of study is from 1973 to 2011.

4. Results Analysis

4.1 Results Presentation

Unit root test results: The ADF test results for the variables are shown in table 1 below.

Table 1: Unit root test results using the ADF test

variables	ADF TEST STATISTICS		
	level	First difference	Decision
FD	-1.306603	-3.443528**	I(1)
GA	-1.755961	-8.105849***	I(1)

NB: (*), (**), (***) indicates significance at 10%, 5%, and 1% respectively

Source: Authors calculations

The results indicate that all the variables are integrated of order 1. This implies that they need to be differenced once before they become stationary. As the variables are non-stationary, the next step consists of testing for the existence of a long run equilibrium relationship between the variables.

Cointegration test results: We test for cointegration using the Johansen trace test. The results are shown in the table 2.

Table 2: Johansen Unrestricted Cointegration Rank Test

Hypothesized		Trace	5 Percent	1 Percent
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Critical Value
None	0.131280	6.035635	15.41	20.04
At most 1	0.036116	1.250659	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level

Source: authors calculations using Eviews 4.1.

Trace test indicates no cointegration at both 5% and 1% levels

Granger causality Wald test results: The relationship between causality and cointegration is such that if two variables are cointegrated, then one can expect Granger causation in at least one direction (Granger, 1988). The absence of cointegration between agricultural sector growth and financial development spells the expectation of no causality between them. Table 3 summarizes the causality between the first differences of financial development (FD) and agricultural sector growth (GA).

Table 3: Pairwise granger causality test results

Null Hypothesis:	Obs	F-Statistic	Probability
D(GA) does not Granger Cause D(FD)	34	1.41607	0.25895
D(FD) does not Granger Cause D(GA)		1.43206	0.25521

Source: authors' calculations using Eviews 4.1.

Since the probabilities of the F-Statistics are greater than 5%, we accept both null hypotheses of no causality between D(FD) and D(GA). For the case of Cameroon, the development of the financial sector does not cause the growth of the agricultural sector and vice versa.

4.2 Policy Implications

The above results have serious agricultural policy implications for Cameroon. As agriculture is a key sector in achieving the Millennium Development Goals by 2015 and becoming an emergent country by 2035, and as the current financial development observed in the country does not profit this sector, the government therefore has the obligation of either finding alternative financing means or directing reforms in the financial sector that would make it finance the agriculture. As such, the state can either create specialised banks to take care of the agricultural sector or modernise the sector through subsidies and other rural sector policies making it more competitive in the fund market.

Shultz (1965) proposed the High Payoff Input Model for the development of the agricultural sector. According to this model, the key to transforming a traditional agricultural sector into a productive source of economic growth is investment designed to make modern high payoff inputs available to farmers in poor countries. Peasants, in traditional agricultural systems are viewed to be rational and efficient resource allocators. They remain poor because in most poor countries, there are limited technical and economic opportunities to which

they could respond. The new, high payoff inputs, as identified by Schultz (1965), can be classified into three categories: the capacity of public and private sector research institutions to produce new technical knowledge; the capacity of the industrial sector to develop, produce, and market new technical inputs; and the capacity of farmers to acquire new knowledge and use new inputs effectively. This model was highly successful in Mexico and Philippines which developed high-productivity grains adapted to the climatic conditions in their countries. The high returns associated with the adoption of the new varieties of seeds and the associated technical inputs and management practices have led the Shultz model to be termed the 'Green revolution' Vernon and Yujiro (1971).

However, for this model to be successful in Sub-Saharan Africa and Cameroon in particular, countries have to invest largely in the construction of specialise agricultural institutions for research on the new inputs, the construction of agricultural infrastructures such as farm to market roads and other regional roads in order to ease the transportation and the marketing of the products and, also the improve on the educational level of farmers so as the increase their capacity to adopt the new innovative inputs. All of these require huge investments. Nonetheless, since these problems cut across most countries in the sub region, joint efforts can be made in their various regional economic groupings. As such, for example a CEMAC regional school for tropical agriculture can be created so as to carry out research on most of the issues specific to the region. Also, roads can be constructed to link all the countries of the region; this will have the advantage of providing a large market for the products and also to ease the marketing of the produce.

Conclusion

The objective followed in this study was to determine the causality relationship between the development of the financial sector and the growth of the agricultural sector in Cameroon. We employed VAR based causality testing techniques on Cameroon data for the period 1973 to 2009. We came out with the results that there exist no long run equilibrium relationship between the development of the financial sector and the growth of the agricultural sector. Also, financial development was not found to granger cause agricultural sector growth and vice versa in Cameroon.

These results indicate that the observed poor performance of the agricultural sector in Cameroon is not caused by the under development of its financial sector. This also implies that the agricultural sector in Cameroon remains rudimentary and has not yet recovered from the past crisis as it cannot efficiently compete for funds with other modern and more developed sectors.

The Cameroonian government in order to boost its agricultural sector should therefore adopt policies that would modernize the sector. Such policies may include the mechanization of production, the promotion of the use of modern techniques, use of improved seeds etc. As the lack of relationship between the two sectors may also indicate that the financial sector has not developed techniques to finance the agricultural sector, this entails that the government should also encourage the opening of agricultural banks so as to guarantee a means of finance for the agricultural sector.

References

1. Amin, A. (2002) "An Examination of the Sources of Economic Growth in Cameroon" AERC research paper 116.
2. FAO and GTZ (1998) "Agriculture Finance: Getting the Policies Right", Agriculture Finance Revisited No. 2.
3. Fouda Owoundi (2009) "La Surliquidité des Banques en Zone Franc: Comment Expliquer le Paradoxe de la CEMAC?" *The African Integration Review*, Vol. 3. No. 2, October 2009.
4. Gbetnkom D., and S. Khan (2002) "Determinants of Agricultural Exports: the Case of Cameroon" AERC research paper 120
5. Gourinchas, P-O., and Jeanne, O. (2002) "On the Benefits of Capital Account Liberalization for Emerging Economies" CEPR, IMF, Princeton University
6. Granger, C.W.J. (1988) "Some Recent Developments in the Concept of Causality", *Journal of Econometrics*, 39, 199-211
7. Johansen, S. (1988) "Statistical Analysis of Cointegration Vectors", *Journal of Economic Dynamics and Control*, No.12, 231 - 254
8. Johansen, S. and Juselius, K. (1990) "Maximum Likelihood Estimation and Inference on Cointegration with Application to the Demand for Money" *Oxford Bulletin of Economic and Statistics*, No.52, 169 - 210
9. Kar, M. and E. Pentecost (2000) "Financial Development and Economic Growth in Turkey: Further Evidence on the Causality Issue." CIFER Working Paper 00/27 Loughborough University
10. King R. and Levine R. (1993) "Finance and Growth: Shumpeter Might be Right" *Quarterly Journal of Economics* 108, 3; 717-38
11. Kouassi E., M. Iyoha, and K.O. Kymn (2005) "Lag Length Selection and Tests of Granger Causality between the Twin Deficits", Mimeo, University of South Africa, South Africa
12. Ministry of the Economy, Planning and Regional Development (2009) "Growth and Employment Strategy Paper (GESP)", Cameroon
13. Mohapi P., and Motelle S. (2006) "The Finance-Growth Nexus in Lesotho: Causality Revelations from Alternative Proxies" Paper Presented

- at the 11th African Econometric Society Conference, Dakar, Senegal on July 6-7
14. G. H. Perivash and J. Tarkomani (2008) "Effects of Financial Markets Development on Growth of Agricultural Sector" *American-Eurasian Journal of Agricultural and Environmental Science* 2 (supple 1): 166-168
 15. Roesch M., B. Wampfler, and C. Mounkama (2003) "Financer la Campagne Agricole dans un Contexte de Libéralisation : de Nouvelles Formes de Coordination entre Acteurs à Construire, le cas du Cameroun" Actes du colloque, 27-31 Mai, Garoua, Cameroun
 16. Shahbaz M., Shabbir M., and Butt M., (2011) "Effect of Financial Development on Agricultural Growth in Pakistan: New Evidence from Bound Test to Level Relationships and Granger Causality Tests" MPRA Paper No. 34162
 17. Shultz, T. W. (1965) *Transforming Traditional Agriculture*, New Haven, Connecticut
 18. Tabi A. J., A. M. Njong, and Neba C. (2011) "Financial Development and Economic Growth in Cameroon, 1970-2005", *Journal of Economics and International Finance*, vol 3(6), 367-375
 19. Vernon, W. R. and Yujiro Hayami (1971) *Agricultural Development : An International Perspective*, Baltimore, USA
 20. Wamba H. (2001) "La Gestion Bancaire en Afrique Centrale a L'heure des Grandes Mutations; Bilan et Perspectives" *Revue Gestion 2000*, No 6
 21. World Bank (2008), "Agriculture for Development", *World Development Report 2008*, World Bank, Washington, DC
 22. Yanga Tonga (2011) "Financial Sector Development and Sectoral Output Growth: Evidence from South Africa", Unpublished Master's Thesis, Rhodes University, South Africa.

Discrimination salariale: une extension de la décomposition d'Oaxaca-Blinder avec application aux données ivoiriennes

Do Ango Simplicio²³

Résumé : *Récemment, un intérêt croissant pour réduire les discriminations par sexes et raciales est apparu. Par conséquent, l'intérêt pour explorer les causes de l'écart des salaires discriminatoires s'est également accru. Un outil souvent appliqué pour ce type d'analyse est la technique de décomposition d'Oaxaca-Blinder. Cependant, il s'avère que cette technique est insuffisante quand il s'agit de calcul des contributions distinctes à la discrimination de la variable indicatrice. C'est parce que les contributions ne sont pas robustes par rapport à un changement de groupe de référence. Dans ce papier, la décomposition d'Oaxaca-Blinder est étendue afin de prendre en compte ce problème susmentionné. La technique est ensuite appliquée aux données Ivoiriennes d'enquêtes.*

Mots clés : *Décomposition – Discrimination*

Classification JEL: *J31, J24, J16, J15*

Wage distribution: an extension of the Blinder-Oaxaca decomposition applied to Ivorian Data

Abstract: *Recently, there has been growing interest in reducing gender and race discriminations. Hence, interest in exploring what causes the discriminatory wages gap has also grown. An often applied tool for this type of analysis is the Oaxaca-Blinder decomposition technique. However, it turns out that this technique is inadequate when it comes to calculation of separate contributions to discrimination for indicator variable. This is because the contributions are not robust against a change of reference group. In this paper the Oaxaca-Blinder decomposition is extended to handle this issue. The technique is then applied to Ivorian survey data.*

Key-words: *Decomposition - Discrimination*

JEL Classification codes: *J31, J24, J16, J15*

²³ Do Ango Simplicio, Université Omar Bongo, Libreville – Gabon Email: doangos@yahoo.fr

Introduction

Ces vingt dernières années ont vu un intérêt croissant pour la réduction de la discrimination sexuelle et raciale. Pour ce type d'analyse, l'outil le plus souvent utilisé est la technique de décomposition d'Oaxaca-Blinder. Cependant, il s'avère que cette technique est insuffisante quand il s'agit de calculer les contributions distinctes à la discrimination pour des variables indicatrices; et d'autre part les contributions ne sont pas robustes par rapport à un changement de groupe de référence (voir Elder et al. 2010; Jones, 1983; et Rio et al., 2011). Dans ce papier, nous nous intéressons à la décomposition d'Oaxaca-Blinder proposée par Nielsen (2000).

Nous montrons d'abord les limites de la décomposition traditionnelle puis nous proposons une méthode plus robuste qui corrige ces limites. La nouvelle méthode est par la suite appliquée aux données Ivoiriennes.

