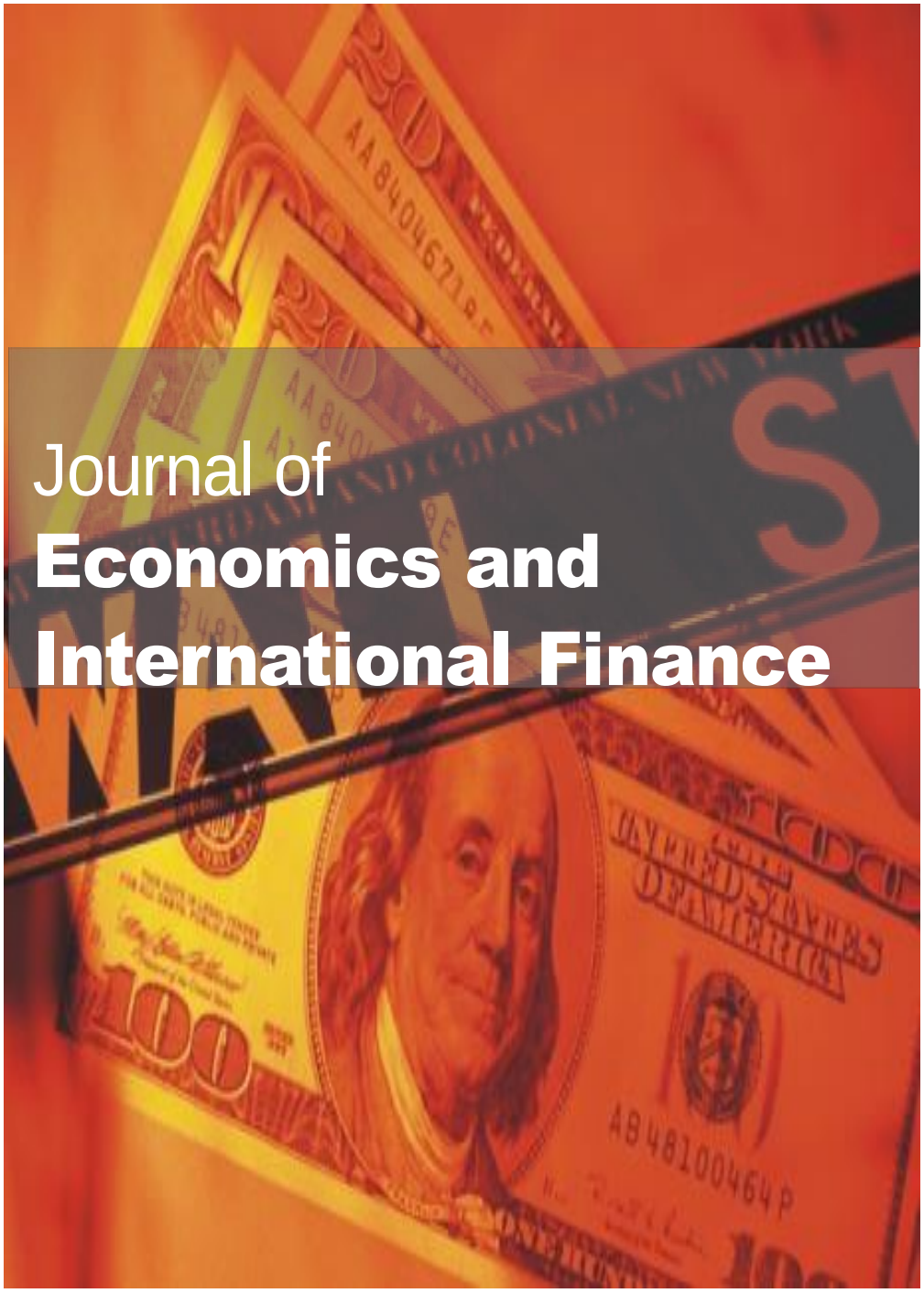
OPEN ACCESS



Journal of Economics and International Finance

July-September 2022
ISSN 2006-9812
DOI 10.5897/JEIF
www.academicjournals.org

ACADEMIC JOURNALS
expand your knowledge

ABOUT JEIF

The **Journal of Economics and International Finance (JEIF)** is published monthly (one volume per year) by Academic Journals.

Journal of Economics and International Finance (JEIF) is an open access journal that provides rapid publication (monthly) of articles in all areas of the subject such as econometrics, trade balance, Mercantilism, Perfect competition etc. The Journal welcomes the submission of manuscripts that meet the general criteria of significance and scientific excellence. Papers will be published shortly after acceptance. All articles published in JEIF are peer-reviewed.

Contact Us

Editorial Office: jeif@academicjournals.org

Help Desk: helpdesk@academicjournals.org

Website: http://www.academicjournals.org/journal/JEIF

Submit manuscript online http://ms.academicjournals.me/

Editors

Editorial Board

Table of Content

Vol. 14(3), pp. 32-45, July-September 2022
DOI: 10.5897/JEIF2022.1171
Article Number: AA7A15B69390
ISSN 2006-9812

http://www.academicjournals.org/JEIF

ACADEMIC JOURNALS
expand your knowledge

Journal of Economics and International Finance

Full Length Research Paper

Analysis of multi-country manufacturing value-added (MVA) using a dynamic panel model

Alemnew Mekonnen Wolde

School of National Development, Institute of South-South Cooperation and Development, Peking University, China.

Received 2 May, 2022; Accepted 27 June, 2022

Industrialization is required to increase an economy's competitiveness and living standards, as well as to catch up to more developed economies; while low and lower-middle-income countries' average performance over the last five decades has been disappointing at 6.7 and 17.4%, respectively. Fabrication exports account for 37.1% of total low-middle-income average exports and 9.6% of low income. As a result, this article's main objective is to discover why manufacturing has historically played such a minor role in these economies. It has also looked into the influencing factors. Literature review was conducted. The study used national and multi-country panel data. There were multiple comparative descriptive analyses using tables and figures. The study used one-step system generalized-method of moments (GMM) model for longitudinal panel data. The study identified key factors limiting MVA share. MVA and the economic complexity index were positive and growing trends. Income growth correlates with manufacturing growth. The MVA share of low-income countries has fallen. Some factors affecting MVA share performance in low-income countries include credit availability and net foreign direct investment (FDI) performance. Regulatory quality, political stability and other factors directly impact MVA share. Export and GDP per capita have a positive significant impact on MVA in both the long and short run. While private credit has a negative impact. The research findings have policy implications, including increased manufacturing exports and higher GDP per capita income.

Key words: Manufacturing development, value-added, multi-country, causes, generalized-method of moments.

INTRODUCTION

Approximately one-third of the world's countries have high per capita incomes, while half have upper and lower-middle incomes (World Bank, 2021a). Most Sub-Saharan African countries have lower per capita incomes (World Bank, 2021a) and nearly 700 million people in the world live in extreme poverty (World Bank, 2018a; b). Economic structural transformation is directly related to manufacturing growth, according to historical, theoretical and empirical research (Lin, 2012; Rocha, 2018; Neuss, 2019). Economic fundamental transformation requires a fundamental change in industrial structure to overcome low-level development bottlenecks, barriers and rigidities (Martins, 2018; Rocha, 2018). Technological advancement, automation, progress and diversification have accelerated these developments (Lin, 2012; Yang, 2014). Sectoral shifts from low to high productivity

E-mail: alemnew_mekonnen@yahoo.com.

(McMillan et al., 2014). To lead industrial technology, Great Britain became the primary fabrication center, which spread to other nations like Switzerland, Belgium and the Western world (Lin, 2012; Szirmai, 2012; Rocha, 2018). Japan, South Korea, Taiwan-China and China have all followed suit (Lin, 2011; Lin, 2012; Szirmai, 2012). Argentine, Brazil, Mexico, Chile and Colombia tried to increase their industrial share in the late nineteenth century (Paolera et al., 2018). Other developing countries, particularly in Africa, have attempted to promote the sector, although they have yet to be effective (Signé, 2018). Despite country differences, sector expansion and development increased GDP per capita, manufactured exports and employment (Rodrik, 2011; Krugman et al., 2012; Andreoni, 2013; UNDIO, 2018). Countries that have completed structural transition, have caught up and have joined or are on their way to joining the advanced high-income group. However, this package and achievements have not been replicated throughout the developing globe (Lin, 2018). The catching-up activity of fabrication is defined in latecomer economies as “wild geese fly in orderly ranks forming an inverse 'V,' exactly as airplanes fly in formation. This wild goose flying pattern is figuratively applied to the three time-series curves... each signifying import, domestic production and export of manufactured goods in less developed countries” (Akamatsu, 1962:11). This concept is more closely related to the success of East Asian manufacturing development in countries (Lin, 2011). These are the supporters of export-oriented versus import-substituted initiatives. Supporters of the latter claim that it relates the importance of learning-by-doing to industrialization (Krugman and Wells, 2006; UNIDO, 2015); whereas supporters of the former believe in the role of trade-learning (Lin, 2012). Import-substituting manufacturing progress occurs when trade restrictions such as quotas and tariffs are used to stimulate domestic manufacturing to substitute imported goods. The objective is to encourage the home market (Krugman et al., 2012). Exporting a manufacturing product has been linked to the product's quality and competitive price in the international market. These can be accomplished by substituting home production for imported ones (Andreoni, 2013; UNIDO, 2015). For a variety of reasons, the import substitution strategy has become fashionable and acceptable. The first argument was that the sector was still in its infancy; hence protection had gained favor among many politicians and economists (Krugman et al., 2012). The manufacturing production structure has been connected to upstream and downstream firms (UNIDO, 2018). Physical demand and supply relationships between economic sectors distinguish these ties (Rosenstein-Rodan, 1984; Rocha, 2018). Infrastructure is considered essential for industry growth. There are two types: hard and software (Lin, 2012). Examples of the former are telecommunications, roads and other public utilities. Other economic and political systems include social capital (Krugman and Wells, 2006; Lin, 2012). To gain access to specific inputs such as qualified labor, the cluster of enterprises focuses on specific geographical areas (Zhang et al., 2011). Many researchers and academics believe that to achieve multifaceted fabrication sector development, governments should implement appropriate and selective policies to advance their manufacturing sector development and reap the benefits (Cimoli et al., 2009; Bagchi, 2012; Scazzieri, 2014). In terms of successful industrial policymaking, the state determines the sector's progress. The starting scenario should be the best way to develop policy (Lin and Monga, 2010; Andreoni, 2013).