Le reste du papier est organisé de la façon suivante: la Section 2 traite de l'économétrie des discriminations salariales et présente une extension du modèle de Nielsen (2000). La Section 3 décrit les données Ivoiriennes qui sont utilisées pour les analyses empiriques. La Section 4 présente les résultats de l'estimation d'un modèle de régression salariale minimaliste. L'évaluation des possibles ou plausibles discriminations est faite à la Section 5. Finalement, la Section 6 conclut le papier.

1. Économétrie de la Discrimination

Tout d'abord, une équation salariale est estimée pour chaque groupe –à savoir le groupe des hommes (m) et celui des femmes (f)– Pour simplifier, un modèle comportant deux (02) variables indépendantes est pris en compte. On obtient alors,

$$Y_i^g = \beta_0^g + Z_i^g \beta_1^g + D_i^g \beta_2^g + \varepsilon_i^g \quad \text{où } i=1, \dots \quad = m, f \quad (1)$$

dans lequel, la variable dépendante Y , désigne le logarithme du salaire; l'exposant g désigne le genre, et i l'indice des individus; les variables explicatives sont, $X_i^g = \{1, Z_i^g, D_i^g\}$, où D et Z sont des variables indicatrices; le vecteur des paramètres est $\beta^g = (\beta_0^g, \beta_1^g, \beta_2^g)$.

En utilisant les hommes comme norme, l'identité suivante définit la première étape de la décomposition d'Oaxaca-Blinder (voir Deininger et Nagarjan, 2013),

$$\bar{Y}^m - \bar{Y}^f = \underbrace{(\bar{X}^m - \bar{X}^f)}_q \beta^m + \bar{X}^f \underbrace{(\beta^m - \beta^f)}_d \quad (2)$$

Le premier terme de la somme que nous désignons par q , est la partie de l'écart salarial entre genre et pourrait s'expliquer par des différences de qualifications,

et le second terme noté d est la partie de l'écart salarial entre les sexes qui est causée par la discrimination. La prochaine étape dans une décomposition détaillée du salaire est d'attribuer à q et d des variables explicatives spécifiques (voir Deininger et Nagarjan, 2013; Oaxaca et Ransom, 1998).

Selon Oaxaca (1973) et Blinder (1973) la contribution à partir de la p ème variable est

$$q_p = (\bar{X}_p^m - \bar{X}_p^f) \beta_p^m, \quad p=1,2 \quad (3)$$

Cependant, s'il y a des ensembles de variables indicatrices entre les variables explicatives, les contributions pour cette série devraient être résumées et évaluées dans leur ensemble parce que chacune des contributions est sensible à un changement dans le groupe de référence, mais la somme ne l'est pas. Selon Oaxaca (1973) et Blinder (1973), les contributions spécifiques à d des paramètres devraient être calculées comme

$$d_p = \bar{X}_p^f (\beta_p^m - \beta_p^f), \quad p=0,1,2 \quad (4)$$

Les contributions, pour toute variable indicatrice sont en général sensibles au choix du groupe de référence. Il n'est pas satisfaisant de juste retirer l'évaluation à la contribution des variables indicatrices puisque l'une des questions les plus intéressantes est la suivante: en raison de quelles caractéristiques personnelles les femmes sont-elles victimes de discrimination? Par conséquent, une technique de décomposition étendue ou généralisée est indispensable (voir Reilly, 1991).

Nous suggérons que le terme constant implicite soit calculé pour chaque type de personnes défini par les catégories des variables indicatrices. Comme ces paramètres sont les mêmes quel que soit le groupe de référence choisi, ils peuvent former la base de la décomposition. Réécrivons d comme suit,

$$d = \frac{N^f (\beta_0^m - \beta_0^f) + \sum_{j=1}^{N^f} Z_j^f (\beta_1^m - \beta_1^f) + \sum_{j=1}^{N^f} D_j^f (\beta_2^m - \beta_2^f)}{N^f}$$

Réécrivons la partie qui n'est pas liée à Z de la façon suivante,

$$\begin{aligned} \frac{N^f (\beta_0^m - \beta_0^f) + \sum_{j=1}^{N^f} D_j^f (\beta_2^m - \beta_2^f)}{N^f} &= \sum_{j \in \{j|D_j^f=1\}} \frac{(\beta_0^m - \beta_0^f) + (\beta_2^m - \beta_2^f)}{N^f} + \sum_{j \in \{j|D_j^f=0\}} \frac{(\beta_0^m - \beta_0^f)}{N^f} \quad (5) \\ &= \alpha_1 [(\beta_0^m + \beta_2^m) - (\beta_0^f + \beta_2^f)] + \alpha_2 (\beta_0^m - \beta_0^f) \end{aligned}$$

Où α_1 est la proportion des femmes avec $D^f = 1$ et α_2 celle avec $D^f = 0$.

Chaque terme, dans l'équation 5 désigne la proportion des femmes avec D^f fois, l'augmentation de leur salaire en termes de points de pourcentage si elles

avaient été rémunérées comme des hommes ; Avec, pour le premier terme, $D^f = 1$ et pour le second, $D^f = 0$. L'augmentation de leur salaire en termes de points de pourcentage si elles avaient été payées comme des hommes, est égale à la différence entre le terme constant de type spécifique entre les hommes et les femmes.

La méthode ci-dessus présentée, peut être généralisée au cas où d'autres variables indicatrices sont incluses (voir Nielsen 2000; Reilly, 1991; et Rio et al., 2011). Comme les contributions sont des fonctions linéaires des paramètres estimés, les écarts types sont par conséquent faciles à calculer.

2. Les Données

Pour l'analyse empirique, les données de l'enquête nationale en 2008 sur le niveau de vie des ménages (ENV 2008) sont utilisées. Les données ont été collectées par l'Institut National de la Statistique (INS) de Côte-d'Ivoire. L'enquête a été conduite sur un échantillon de 12600 ménages distribués à travers 11 strates de 630 grappes. L'échantillon de 12600 ménages a été obtenu par un tirage au sort à deux niveaux ou degrés. Pour la présente étude, un échantillon de 1766 adultes actifs provenant de zones urbaines (Région d'Abidjan) a été sélectionné, c'est-à-dire 1162 hommes et 604 femmes. Des statistiques descriptives sur cet échantillon sont contenues dans le Tableau 1.

Dans l'analyse empirique, la variable dépendante est le logarithme du salaire mensuel de l'emploi principal. Le Tableau 1 révèle un écart de revenu de 48,6% entre hommes et femmes. En outre, le Tableau révèle un écart d'instruction entre les hommes et les femmes. En fait, près de 40% des femmes actives de l'échantillon n'ont pas d'éducation contre seulement 26,5% pour les hommes. 43,8% des hommes actifs ont terminé au moins les études secondaires; le taux est un peu plus faible pour les femmes (27,8%).

Tableau 1: Statistiques Descriptives

	Hommes		Femmes	
	Moyenne	Ecart-type	Moyenne	Ecart-type
Salaire(en Log)	11.286	0.031	10.8	0.0478
Expérience	8.559	0.229	6.509	0.243
Expérience au carré	133.875	7.451	77.852	5.716
Niveau études primaire	0.296	0.013	0.315	0.019
Niveau études collège	0.181	0.011	0.134	0.014
Niveau études lycée	0.067	0.007	0.046	0.009
Niveau études université	0.190	0.012	0.096	0.012
Source : ENV 2008, Calculs de l'auteur				

3. Résultats d'Estimation

Les résultats de l'estimation de l'équation de salaire minimaliste sont présentés dans le Tableau 2. Le gain par rapport à l'expérience est plus élevé pour les hommes que pour les femmes en début de carrière sur le marché du travail; cependant, ce gain atteint un maximum après 29 ans, alors que pour les femmes, il ne cesse d'augmenter jusqu'à 43 ans d'expérience. Le gain par rapport aux études effectuées est plus élevé pour les femmes que pour les hommes à tous les niveaux.

Tableau 2: Résultats de l'estimation des Equations salariales

	Hommes		Femmes	
	Coefficient	Ecart-type	Coefficient	Ecart-type
Experience	0.079	0.010	0.061	0.022
Experience au carré	-0.001	0.0003	-0.001	0.0009
Primaire	0.031	0.073	0.386	0.098
College	0.344	0.083	0.531	0.131
Lycee	0.455	0.117	1.041	0.202
Université	0.968	0.082	1.699	0.149
Constante	10.508	0.070	10.053	0.099
R ²	0.212		0.261	
R ² ajusté	0.208		0.254	
Taille du groupe	1162		604	

Source : ENV 2008, Calculs de l'auteur

4. Evaluation des Discriminations

L'écart de salaire est d'abord décomposé selon l'Equation 1, le résultat se trouve dans le Tableau 3. Plus de la moitié de l'écart de salaire (0,284) est due à la discrimination et le reste est dû aux différences de qualifications. Des écarts types, on voit que les contributions d et q sont bien significatives.

Dans le Tableau 4, les contributions spécifiques à d et q à partir des variables explicatives sont obtenues. Les contributions y sont calculées selon la technique de décomposition d'Oaxaca-Blinder originelle.

Tableau 3: Contributions estimées de l'écart salarial entre genre

	Contribution	Ecart-type
Qualification (q)	0.202	0.026
Discrimination (d)	0.284	0.052
Discrimination (d+q)	0.486	0.057

Source : ENV 2008, Calculs de l'auteur

Tableau 4: Contributions spécifiques aux composantes q et d (Approche d'Oaxaca-Blinder)

	Contribution a q	Ecart-type	Contribution a d	Ecart-type
Variables continues				
Expérience	0.161	0.033	0.114	0.157
Expérience au carré	-0.076	0.021	-0.051	0.077
Variables indicatrices et terme constant				
Primaire	-0.0006	0.0015	-0.112	0.038
College	0.0163	0.007	-0.025	0.021
Lycee	0.0094	0.0057	-0.027	0.011
Universite	0.091	0.018	-0.070	0.021
Constante	0	0	0.456	0.121
Total	0.202	0.026	0.284	0.052

Source : ENV 2008, Calculs de l'auteur

20,2 points de pourcentage de différence entre les sexes est causée par des différences de qualifications; seulement 8,5 points de pourcentage proviennent d'une différence dans l'expérience accumulée et de 11,6 points de pourcentage proviennent du fait que les femmes ont un niveau d'éducation inférieur à celui des hommes.

A présent, les contributions à l'écart de salaire discriminatoire présentées dans le Tableau 5 sont analysées. On voit que les travailleurs qui n'ont pas d'éducation formelle expliquent 18,6 points de pourcentage de l'écart de salaire discriminatoire alors que pour ceux qui ont des niveaux d'éducation la contribution à la discrimination est négligeable. D'autre part, 31,5% des femmes sont concernées par plus des deux tiers de l'écart de salaire de discrimination; à la fois en valeur absolue et en valeur relative. Les femmes qui n'ont pas

d'éducation formelle représentent une forte proportion de l'écart de salaire discriminatoire.

Tableau 5: Contribution des variables indicatrices a la discrimination (d)

	Proportion de l'échantillon	Contribution a d	Ecart-type
Aucune éducation formelle	0.315	0.186	0.0496
Primaire	0.302	0.032	0.052
Collège	0.166	0.036	0.066
Lycée	0.060	-0.006	0.097
Université	0.157	-0.026	0.0723
Contribution totale des variables indicatrices	1.00	0.222	0.056

Source : ENV 2008, Calculs de l'auteur

Conclusion

Dans ce papier, nous avons utilisé une technique de décomposition détaillée alternative présentée par Nielsen (2000) puis généralisée pour calculer les contributions à la discrimination salariale pour les variables indicatrices. La technique proposée permet une meilleure compréhension des fondements de la partie discriminatoire de l'écart salarial entre les sexes.

La technique est illustrée sur les données Ivoiriennes, où il est constaté que les femmes qui n'ont aucune éducation formelle connaissent plus de discrimination. L'approche originale d'Oaxaca-Blinder révèle que la part de l'écart de revenu entre hommes et femmes qui viennent d'une différence de qualifications s'explique principalement par le fait que les femmes ont un niveau d'éducation plus faible.

Références

1. Blinder, AS (1973) 'Wage discrimination: reduced form and structural estimates', *Journal of Human Resources*, 8, pp. 436-455.
2. Deininger K, Jin S and Nagarajan H (2013) 'Wage discrimination in India's informal labor market: exploring the impact of caste and gender', *Review of Development Economics*, 17(1), pp. 130-147.
3. Elder, FE, Goddeeris JH and Harder SJ (2010) 'Unexplained gaps and Oaxaca-Blinder Decompositions', *Labour Economics*, 17, pp. 284
4. Jones, FL (1983) 'on decomposing the wage gap: a critical comment on Blinder's method', *Journal of Human Resources*, 18, pp. 126-130.

5. Nielsen, HS (2000) 'Wage discrimination in Zambia: an extension of the Oaxaca-Blinder decomposition', *Applied Economics Letters*, 7, pp. 405-408.
6. Oaxaca, R (1973) 'Male-female wage differentials in urban labor markets', *International Economic Review*, 14, pp. 693-709.
7. Oaxaca, R and Ransom M (1998) 'Identification in detailed wage decompositions', *Review of Economics and Statistics*, 81, pp. 154-157.
8. Reilly, B (1991) 'Occupational segregation and selectivity bias in occupational wage equations: an empirical analysis using Irish data', *Applied Economics*, 23, pp. 1-7.
9. Rio C del, Gradin C and Canto M (2011) 'the measurement of gender wage discrimination: the distributional approach revisited', *Journal of Economic Inequality*, 9, pp. 57-86.

An Econometric Study of the Determinants of Foreign Direct Investment (FDI) In SADC Countries

Simon Nyarota²⁴, William Kavila²⁵, Nebson Mupunga²⁶

Abstract: *The growing global competition for Foreign Direct Investments (FDI) has seen many countries and regional economic blocks adopting innovative and bolder investment promotion strategies and policies to attract FDI. Against this background, this paper reviews the experiences of SADC countries in attracting foreign direct investment and explores the major determinants of FDI in the SADC region. A cross-country panel regression analysis using data from 1996-2011 for SADC countries was applied to ascertain the determinants of FDI. The estimation results from a panel of SADC member countries show that agglomeration, credit to private sector, urban population share, trade openness, market size and infrastructural development have a positive significant relationship with FDI inflows in the region. The major recommendation from the study is the need to improve both institutional and governance indicators to create a conducive business environment for FDI. There is also need for SADC member countries to remove restrictions on market seeking and locational advantage FDI. Member states also need to strengthen regional integration and greater diversity on investment matters for the region to benefit from synergetic effects of regional integration through the halo effect.*

Key Words: *Foreign Direct Investment, Panel Data Analysis, Hausman Test, Fixed Effects, Random Effects*

JEL Classification, F21, F23

Une étude économétrique des déterminants de l'Investissement Direct Etranger (IDE) dans les pays de la SADC

Résumé: *La concurrence croissante dans le domaine des Investissements Directs Etrangers (IDE) a abouti à l'adoption par plusieurs pays et blocs économiques régionaux de stratégies et*

²⁴ Director, Economic Research, Reserve Bank of Zimbabwe, snyarota@rbz.co.zw

²⁵ Deputy Director, Economic Research, Reserve Bank of Zimbabwe, wkavila@rbz.co.zw

²⁶ Principal Economist, Economic Research, Reserve Bank of Zimbabwe, nmupunga@rbz.co.zw

Disclaimer: The views expressed in this paper are of the authors and do not necessarily reflect the position of the Reserve Bank of Zimbabwe, SADC or its Secretariat but those of the authors. For any information concerning this paper please contact the above mentioned Authors.

politiques de promotion des investissements novatrices et plus audacieuses en vue d'attirer les IDE. A la lumière de cette réalité, ce document examine l'expérience des pays de la SADC dans leurs activités d'attraction des IDE et explore les principaux facteurs décisifs des IDE dans la région de la SADC. Une analyse transfrontalière de régression sur panel, basée sur des données couvrant la période 1996 – 2011 pour les pays de la SADC, a été faite pour identifier les facteurs décisifs des IDE. Les résultats des estimations d'un panel de pays membres de la SADC démontrent que l'agglomération, le crédit au secteur privé, la part de la population urbaine, l'ouverture commerciale, la taille du marché et le développement des infrastructures sont un corolaire important des flux des IDE dans la région. La recommandation principale de l'étude est qu'il faut améliorer les indicateurs institutionnels et de gouvernance pour créer un environnement commercial propice aux IDE. Il faut également que les pays membres de la SADC lèvent les restrictions sur les IDE de recherche des marchés et d'avantages d'implantation. Les états membres doivent également renforcer l'intégration régionale et diversifier les domaines d'investissement dans la région afin de bénéficier de la synergie des efforts d'intégration régionale par l'effet de halo.

Key Words: Investissement Direct Etranger, Analyse des données de panel, Essai Hausman, effets fixes ou à effets aléatoires

Classification JEL, F21, F23

Introduction

Global competition for FDI has intensified, against the backdrop of continued global economic and financial fragilities and inadequacy of domestic resources to meet investment needs in most economies. Concomitantly, investment promotion strategies employed by countries to attract FDI have also continued to change in a bolder and innovative manner. The increased competition for FDI has seen a number of countries and regional blocs putting in place policies to enhance FDI attraction at both country and regional level. Consistent with this, SADC has passed a number of protocols and policies such as the Finance and Investment Protocol (FIP) and Free Trade Area (FTA) in a bid to enhance the investment climate at regional and country level. Although these policies are yet to be fully implemented, they have already taken root in enhancing the appeal of SADC as an attractive investment destination.

Notwithstanding these developments, SADC member countries still face enormous challenges in building a conducive environment for FDI, as reflected by varied and uneven patterns of FDI flows within the region. Major challenges relate to adverse political developments and political risks, lack of the requisite legislation to protect investment, energy and infrastructural bottlenecks, corruption and weak integration processes at the regional level. Some countries in the region score very low in terms of institutional and governance indicator

rankings, such as doing business and government effectiveness. This has deterred potential FDI inflows and negatively affected the regions' growth potential, amid vast untapped resources.

Recommendations from various researchers²⁷ point to the need to reduce the cost of doing business and improving infrastructure such as roads, rail and telecommunications, necessary to bring down the comparatively high investment costs for investors. Reports issued by multilateral organizations, such as the World Bank (WB), and their rankings concerning the investment climate of the respective country or region are an international dimension that also affects FDI inflows in SADC. These rankings are seriously considered by investors when making a decision about whether or not to invest in a particular sector in the region.

In addition, barriers to entry still exist in some SADC countries, where certain sectors are reserved for indigenous people. In some cases, investors avoid investing in some SADC member countries due to policy uncertainty and contradictions and high levels of corruption. Although most SADC countries have improved their regulatory frameworks by permitting profit repatriation and providing tax and other incentives to attract investment, the challenge remains on the need to attract investment in high value added sectors.

The combination of the various schools of thought on factors affecting FDI in different economies and its impact on economic development highlights the need for empirical research on this subject matter. Against this backdrop, this study seeks to investigate why some SADC countries continue to receive more FDI inflows compared to others, despite comparable resource endowments and common policy stance and direction. The answer to this question calls for a comprehensive analysis of the major factors driving FDI inflows in the region. In view of the different levels of FDI trends in these countries, the following key questions need to be answered:

- a) Why have some countries in the SADC region managed to attract more FDI than others?
- b) Can regional integration increase the likelihood of FDI inflows in SADC countries, In other words, do FTA and FIP have an impact on FDI because of a halo effect,²⁸ a larger market or easier establishment of cross-border production networks?

²⁷ See for example, FDI in SADC Countries prepared by the Centre for Chinese studies.

²⁸ It is the phenomenon whereby we assume that because people are good at doing A they will be good at doing B, C and D (or the reverse, because they are bad at doing A they will be bad at doing B, C and D). The phrase was first coined by Edward Thorndike, a psychologist who used it in a study published in 1920 to

- c) What are the implications of the answers to the above questions for national and regional policies?

The rest of the paper is organized as follows, Section 2, presents an overview of recent trends in FDI in the SADC region over the past decade and highlights the major factors that contributed to FDI patterns. Section 3, reviews the existing literature on FDI including the major determinates of FDI, to developing economies. Section 4, highlights the methodology applied in the study and specifies an econometric methodology for assessing the main determinants of FDI in the SADC region. Section 5 presents and analyzes the results from the study and finally, Section 6 summarizes the study as well as provide some policy recommendations, implications and areas for further research.

1. SADC review and FDI Dynamics

1.1. Review of SADC Economies

The last decade has seen a rise in interest from businesses, organisations and governments undertaking systematic political risk analysis when embarking on foreign projects in developing economies. This risk analysis has seen a number of countries entering into various international investment and bilateral investment agreements in order to safeguard their investments. Consistent with this development, regional countries have entered into a number of various investment agreements as shown in the Table 1 below.

Table 1. List of Bilateral Investment Treaties (BITs) and International Investment Agreements (IIA's) for SADC Countries

COUNTRY	BIT'S	IIA'S	TOTAL
Angola	8	7	15
Botswana	8	6	14
DRC	15	8	23
Lesotho	3	7	10
Malawi	6	8	14
Mauritius	36	9	45
Mozambique	24	6	30
Namibia	13	6	19
Seychelles	7	8	15
Swaziland	5	9	14
Zambia	12	9	21

describe the way that commanding officers rated their soldiers. He found that officers usually judged their men as being either good right across the board or bad.

South Africa	46	9	55
Zimbabwe	30	9	39
Total	213	101	314

Source: UNCTAD 2012

The signing of bilateral investment treaties to protect foreign investments against political risks has complemented the liberalization of FDI regimes. By December 2011, SADC countries had signed 314 such treaties as shown in the table above. Besides political risks, there are other reasons why SADC does not appear to be a very attractive destination for FDI. The amount of FDI inflows to the region also continues to be hampered by poor infrastructure which hinders business growth and efficiency. A further limitation is the perception by prospective foreign investors on the degree and level of corruption, law enforcement on contracts and government ineffectiveness.

According to Schneider and Frey (1985), political instability and the frequent occurrences of disorder create an unfavourable business climate which seriously erodes the risk-averse foreign investors' confidence in the local investment climate and thereby repels FDI away. An analysis of political stability and FDI in SADC member countries shows that those countries that have exhibited stable macroeconomic and political stability have also achieved higher FDI growth. For instance, Zambia's attractive investment climate is underpinned by socio economic stability, where the country is now dubbed as a beacon of peace in Africa, coupled with relative good security and low crime levels. This is supported by immense investment opportunities in most sectors with government's pro-private public investment in roads, electricity and other infrastructure.

For instance, the Zambian government has been progressive in ensuring good governance and fighting corruption. These efforts greatly contributed to Zambia being rated "B+" in the sovereign credit rating by Standard & Poors, and Fitch in 2011. Furthermore, over years of committed business reforms, evidence of a favourable and improving investment climate has been observed with the country's World Bank Doing Business ranking improving. The Zambian government has been aggressive in addressing the issue of reducing the cost of doing business by improving infrastructure such as roads, telecommunications, energy and water. Through the central bank, the Zambian government has also created a favorable macroeconomic environment that has led to a downward trend in the cost of borrowing to improve access to long term finance at lower interest rates. Mauritius is another good example. It is one of the most open and financially sound economies in sub-Saharan Africa. The success of the Mauritian economy is largely a result of its political and socio-economic stability, coupled with good governance and its pro-investment policies. Foreign investors judge

that Mauritius, which is set against a beautiful tropical environment, is a safe and attractive place to live in as well as a buoyant place to do business. Crime prevalence is very low.

Most SADC countries are also rated lowly particularly with regards to starting business and other institutional assessments. In terms of doing business and the UNCTAD's inward performance²⁹ ranking, SADC member countries still lag behind most developing economies.

Table 2: Doing Business Rankings for SADC Countries 2012

Economy	Ease of Doing Business Rank	Starting a Business	Getting Electricity	Registering Property	Getting Credit	Protecting Investors	Enforcing Contracts
Mauritius	23	15	44	67	78	13	61
South Africa	35	44	124	76	1	10	81
Botswana	54	90	91	50	48	46	65
Namibia	78	125	105	145	24	79	40
Zambia	84	69	118	96	8	79	85
Seychelles	103	113	149	63	166	65	84
Swaziland	124	161	158	128	48	122	171
Tanzania	134	113	96	137	129	100	36
Mozambique	139	70	172	156	150	46	131
Lesotho	143	144	141	150	150	147	102
Malawi	145	139	177	95	126	79	121
Zimbabwe	171	144	167	85	126	122	112
Angola	172	167	120	129	126	65	181
Congo, Rep.	181	175	152	156	98	155	159

Source: UNCTAD 2012

Countries that are rated highly in terms of doing business and protecting investors tend to receive more FDI inflows than countries which are rated lowly. Mauritius ranks 1st in Africa in the World Bank Ease of Doing Business Report of 2012. Mauritius is opening itself to the world by offering business friendly platforms. The UNCTAD FDI attraction Index for 2011, which ranks countries by the FDI they receive in absolute terms and relative to their economic size, places Mauritius in the category of countries which are in line with investor expectations. South Africa is rated 1st in the world in terms of

²⁹ The FDI performance index captures a country's relative success in attracting global FDI. If a country's share of global inward FDI matches its relative share in global GDP, the country's Inward FDI Performance Index is equal to one. A value greater than one indicates a larger share of FDI relative to GDP; a value less than one indicates a smaller share of FDI relative to GDP. A negative value means foreign investors disinvested in that period. The index is calculated using three-year averages to offset annual fluctuations in the data.

getting credit. An exceptional case is Angola, with high FDI but rated lowly in terms of doing business indicators. The country's high FDI in flows is, however, due to the abundant resources, coupled with political and macroeconomic stability. In 2011, Zimbabwe's FDI inflows accelerated by 133 percent from 2010 levels of US\$166 million, to US\$387 million in 2011, as its ranking also improved.

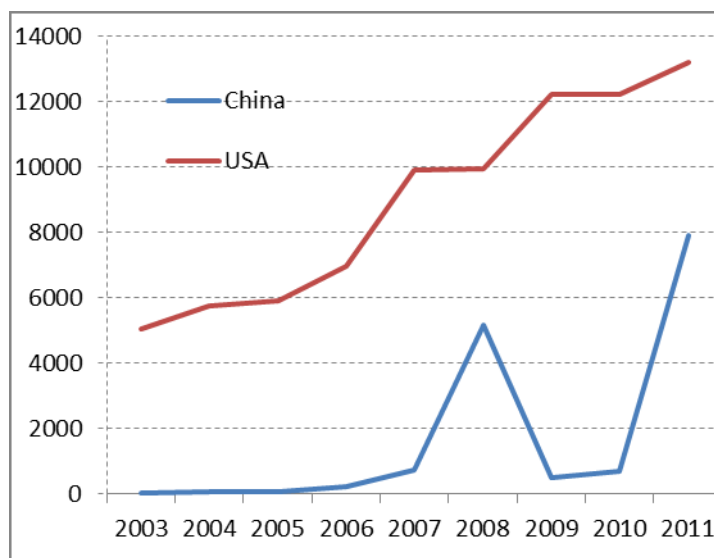
1.2. Review of SADC FDI Dynamics

SADC has witnessed a dramatic change in FDI source countries over the years, with implications on growth and employment creation. Historically, the major FDI source countries in the region were the United States of America (USA), United Kingdom (UK), and France. China has, however, emerged as a major source of FDI in the SADC region in the new millennium³⁰. According to the Chinese Ministry of Commerce (MOFCOM), China was the fifth largest FDI source country in the world with US\$56.5 billion of global FDI inflows in 2009. This brought Chinese FDI total stock to US\$245.8 billion, invested mainly in the finance, mining and retail sectors.

In the SADC region, FDI inflows from China are mainly invested in the mining, agriculture, telecommunications and manufacturing sectors. China has been expanding investments into Southern Africa at a time when other traditional sources of FDI are holding back, citing the impact of the global financial crisis. In Zimbabwe, the Chinese are also exploring investments in the electricity, mining and manufacturing sectors. South Africa is also a dominant source of FDI in the region, notably for Zimbabwe, Swaziland, Lesotho, Namibia and Mozambique. Figure 1 below shows the trend in FDI from China and the USA.

Since 1999, the Chinese government has been encouraging Chinese enterprises to invest abroad, following its so-called Go Out or Going Global strategy. The Chinese 11th Five-Year Plan period (2006-2010) saw the implementation of the going out strategy in its entirety. China deliberately mixes assistance and trade preferences with investment policies in its South-South cooperation. Critics point to the fact that most of Chinese FDI is invested in resource-rich countries, a term which is mostly used to refer to countries with large oil and mineral reserves such as gold, diamonds and copper.

³⁰ Refer to study done by the Center Of Chinese Studies on FDI in SADC countries, 2011.

Figure 1: Total FDI from China and USA (2003-2011)

Source: UNCTAD 2012

1.2.1. Foreign Investment Restrictions

Foreign investment restrictions mainly in the form of foreign equity limitations, screening or approval mechanisms, restrictions on the employment of foreigners as key personnel, and operational restrictions prevalent in some member states have also been cited by researchers as deterring potential FDI. In some countries, certain sectors are reserved for locals and this may have some adverse implications on FDI. Mozambique restricts foreign ownership in the fixed-line telecommunication subsector but allows 100 percent foreign ownership in mobile subsector. Only Zambia permits 100 percent foreign ownership in the media sector. Mauritius and Zambia permit 100 percent foreign ownership in telecommunications, while Tanzania has a restriction of 66 percent in insurance. Zimbabwe's Indigenization and Empowerment Act restricts foreign ownership to 49 percent in all sectors. The indigenization and empowerment regulations in Zimbabwe have been cited by many analysts as a major deterrent to FDI attraction.

The Black Economic Empowerment (BEE) in South Africa and Namibia provides for preferential procurement to indigenous people. Lesotho restricts ownership of small-scale retail and services businesses to local entrepreneurs. No foreign ownership, or even board directorship, by a non-citizen is permitted at any level in these restricted businesses in Lesotho. There are, however, no

restrictions on foreign ownership in Angola and Malawi in all sectors of the economy. Perennial policy uncertainties in some SADC member countries also affect investor decisions and influence the level of investment and confidence of investors. The high degree of uncertainty explains the huge capital outflows in the form of profit repatriation in some member countries. The significant capital outflows in some member countries obscure them from realizing the full potential benefits from FDI as significant financial resources are not deployed in the local economy to boost other productive sectors.

1.2.2. Infrastructure Deficit

Infrastructural deficits have been cited by many researchers as causing a significant drawback to attraction of FDI in the region. With the exception of South Africa, other countries still lag behind on various dimensions of infrastructure development. Although SADC's infrastructure ranks consistently above the other Sub-Saharan African regions on all aggregate infrastructure indicators, investors still advocate for more improvements. Infrastructure development in SADC has been constrained by declining levels of public investment on infrastructural projects, soaring debt burdens in some of the countries, sluggish economic growth, and increased pressure on governments to reduce expenditure. Many governments find it easier, and politically expedient to reduce on capital expenditure, including infrastructure, where they will suffer less of a political backlash than if they were to reduce spending on the public service wage bill.

Major improvements are required in areas such as access to improved sources of water and sanitation, as well as electricity, where the differences between SADC and the Economic Community of West African States (ECOWAS), the next-best performer in terms of aggregate performance, are not significant. In terms of paved road density, fixed line telephone and internet density, SADC performs significantly better than all the other regions. Table 3 below shows the region's infrastructural indicators against other regional blocs in Africa.

Table 3: Infrastructural indicators in Africa

	Western	Eastern	Southern	Central
Paved road density	38	29	92	4
Fixed line telephone	28	6	80	13
Internet density	2	2	4	1
Electricity Coverage	18	6	24	21
Improved Water	63	71	68	53
Improved Sanitation	35	42	46	28

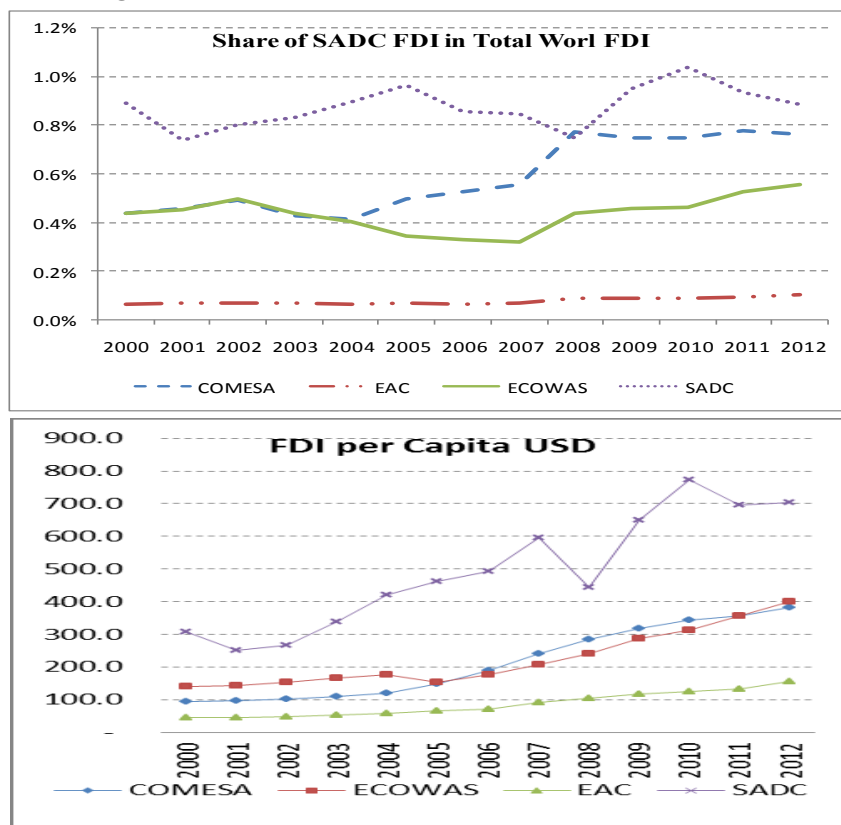
Source: UNCTAD 2012

The backlog in infrastructure development influences the overall cost of doing business in SADC countries and as such, reduces profitability. Higher communication costs, high percentages of unsurfaced roads deter potential FDI inflows. Mauritius presents a good example for FDI attraction linked to infrastructure. The entire island is connected with electricity and water supply for agricultural, industrial and household consumption. Industries can thus be located anywhere on the island. In addition, Mauritius has a well-developed digital network infrastructure and offers excellent telecommunication facilities and telecommunication system that compares favorably with that of many countries in the developed world. Similarly, Seychelles has a well-developed electricity infrastructure, water supplies, and road network.

1.3. Dynamics of SADC-FDI

The stock of FDI in SADC countries increased considerably over the past three decades, from around US\$24.7 billion in 1980 to US\$204 billion by 2011. This notwithstanding, FDI per capita and the share of SADC FDI stock to total world FDI has remained relatively small, although relatively high when compared to other regional blocs in Africa. Figure 2 below shows the trend in the share of SADC FDI stock to total world FDI, compared to other regional economic blocs in Africa.

Figure 2: Comparison of SADC Total FDI with Other Regional Groupings



Source: UNCTAD 2012

The trend indicates that SADC has increasingly become an attractive investment destination in recent years. The trend slightly reversed in 2009, reflecting the effects of the global financial crisis. SADC has, however, great potential of attracting increased FDI flows from emerging economies, such as China, India and Brazil.

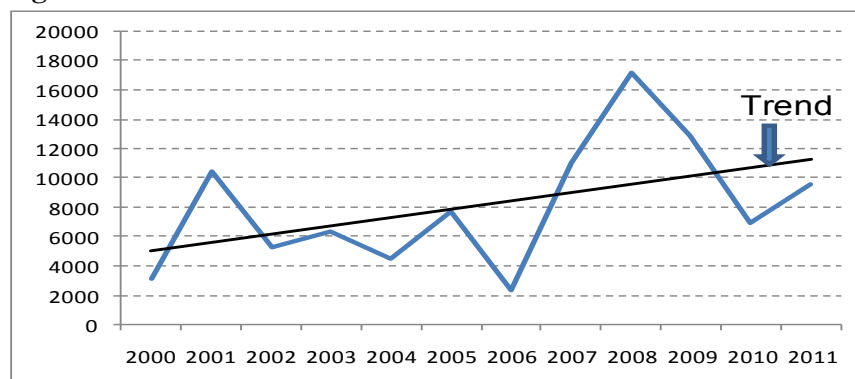
The SADC region's performance with regard to attracting FDI³¹ was relatively poor throughout the 1990s and early 2000s. During that time, most SADC countries had double-digit inflation rates, which were not favourable to

³¹ SADC 2010, Finance and Investment Protocol Information brochure Report: 3.

investors.³² The low levels of FDI were also attributed to the small size of domestic markets and other socio-economic issues, such as high levels of crime and corruption. SADC, however, maintained an upward trend in FDI inflows from 2001 up to 2008, before slowing down in 2009, mainly due to the effects of the global financial crisis. FDI in most member states, notably, South Africa, Botswana, Angola, Tanzania, Zambia, Namibia, Mozambique and Zimbabwe has mainly been resource seeking as opposed to locational advantages and market seeking. An exception is Mauritius, which is not endowed with natural resources. The strength of Mauritius, however, lies in the quality of its human resources. Mauritius has the highest adult literacy rate in Africa and is now reaping the benefits of a strong commitment to free education for all initiated in the late 1970's. Angola and South Africa topped the list of FDI destinations in SADC. South Africa's FDI is dominated by mining and agricultural activities, whereas FDI in Angola is concentrated in the petroleum extraction industry and mining.

Angola has a wide range of mineral resources, which include diamond, iron, gold, phosphate, manganese, copper, lead, zinc, uranium, titanium, beryllium, quartz, gypsum, marble and granite. South Africa is one of the most sophisticated, diverse and promising emerging markets globally. Strategically located at the tip of the African continent, South Africa is a key investment location, both for the market opportunities that lie within its borders and for the opportunity that exists to use the country as a gateway to the rest of the continent. The unique combination of a highly developed first-world economic infrastructure and a huge emerging market economy has given rise to a strong entrepreneurial and dynamic investment environment. South Africa is the economic powerhouse of Africa and is a member of BRICS which also include Brazil, Russia, India, and China. Figure 3 below shows the trend in FDI inflows to SADC countries.

³² Muradzikwa, 2002 "Foreign direct investment in SADC", Development Research Unit Working Paper 2.

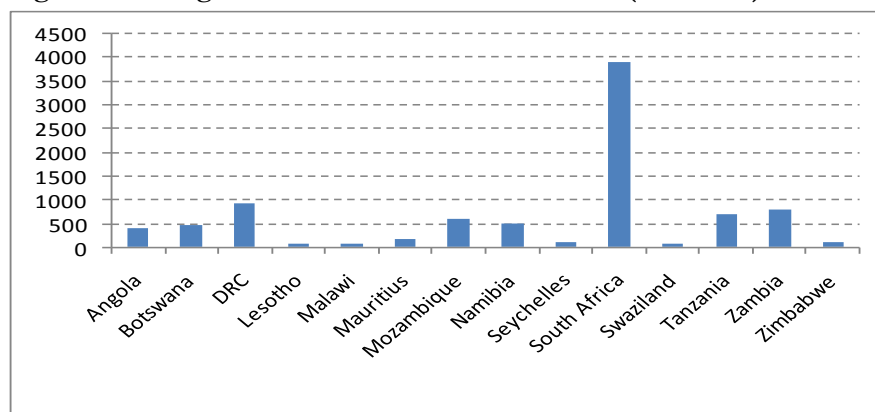
Figure 3: FDI Inflows in SADC Countries

Source: UNCTAD 2012

The trend depicts a general upward trend from the year 2000 onwards. The significant decline in FDI flows to SADC in 2009 could also be attributed to a decision by Shell and BP to disinvest from their downstream business activities, retailing, in particular and the effect of the global financial crisis. The world investment report for 2011 notes that Shell announced plans to withdraw from down-stream activities in 21 African countries, while on the other end BP disinvested in five SADC countries.

A notable feature from the trend in FDI³³ is that countries that made significant strides towards privatisation of state-owned enterprises, such as Mozambique and Zambia, have been able to attract substantial amounts of Greenfield FDI that has provided the stimulus for growth in these economies. In this respect, privatisation of state-owned enterprises could be seen as a catalyst for FDI, which other SADC countries can carefully consider so as to improve the levels of FDI. In Mozambique, FDI reached historical levels in 2011 amounting to more than US\$2 billion and investment was mainly in natural resource exploitation. The Mozambique government has been implementing reforms on fiscal and financial sectors aimed at improving the business climate in the country. Figure 1.4 below shows the average net FDI inflows for the SADC region from 2001 to 2012.

³³ See Annex.

Figure 4: Average Net FDI Inflows USD Millions (2001-2012)

Source: UNCTAD 2012

FDI in the SADC region has over the years been directed mainly to Greenfield investments as opposed to mergers and acquisitions. Between 2005 and 2011, a total of 1 626 Greenfield investments were approved in the 14 member countries excluding, Madagascar, with a total value of US\$181.5 billion. This can be compared to investments through mergers and acquisitions, where a total of 394 projects with a value of US\$30.6 billion were approved during the comparable period. This indicates that the region has a lot of untapped business ventures, where FDI can be directed. Table 4 below shows the cumulative number of projects for both greenfields and mergers and acquisitions approved in SADC countries from 2005 to 2011.

Table 4: Cumulative Greenfields and Mergers and Acquisition (2005-2011)

Country	Greenfield Investments		Mergers and Acquisition	
	Number	Value(US\$ Million)	Number	Value(US\$ Million)
Angola	247	29,599	5	530
Botswana	68	5,157	12	128
DRC	64	12,735	5	180
Lesotho	8	856	0	0
Malawi	15	1,500	4	0
Mauritius	44	2,858	35	605
Mozambique	86	29,625	17	98

Namibia	63	6,114	20	408
Seychelles	11	1,767	4	157
South Africa	711	54,433	243	28 110
Swaziland	15	860	3	0
Tanzania	115	10,309	13	62
Zambia	110	14,951	20	296
Zimbabwe	69	10,702	13	47
Total	1626	181,466	394	30 21

Source: UNCTAD 2012

2. Literature Review

2.1. Theoretical Literature

According to the OECD,³⁴ foreign direct investment reflects the objective of obtaining a lasting interest by a resident entity in one economy in an entity resident in an economy, other than that of the investor. The lasting interest implies the existence of a long-term relationship between the direct investor and the enterprise and a significant degree of influence on the management of the enterprise. Accordingly, direct investment involves both the initial transaction between the two entities and all subsequent capital transactions between them and among affiliated enterprises, both incorporated and unincorporated.

A variety of theories have tried to explain the motives for FDI. However, there is no single theory that explains the different motives of FDI in all countries.

The early theories of related to capital market and portfolio investments were used to describe the origination of FDI (Kindleberger, 1969). This approach stated that in the absence of uncertainties or risks, capital tended to flow to areas where it realizes the highest return. This view motivates direct investors to invest their capital from low return countries to high return countries. However, this context failed to incorporate the fundamental difference between portfolio and direct investment. As stated in the OECD FDI definition, direct investment entails some degree of control. Accordingly, the important theoretical shortcoming of the capital market and portfolio investments theory is that it does not explain control. If interest rates are higher abroad, an investor will consider lending money abroad, but there is no logical necessity for that investor to control the enterprise to which he or she lends the money (Hymer, 1976).

³⁴ Refer to OCED Benchmark Definition For Foreign Direct Investment Guideline, 1996.

Dunning (1977 and 1979)'s eclectic framework provided a comprehensive theory on the motives for FDI. The eclectic framework postulates that firms invest abroad in pursuit of Ownership (O), Location (L) and Internalisation (I) advantages. This is usually referred to as the OLI framework. The owner-specific advantage of property rights/patents, expertise and other tangible assets allow a firm to compete with others in the market it serves regardless of the disadvantage of being foreign because it is able to have access to exploit and export natural resources and resource based products that are available to it. The location advantages are those that make the chosen foreign country a more attractive site such as the country's natural endowments, government regulation, labour, transport costs, macroeconomic stability, trade barriers, gains in trade costs, and cultural factors, among other things.

The internalisation advantage arises from exploiting imperfections in external markets, including reduction in uncertainty and transaction costs in order to generate knowledge more efficiently as well as reduction of state generated imperfections such as tariffs, foreign exchange controls and subsidies. When the O, L, and I advantages outweigh the costs and risks of producing abroad, FDI arises. The eclectic, or OLI paradigm, suggests that the greater the O and I advantages possessed by firms and the more the L advantages of creating, acquiring (or augmenting) and exploiting these advantages from a location outside its home country, the more FDI will be undertaken. Where firms possess substantial O and I advantages but the L advantages favour the home country, then domestic investment will be preferred to FDI and foreign markets will be supplied by exports. From the eclectic theory, the main motives for FDI according to Dunning (1993) are thus, resource seeking (to access raw materials, labour force, and physical infrastructure resources, market seeking (horizontal strategy to access the country's markets); efficiency seeking (vertical strategy to take advantage of lower labour costs, especially in developing countries); and strategic-asset seeking (to access research and development, innovation, and advanced technology). Although the OLI paradigm does explain the existence of foreign investors, its main problem is that it has difficulty explaining the recent trends in FDI such as the surge and concentration of FDI among similar countries. Furthermore, no sound empirical models have been generated in order to compare real data with the theory. However, eclectic paradigm is mainly criticised for having too many variables that it loses any operational practicality. Dunning himself accepted this fact and stated that it was an inevitable consequence of trying to incorporate the different motivations behind FDI into one general theory. This criticism resulted in the Investment Development Cycle or Path theory that proposes a link between a country's level of economic development and its international investment positions, the net outward FDI stock per capita. The basic hypothesis is that when a country

develops, the conditions encountered by foreign and local firms will change. Consequently, this affects the flows of inward and outward FDI which in turn will have an impact on the economic structure of the country. As a result, there is a dynamic interaction between the two. This theory accepts the fact that a Government can influence the country's condition through its policies, thereby affecting FDI flows and domestic firms' ownership advantages. In this way, the Investment Development Cycle theory introduced a new notion of a dynamic approach to Dunning's eclectic theory.

Although these theories have examined in detail the economic factors affecting FDI, they did not adequately explore political factors (Buthe and Milner, 2008). There is however, a common view that the motives for FDI are to reap the benefits in the form of location, firm- specific or internationalization of markets. The FDI theories also acknowledge the fact that government policies play a vital role in attracting foreign investments in the economy.

2.2. Empirical Literature

FDI has received more and more interest from economists and policymakers, owing to its growing economic importance for both developed and developing countries. According to the 2010 World Investment Report, FDI inward flows accounted for 9.1 percent of Gross Fixed Capital Formation in 2009³⁵ revealing the importance that these flows can have for economic growth. A recent study by the Centre for Chinese Studies³⁶ has noted that SADC member countries can learn from one another for the benefit of making the region more attractive to FDI. The SADC Secretariat can draw lessons from the increasing FDI inflows in some member states and use this knowledge to suggest adaptations to other member countries in order to make them more attractive to FDI. The study recommended that Mauritius be used as a good example of maximizing FDI potential.

Lederman et al. (2010) used international data and a micro-data set of firms in thirteen (SADC countries) to investigate the benefits and determinants of FDI in the region and found that income level, human capital, demographic structure, institutions, and economic track record affect FDI inflows per capita. They also found some differences between SADC and the rest of the world in FDI behavior, namely, that in SADC, the income level and openness are less important in explaining FDI behaviour. However, relative to other regions of

³⁵ See UNCTAD Investment Report 2010.

³⁶ Refer to the Study by Centre for Chinese Studies on Assessing China's Role in Foreign Direct Investment in Southern Africa 2011.

the world, they found that SADC's low FDI inflows are explained by economic fundamentals such as previous growth rates, average income, phone density, and the adult share of population.

Mauro (2000) used the gravity-model approach to analyze the impact of regional integration on FDI. The variables considered include tariffs, non-tariff barriers and exchange rate variability. In his gravity model the sample of home countries examined include France, Germany, Italy, UK, Japan, South Korea, US and Canada, while a set of host countries for FDI is constituted by both OECD and non-OECD members. The paper considered three years: 1988, 1993 and 1996. The results show that FDI does not respond to changes in tariffs, which in turn suggests that the tariff-jumping argument is not supported empirically. In other words, an increase in the tariff level has no significant impact on FDI.

Mauro (2000) also finds that non-tariff barriers negatively affect FDI which could be explained via the argument of market-accessibility and the existence of sunk costs. When foreign firms invest in a host country, they incur sunk costs in setting up the affiliates and if they then cannot access a larger market, not because of tariffs, but because of non-tariff barriers, their losses can even be greater than for the exporters. The major problem with this study is that it concentrates on trade openness (tariff and non-tariff barriers) only leaving out other important FDI determinants such as market size, size of the labour force and political stability found to be significant by other studies like Asiedu (2006), Obwona (2001), Walsh and Yu (2010).

Campos and Kinoshida (2003) examined the importance of agglomeration economies and institutions vis-à-vis initial conditions and factor endowments in explaining the locational choice of foreign investors. The study used panel data for 25 transition economies³⁷ between 1990 and 1998. In order to test for agglomeration effects, the study relates current FDI stock to past FDI stock and other explanatory variables and employed the generalized method of moments (GMM). The study also examined the impact of macroeconomic variables: market size using GDP as a proxy, trade openness and inflation. The study finds that the main determinants of FDI are institutions, agglomeration, and trade openness.

Chiguvu (2009) analyzed the determinants of inward FDI in the SADC region for the period 1995 to 2007 using a panel data approach. The determinants of FDI in the SADC region considered in his study are trade openness, inflation, government size, external debt, market size and growth, labour availability,

³⁷ The economies covered in the data are Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic, Slovenia, Ukraine, Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyz Republic, Moldova, the Russian Federation, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.

infrastructure quality, financial depth and corruption. Chiguvu (2009) like Obwona (2000) used nominal total population as a proxy for labour availability in a country. His main findings suggest that more open economies attract FDI. He also finds that major pull factors of FDI are bigger markets, low inflation, lower external debt, and quality infrastructure. These results confirm findings of other studies, Asiedu (2006), Campos and Kinoshida (2003), among others.

Walsh and Yu (2010) find that primary sector FDI has no strong linkages to either macroeconomic stability, level of development, or institutional quality, while clustering effects appear important, with larger FDI stocks attracting greater additional inflows. This is intuitive, as FDI decisions in, for example, mining or petroleum are primarily determined by the location of those resources, with both equipment and labor easily transferable across borders. Secondary and tertiary FDI benefits from agglomeration or clustering effects while FDI in services appears to be more strongly impacted by macroeconomic conditions than FDI in manufacturing.

Furthermore, Walsh and Yu (2010) contend that a weaker real effective exchange rate draws more manufacturing FDI into an economy, while it reduces the amount of tertiary FDI. Tertiary FDI flows are also higher in more rapidly growing economies, than those which are more open. More flexible labor markets and deeper financial markets attract more secondary FDI, while better infrastructure and a more independent judiciary attract more tertiary FDI. Educational attainment was found to have little relationship to either type of FDI.

Asiedu (2006) used a panel data for 22 countries³⁸ in Sub-Saharan Africa over the period 1984-2000 to examine the impact of political risk, institutional framework and government policy on FDI flows. Measures of institutional quality considered in his study are corruption and the extent to which the rule of law is enforced. Political risk factors considered in the study are coups, assassinations, revolutions and riots. Coups are the number of forced changes in the top government, while assassinations include any politically motivated murder or attempted murder of a senior government official. Revolutions include any illegal or forced change in the ruling government, and riots are the number of violent demonstrations or clashes of more than 100 citizens involving the use of force.

³⁸ Countries in the sample are Cameroon, Congo Rep., Cote d'Ivoire, Ethiopia, Gabon, Gambia, Ghana, Kenya, Madagascar, Malawi, Mali, Mozambique, Niger, Nigeria, Senegal, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia and Zimbabwe.

Asiedu's study reveals that an efficient legal system, a good investment regulatory framework, an educated labor force, natural resource endowments, good infrastructure, and large markets promote FDI, whereas, high inflation, corruption and political instability deter FDI. An important implication of his results was that FDI to Africa is not solely driven by natural resource endowment, and that governments can play an important role in promoting investments to the region.

3. Empirical Methodology

Based on the theoretical framework of FDI and the structure of SADC economies, we used a cross-country panel regression for the period 1996-2011 to establish the hypothesized relationship between FDI inflows and the relevant independent variables. The period was chosen to coincide with data on institutional variables which are only available after the 1996 period.

3.1 Model Specification

The model specification derives from the common factors that influence FDI in the region. The panel specification is as follows:

$$\begin{aligned}
 FDI_{t,i} = & \alpha + \beta_4 \ln(PGDP_{i,t-1}) + \beta_{11} \ln(URB_{i,t-1}) \\
 & + \beta_1 \ln(CPS_{i,t-1}) + \beta_2 \ln(CPI_{i,t-1}) \\
 & + \beta_6 \ln(OPEN_{i,t-1}) + \beta_7 \ln(INFRA_{i,t-1}) \\
 & + \beta_9 \ln(PS_{i,t-1}) + \beta_{10} \ln(ROL_{i,t-1}) \\
 & + \beta_3 \ln(GOEF_{i,t-1}) + \beta_5 \ln(FDI_{i,t-1}) + \varepsilon_{t,i}
 \end{aligned}$$

$$(t = 1996, 1997 \dots 2011; i = 1, 2, \dots 14)$$

where subscript i represents each of the 14 SADC³⁹ member countries to be used in the study t refers to years from 1996 to 2011, α is the intercept and $\varepsilon_{t,i}$ is the error term.

The regression equation is expressed as a log-linear in order to capture the elasticity of FDI inflows with respect to each of the explanatory variables. Further, the variables were lagged to facilitate the interpretation of model results as the reaction of FDI to changes in either of the independent variables. We used the FDI inflow as a percentage of GDP as the dependent variable (FDI), a widely used measure.⁴⁰ The FDI inflow variable is desirable to the FDI stock

³⁹ SADC member states in the sample are: Angola, Botswana, Democratic Republic of Congo, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe.

⁴⁰ See studies by Adeisu, 2002 and Quarzi, 2005.

variable as it specifically capture the changes in economic fundamentals and policy pronouncements. The independent variables include measures of market size, financial depth, macroeconomic environment, governance and institutional factors. Market size is a measure of the host country's domestic market and is proxied by the log of per-capita income to GDP (PGDP) and urban population share (URB).

A large market size implies greater demand for goods and services and offers economies of scale for the investor. Financial depth is measured as the size of a country's monetary system and is proxied by the ratio of credit to private sector to GDP (CPS). Macroeconomic factors are proxied by the country's inflation rate (CPI). Inflation is used as an indicator of macroeconomic instability (Buckley et al., 2007). A stable macroeconomic environment promotes FDI by showing less investment risk. The institutional and governance factors considered in the model include trade openness (OPEN), infrastructure (INFRA), political instability (PS), rule of law (ROL) and government effectiveness (GOEF).

The model also included the lagged FDI variable to test for agglomeration effects. Agglomeration may exist under the assumption that foreign investors may be attracted to countries with existing foreign investment. In this case, foreign investors may view the investment decisions by others as a good signal of favorable conditions and invest there too, so as to reduce uncertainty. The commonly used institutional factors that influence FDI in an economy are trade openness and infrastructural development. Trade openness portrays the ease with which investors can freely move capital in and out of an economy and is measured as a percentage of the sum of exports and imports to GDP. The impact of openness on FDI can have a positive sign if FDI is export-oriented and a negative one if FDI is tariff jumping. With regards to infrastructural development, there are varying theoretical and empirical views on its impact on FDI. Ang (2008), Asiedu (2006), and Onyeiwu and Shrestha (2004) find that the relationship between the level of infrastructure development and FDI flows is significantly positive. However, Marr (1997) argues that the prevalence of poor infrastructure in the areas of road, rail system, electricity and telecommunication, can create an incentive for the flow of foreign investments.

In this paper, we used the number of telephone and mobile phone subscribers per 1000 people as a proxy for infrastructure (INF) provision. This measure is consistent with proxy used by UNCTAD, among other factors, to compile the inward FDI potential index. Information, Communication and Technology (ICT) infrastructure and skills are now critical in integrating local producers into international technological and communications networks, and in attracting

vertical FDI in services as well as manufacturing⁴¹. We also examined the impact of governance indicators on FDI in SADC countries. The governance indicators were proxied by the control of corruption, regulatory quality and rule of law (Lederman et al., 2010; Globerman and Shapiro, 2002). The World Bank has come up with six worldwide governance indicators namely, regulatory quality, rule of law, control of corruption, voice and accountability, government effectiveness and political stability. The governance indicators included in this paper are government effectiveness, political stability and rule of law. Politically stable economies guarantee the safety of investors' interest and reduce uncertainty over future possible policy reversals.

According to the World Bank, political stability measures the likelihood that the government in power will be destabilized through unconstitutional or violent means. The rule of law index covers the effectiveness and the predictability of the judiciary and the enforceability of contracts and aims at measuring the confidence that agents have in the legal system. Government effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Surveys⁴² of investors have indicated that political stability is one of the key concerns of potential investors, although empirical results are somewhat mixed. Wheeler and Mody (1992) find that political risk is insignificant in determining the production location decisions of US firms. On the other hand, Asiedu (2005) examined the impact of political risk, institutional framework and government policy on FDI flows into sub-Saharan Africa over the period 1984-2000 and found that political stability deters FDI.

3.2 Panel Estimation Models

The estimations were conducted using panel data analysis under the OLS assumption. However, panel estimation of FDI regressions raises some econometric issues stemming from the dependence of FDI on past values of some explanatory variables such as infrastructure. Potential endogeneity arises in the sense that public FDI does not only react to the infrastructural deficit in the country, but can also influence this variable. Accordingly, the OLS results were cross checked with results from the General Methods of Moments (GMM) for robustness check. The Hausman Specification test (Table 1.6) was used to select

⁴¹See studies by Addison and Heshmati (2003)

⁴² See Jenkins and Thomas (2002) and WIR Survey conducted by the United Nations Conference on trade and development

between the fixed effects and random effects model. The test chose the random effects as a perfect fit (Table 1.6). As a result we used the results of a random effects model which can jointly capture cross-country and within country determinants of FDI. Non stationary variables were differenced to avoid the problem of unit roots given that most economic data are integrated of order one I(1).

3.3 Panel Cointegration

We also analyzed the long-run cointegrating relationships between FDI and explanatory variables. The estimation for panel cointegration was conducted using the Kao (1999) residual cointegration tests. The panel cointegration will facilitate the pooling of information regarding long-run relationships from across panel, while allowing the associated short run dynamics and fixed effects to be heterogeneous across the panel.

3.4 Data Needed and Sources

The data for the trends and regression analysis was obtained mainly from SADC member countries as well as the International Monetary Fund (IMF), UNCTAD, World Bank, and African Development Indicators data sources. It was, however, noted that some SADC member countries do not have adequate records on FDI by partner countries and also by sectors. All the independent variables were lagged by one period, on the assumption that FDI decisions may be made based on historical data and hence all the independent variables that are supposed to have effect on FDI inflow would materialize their effect the next period (Lederman 2010).

4. Results Presentation and Analysis

4.1 Empirical Results Presentation

As a preliminary analysis, we tested for the stationarity of the data and estimated the pairwise correlation coefficients between the model variables to identify potential sources of multicollinearity in the estimated model. We also tested for the existence of a long run relationship between the variables using the panel co-integration approach. Table 5 below shows results of the panel unit root tests conducted using the Levin, Lin Chu (2002) t-tests.

Table 5: Results of Panel Unit Root Tests

	Level	First difference
CPS	2.01457 (0.2568)	4.67978*** (0.0000)
FDI	2.2198* (0.0832)	5.53805*** (0.0000)
GOFF	0.78393 (0.2165)	8.66397*** (0.0000)
CPI	0.87380 (0.8089)	0.87380*** (0.8089)
INFRA	3.93034 (0.9898)	14.4403*** (0.0000)
OPEN	0.51853 (0.3020)	6.860148*** (0.0000)
PGDP	3.61219* (0.0632)	4.6638*** (0.0000)
PS	1.66828* (0.0476)	11.6939*** (0.0000)
ROL	0.45055 (0.3261)	4.76607*** (0.0000)
URB	1.6548 (0.3215)	5.50087*** (0.0000)

Note: *** stationary at 1%, ** stationary at 5%, * stationary at 10%

The results from the panel unit root test in Table 5 shows that all variables are stationary after first differencing. Table 6 below shows the correlation coefficient results.

Table 6: Correlation Matrix for the FDI and Its Determinants

	CPS	FDI	GOF F	CPI	INFRA	OPEN	PGDP	PS	ROL	URB	VIF
CPS	1.00										1.70
FDI	0.17	1.00									1.36
GOFF	0.46	0.06	1.00								8.98
CPI	-0.08	0.02	- 0.21	1.00							1.13
INFRA	0.38	0.19	0.42	-0.10	1.00						2.66
OPEN	-0.01	0.33	0.11	0.10	0.34	1.00					1.90
PGDP	0.40	0.24	0.67	-0.10	0.72	0.50	1.00				5.02
PS	0.15	-0.03	0.70	-0.28	0.37	0.11	0.36	1.00			4.09
ROL	0.32	-0.02	0.88	-0.24	0.37	0.12	0.52	0.81	1.00		6.95
URB	0.35	0.07	0.31	0.03	0.39	0.35	0.58	-0.05	0.13	1.00	1.92

The results in Table 6 show that, per-capita income, rule of law and government effectiveness overlap with one another, government effectiveness and rule of law variables exceeding the Variance Inflation Factor (VIF) conventional benchmark of 5⁴³. As a result, these variables were dropped and catered for through the political stability variable. The VIF quantifies the severity of multicollinearity in an OLS regression analysis. It provides an index that measures how much the variance (the square of the estimate's standard deviation of an estimated regression coefficient is increased because of collinearity). Table 7 below summarizes the regression results for panel cointegration using the Kao residual Cointegration tests.

Table 7: Results of Panel Cointegration

Series	Panel statistic	P-Value
FDI,CPS,URB,OPEN,PGDP,PS,INFRA,CPI,GOFF,ROL	2.364537	0.0462
Residual Variance	0.001051	
HAC Variance	0.006420	

The results of the panel cointegration in Table 7, rejects the null hypothesis of no cointegration, implying that a long run relationship exists between FDI and the explanatory variables.

Table 8 below shows results of regression analysis conducted using the random effects OLS model and the GMM approach.

Table 8: Random effects Regression Results on FDI determinants in SADC

Variable	OLS	GMM
α	2.474414** (2.020824)	0.056429*** (2.091917)
$\ln FDI_{i,t-1}$	0.889922*** (34.27891)	0.925714*** (34.39151)
$\ln CPS_{i,t-1}$	0.007221* (1.997760)	0.005177* (1.812457)
$\ln(URB_{i,t-1})$	0.539019** (2.030380)	0.096986* (1.923457)

⁴³ See Kutner, Nachtsheim, Neter, Applied Linear Regression Models, 4th edition, McGraw-Hill Irwin, 2004.

$\ln(OPEN_{i,t-1})$	0.100711** (2.050489)	0.070263*** (2.701403)
$\ln(PS_{i,t-1})$	-0.002444* (-1.627475)	-0.009791*** (-3.258763)
$\ln(PGDP_{i,t-1})$	0.006517** (2.198376)	0.036245** (2.398376)
$\ln(INFRA_{i,t-1})$	0.554832** (2.089666)	0.244466** (2.002451)
$\ln(CPI_{i,t-1})$	0.001444 (0.218312)	0.000454 (0.124567)
Diagnostics		
Adjusted R-squared	0.871664	0.899129
DW- Statistic	1.973168	2.251534
Hausman Test	Prob<chi2=0.2560	
J-Statistic		193.000

Note: *** significance at 1%, ** significance at 5%, * significance at 10%.

4.2 Empirical Results Analysis

The estimation results using the Swamy-Arora random effects estimations and the GMM yield almost similar results, with slight differences in the level of significance. This result was also confirmed by previous studies (Catrinescu et al., 2006; Aggarwal et al., 2006 and Anyanwu 2010). As such, the analysis in this paper is based on the OLS Swamy-Arora random effects results. The results generally show that agglomeration, credit to private sector, urban population share, trade openness, market size and infrastructural development have a positive significant relationship with FDI inflows to SADC member countries. The positive and significant coefficient on agglomeration shows that countries that are already enjoying high FDI flows tend to receive more FDI due to inertia. The existing level of FDI in an economy can attract other forms of FDI such as debt and equity through the financing of expansion programmes. High levels of FDI are also a signal to other potential investors on the investment climate of a country.

Credit to private sector was found to have a positive and significant effect on FDI, contrary to the hypothesis that FDI will be greater where the capacity of the private sector to finance its investment is constrained by an underdeveloped domestic financial sector. Foreign investors prefer to invest in countries with higher levels of credit to private sector because they can access working capital domestically after their initial investment. The positive and significant coefficient on openness is consistent with foreign investment to most

developing countries being mainly export-oriented. It is also consistent with the FDI theory that openness is indicative of the host countries' ease of access to the world market for material inputs. It also suggests that economies in which trade is important also have relatively higher FDI. Jun and Singh (1996) found that higher levels of exports lead to higher FDI inflows.

The positive coefficients on market size and urban population share suggest that FDI to the region has been market seeking. A large urban population signifies a bigger market as the urban population has generally higher income levels. According to Scaperlanda and Mauer (1969), FDI responds positively to the market size once it reaches a threshold level that is large enough to allow economies of scale and efficient utilization of resources. Enhanced regional integration will therefore increase market size in SADC and help attract investors currently constrained in part by the small size of some domestic SADC markets. This is all the more important given our finding that large market size attracts FDI to SADC.

Political instability was found to have a negative relation with FDI, implying that perceived political instability and government ineffectiveness in some SADC countries continues to deter potential FDI inflows in those countries. The negative impact of political instability could be due to weak law enforcement, government bureaucracy, and inefficient regulatory structures that characterize most African economies (Egger and Winner, 2005). In the presence of political instability, there is high risk of not getting the full benefits across all components of FDI, namely equity, reinvested earnings and debt. Infrastructural development was found to have a positive impact on FDI, implying that recent increases in mobile telecommunication networks into SADC countries have had a significant impact in explaining increases in FDI inflows over the past decade. This positive effect has been confirmed by a number of previous studies, including Ang (2008), Onyeiwu and Shrestha (2004), and Asiedu (2002).

4.3 Policy Implications

The policy implication from the above assessment is that SADC countries should avoid instituting stricter foreign investment regulations in sectors which they do not have unique comparative advantage, because investors would move to other countries offering better investment conditions. However, in sectors where a country has some unique comparative advantages such as extractive industry, investors may not necessarily be deterred by strict investment regulations. The regional integration initiatives by SADC, such as the Free Trade Area and the Finance and Investment Protocol, among others have enhanced

market seeking FDI flows into the region as reflected by the recent upward trend in FDI inflows to the region.

The significant openness variable, underscore the need for SADC to promote greater regional integration by removing remaining trade obstacles, particularly in extractive industries, which need huge capital outlay, beyond the capacity of the domestic financial system. Enhanced trade openness will enable the SADC region to benefit as a whole, by knocking down barriers to trade and opening the doors of mutual gain by strengthening policies aimed at ensuring free flow of goods and services. There is also need to strengthen governance through promoting effective contract enforcement and fighting corruption. Sound governance, infrastructure and institutional quality, especially the rule of law, not only attracts FDI, but also creates the conditions under which domestic TNCs emerge and invest abroad. Deepening regional integration and economic cooperation will help improve the competitiveness of SADC in attracting FDI through the halo effect and a large market size. A regional approach can enhance these factors where an individual country by itself has limited scope in achieving enhanced locational competitiveness associated with the benefits of agglomeration, full capacity utilisation and in overcoming the handicap of small markets.

Conclusion and Recommendations

This study was aimed at reviewing the experience of SADC countries in attracting FDI and to explore why some member countries continue to receive more FDI than others. The study noted that countries with higher FDI levels (agglomeration), credit to private sector, urban population share, trade openness, market size and adequate infrastructure tend to attract more FDI, compared to others. The study also established that countries which have made significant progress in the privatization of public enterprises and reducing the cost of doing business in general have also managed to attract more FDI flows compared to others.

Countries with unique specific factors such as availability of natural resources also tend to receive more FDI flows, notwithstanding the presence of unfavourable investment regimes, such as political instability, absence of rule of law and corruption. These countries can institute stricter foreign equity requirements and empowerment regulations without running the risk of losing potential investors in those sectors. However, the existence of foreign investment impediments can affect FDI in other sectors of the economy, especially those requiring market seeking and locational advantage FDI, which are sensitive to unfavourable investment climates.

The major implication from this study is the need for SADC to promote greater regional integration by removing remaining trade obstacles, particularly in extractive industries, which need continuous cutting-edge investments. The SADC region will benefit as a whole from becoming more open to itself, by knocking down barriers to trade and opening the doors of mutual gain by strengthening policies aimed at ensuring free flow of goods and services. There is also need to strengthen governance through promoting rule of law in contract enforcement and ensuring political stability and fighting corruption. SADC should also put more efforts on creating a common set of trade and investment rules that will help to provide a better investment environment for those who service the SADC market and potential investors who locate to SADC to service outside markets. Deepening regional integration and economic cooperation will help improve the competitiveness of SADC in attracting FDI through the halo effect and a large market size. A regional approach can enhance these factors where an individual country by itself has limited scope in achieving enhanced locational competitiveness associated with the benefits of agglomeration, full capacity utilisation and in overcoming the handicap of small markets.

The consolidation of the financial sector also plays an important role to attract FDI to the country and the region as a whole. Countries need to deal with the high cost of financial intermediation, interest rate differentials and credit provision procedures. There is, therefore need to harmonize the fiscal legislation, especially the taxation policy, and to invest more on basic infrastructures such as roads, bridges, power plants in order to facilitate trade amongst member countries and lure foreign investors to the region. As such, central banks have a role to play in terms of ensuring a conducive financial environment for the provision of domestic credit to the productive sectors of the economy.

There is also need to explore diversification through developing new investment niches in dynamic sectors, beyond natural resources sector, by tapping into other areas such as engineering, software development and computing. This can be achieved by removing obstacles such as foreign investment restrictions in market seeking investments. SADC countries with high FDI in extractive industries such as mining should actively promote FDI in other sectors of the economy. In essence, SADC countries need to aggressively promote FDI in sectors that provide backward, forward and horizontal linkages with extractive industries through refining and beneficiation.

Overall, it can be concluded that the reasons why investors choose to invest in a particular country are wide-ranging and complex, reflecting the macroeconomic,

institutional, social and natural environment. Understanding the major factors why investors choose to invest in the region is paramount to enhance the region's appeal as a destination of choice. The major policy areas SADC countries should focus on, to attract more FDI, is to institute policies aimed at improving stability of the monetary system, removing foreign investment restrictions, allocating more resources to infrastructural development, opening their markets by entering into the right kind of bilateral and multilateral trade agreements, and improving governance and institutional indicators such as doing business, political stability, rule of law and the fight against corruption. Significant progress in these areas will not only attract FDI, but can also bring credibility on the effectiveness of governments.

References

1. Anyanwu J. C. (2011) "Determinants of Foreign Direct Investment Inflows to Africa, 1980-2007", African Development Bank Working Paper Series Number 136, Tunis, Tunisia.
2. Asiedu, E. (2006), "Foreign Direct Investment in Africa: The Role of Natural Resources, Market Size, Government Policy, Institutions and Political Instability". World Institute for Development Economics Research Working Paper Number 05/24, United Nations University.
3. Asiedu, E. (2002). "On the Determinants of Foreign Direct Investment to Developing Countries: Is Africa Different?" *World Development*, 30 (1), 107-19.
4. Baum, C. F., Schaffer, M. E., and Stillman, S. (2007) "Enhanced routines for instrumental variables /GMM estimation and testing", Boston College Economics Working Paper. 667.
5. Bezuidenhout, H., and Naudé, W. A. (2008) "Foreign direct investment and trade in the Southern African development community", Working Papers RP2008/88, World Institute for Development Economic Research (UNU-WIDER).
6. Borenstein, E., de Gregorio, J., and Lee, J.-W. (1998) "How does foreign direct investment affect economic growth?" *Journal of International Economics*, 45, 115–135.
7. Buthe, T. and H.V. Milner (2008). "The politics of FDI into developing countries: Increasing FDI through international trade agreements?" *American Journal of Political Science*, vol. 52, No. 4.
8. Campos and Kinoshida (2003), "Why Does FDI Go Where It Goes? New Evidence from the Transition Economy", IMF Working Paper 03/228.

9. Dunning (1981) "International Production and the Multinational Enterprise", George Allen and Unwin, London.
10. Hymer, S.H. (1976). *The International Operation of National Firms: A Study of Direct Foreign Investment*. MIT Press, Cambridge, MA, United States
11. Kindleberger, C.P. (1969). *American Business Abroad*. Yale University Press, New Haven, CT, United States.
12. Kao, Chiang, and Chen (KCC, 1999), "International R&D Spillovers: An Application of Estimation and Inference in Panel Cointegration", *Oxford Bulletin of Economics and Statistics*, 61, 693–711.)
13. Lederman, D., Mengistae, T and Xu, L. C. (2010), *Microeconomic Consequences and Macroeconomic Causes of Foreign Direct Investment in Southern African Economies*, World Bank Policy Research Working Paper 5416, September.
14. Levin, A., C.F. Lin, and C. Chu. (2002), "Unit Root in Panel Data: Asymptotic and Finite Sample Properties". *Journal of Econometrics*, 108 1-24
15. Markusen, J., and A. Venables, (1998) "Multinational Firms and the New Trade Theory", *Journal of International Economics*, Vol. 46, No. 2, pp. 183–203.
16. Mauro, F. (2000), "The impact of economic integration on FDI and exports: A gravity approach", Centre for European Policy Studies, Working Document No. 156
17. Miyamoto, K. (2003) "Human capital formation and foreign direct investment in developing countries", Organization for Economic Co-operation and Development (OECD) Paper No. 211.
18. Morisset, P. (2000). "Foreign Direct Investment to Africa: Policies also Matter" *Transnational Corporation*, 9 (2), 107-125.
19. Naudé, W. A., & Krugell, W. F. (2003) "Managing and developing human resources for attracting foreign direct investment in Africa", *Management Dynamics*, 12(3), 2–11.
20. Obwona, M. B. (2001), "Determinants of FDI and their impact on economic growth in Uganda", Economic Policy Research Centre, African Development Bank, Oxford, UK
21. Organization for Economic Co-operation and Development (1996), "The Detailed OECD Benchmark Definition of Foreign Direct Investment", third edition. OECD Publications, Paris, France.
22. Quazi R. (2007) "Economic Freedom and Foreign Direct Investment in East Asia", College of Business Prairie View A&M University Prairie View, Texas 77446, USA International Academy of Business and Public Administration Disciplines (IABPAD) meetings

23. Shatz, H. and Venables A. J, (2000), “The Geography of International Investment”, World Bank Policy Research Working Paper No. 2338
24. UNCTAD (2010) “Regional Trends: Africa, World Investment Report 2010|Investing in a Low-Carbon Economy”, United Nations Conference on Trade and Development: Geneva.
25. Van Der Lugt S. and Hamblin V. (2011) “Assessing China’s role in foreign direct investment in Southern Africa”, Center for Chinese Studies
26. Walsh, P. W. and Yu, J. (2010), “Determinants of Foreign Direct Investment: A Sectoral and Institutional Approach”, IMF Working Paper 10/187 (Washington: International Monetary Fund).
27. World Bank. (2002), Governance Research Indicator Country Snapshot. World Bank, Washington DC

Politique rédactionnelle

Les articles soumis à la Revue africaine de l'intégration et de Développement sont évalués de façon anonyme par au moins deux lecteurs externes. La Revue n'accepte pas de publier des articles présentés simultanément ailleurs. De plus, une fois l'article accepté, l'auteur ne peut le retirer sans l'assentiment du rédacteur. Les opinions exprimées par les auteurs n'engagent en rien la Revue.

Présentation des articles

- Envoyer l'article au:

*Département des Affaires économiques
Commission de l'Union africaine
B.P. 3243*

Addis Abeba, ETHIOPIE

Fax: +251-11-5- 18 26 78

Tel: +251-11-5 18 26 58

E-mail:

ReneKouacy@yahoo.com

Ambelab@africa-union.org

DossinaY@africa-union.org

OlomoP@africa-union.org

- Veiller à ce que l'article comporte:
 - Au plus trente pages, références comprises, imprimées à double interligne et d'un seul côté du papier ;
 - Un résumé en français et en anglais (abstract) d'au plus 100 mots, une notice biographique et la bibliographie ;
 - Une introduction et une conclusion ;
 - Une page titre donnant le nom de l'auteur, son affiliation et, le cas échéant, les remerciements.
- Indiquer l'emplacement des hors-texte (tableaux, graphiques, cartes, etc.) dans le manuscrit, les numéroter et les présenter sur des pages à part. Soumettre cartes et graphiques en prêt-à-photographier ; Ecrire les nombres inférieurs à

dix en toutes lettres et utiliser le signe de pourcentage dans le texte et les tableaux, en prenant soin de les séparer du nombre par une espace ;

- Mettre en retrait et sans guillemets les citations dépassant cinq lignes ;
- Ecrire en italique, dans le texte et les équations, les lettres utilisées comme symboles statistiques ou variables algébriques, scores de test et échelles ;
- Limiter les notes aux explications absolument nécessaires, les numéroter consécutivement et les présenter en notes de bas de page ; la numérotation doit être recommencée sur chaque page ;
- Indiquer les références dans le texte selon la présentation auteur-date, par exemple:

(Kouassi, 1998), (Abebe, 1987, p.10-13 ; Makeba, 1990, chap.2) ;

- Indiquer les références bibliographies comme suit:

- *livre* : Fanon, F.(1961), *Les Damnés de la Terre*, Paris, François Maspero.
- *article dans un livre* : Jean-Paul, Azam (1988). “*Examen de Quelques Problèmes Économétriques Soulevés par la Méthode d’Analyse des Stratégies.*” Dans *Stratégies de Développement Comparées*, sous la direction de Patrick et Sylviane Guillaumont, Ed. Economica, Paris, pp. 157-164

Editorial Policies

All articles submitted to the African Integration and Development Review are assessed anonymously by two or more outside readers. Multiple submissions are not accepted. Once a paper has been accepted for publication, it may not be withdrawn by the author without consulting the editor. The African Integration and Development Review is not responsible for the opinions expressed in the articles.

Submission of manuscripts

- Manuscripts should be sent to:

*Economic Affairs Department
African Union Commission
Box 3243
Addis Ababa, ETHIOPIA
Fax: +251-11-5- 18 26 78
Tel: +251-11-5 18 26 58*

E-mail:

ReneKouacy@yahoo.com
Ambelab@africa-union.org
DossinaY@africa-union.org
OlomoP@africa-union.org

- The manuscript should:
 - be not more than thirty pages long, including the list of references, all double-spaced and printed on one side of the paper only;
 - include an abstract, of not more than 100 words, a biographical note and a bibliography;
 - An introduction and conclusion;
 - A cover page including the title of the article, the author's name and affiliation as well as any acknowledgements that may apply.
- The location of tables, figures and maps in the text should be indicated. They should also be numbered consecutively and placed on separate pages. Maps or graphs must be in camera-ready copy with the final version of the manuscript.
- Numbers below 10 are written in words. The percentage sign is used in both text and tables provided that it is separated from the figure by a space.
- Quotations of more than five lines should be indented without quotation marks.

- Letters used as statistical symbols or algebraic variables, test scores and scales should be in italics.
- Notes are limited to content notes only, and should be numbered consecutively and placed as a footnote; the numbering should be restarted on each page.
- References are indicated in text, using the author-date method of reference, e.g. (Kouassi, 1998), (Abebe, 1987, p.10-13; Makeba, 1990, chap.2)
- Indicate the bibliographical references as follows:
 - *book*: Fanon, F. (1961), *Les Damnés de la Terre*, Paris, François Maspero.
 - *article in book* : Jean-Paul, Azam (1988). "Examen de *Quelques Problèmes Économetriques Soulevés par la Méthode d'Analyse des Stratégies.*" Dans *Stratégies de Développement Comparées*, sous la direction de Patrick et Sylviane Guillaumont, Ed. Economica, Paris, pp. 157-164.