The problem statement, economic progress and development have resulted from the shift from agrarian to contemporary manufacturing, non-manufacturing industries and service sectors (Rosenstein-Rodan, 1984; Neuss, 2019). They have also resulted from structural changes. Considering these multifaceted aims of the sector, low and lower-middle-income countries have aspired to have robust industry advancement in general and manufacturing in particular, to change traditional agriculture to modern agriculture since the 1950s (Lin, 2012; UNDIO, 2017). To move this sector forward, the governments were given resources during the 1950s and 1960s to encourage private operators, however, under the command economy; the manufacture of states-owned heavy industries was the primary goal in not few low and lower-middle-income countries (UNIDO, 2017; Lin, 2018; Signé, 2018). Since the beginning of the 1990s, following the end of the socialist era, the states have established and implemented the free market system to bring about economic structural changes (Lin, 2018; Signé, 2018). Since 2000, the economy has been seeing rapid GDP growth consequently to the reforms. Although the sector's contribution to GDP has increased, the shift to manufacturing has been minor. Until 2019, the manufacturing output contribution of low-income countries is not more than 6.7% of GDP. In lower-middle-income countries, the figure is 17.4%. The structural shift has shifted to non-manufacturing and service industries. Neither industry employment nor exports have increased. By 2019, the sector's labor force contribution averaged 9.7% of the total labor force in low-income countries, versus 18.23% in lower-middle-income countries (World Bank, 2020a). In 2019, its exports accounted for around 9% of total exports, while the latter accounted for 37.07% (World Bank, 2021b). Textiles, leather and leather products, clothing, meat and associated outputs were the main manufactured goods exports (World Bank, 2020b). These data confirm the transformation's failure. Moreover, many African countries are ranked among the least transformed in 2014, using five indicators such as export competitiveness, economic diversification and technology upgrade (ACET, 2014). Unless corrective policy measures are implemented, premature deindustrialization

will be unavoidable, especially in low-income economies. This research seeks to understand why manufacturing is so marginal in developing countries. The study looks into why the MVA share of GDP has remained low for so long. It will also examine the influences on these performances. The study will add to existing knowledge on manufacturing development, specifically output growth, determinants in developing economies. This study will provide policymakers with comprehensive information on the major drivers of sector growth. The study also makes policy suggestions for boosting industrial output. Based on the study's findings, the manufacturer can engage the government in public-private partnerships. To the researcher's knowledge, no comprehensive study combining descriptive and econometric research on MVA share has been conducted.

THEORETICAL AND EMPIRICAL LITERATURE REVIEW

Manufacturing is the production of services and goods using shared production elements such as land, labor, capital and raw material investment (Andreoni, 2013; UNIDO, 2015). In and across industries, manufacturing development is the result of economic sector transformation (Stiglitz 2017; Neuss, 2019). Transformation across sectors occurs when dynamism moves from agriculture to manufacturing. However, within sectors, the fabrication sector is moving from low to middle and high-tech (Pisano and Shih, 2009, Altenburg and Melia, 2014). It denotes a shift from fabrication subsectors like food and beverage, textile and garment, to computerization of technology accumulation (Stiglitz, 2017). MVA as a percentage of GDP is a major indicator of manufacturing expansion (UNIDO, 2015; Neuss, 2019). It implies structural change as evidenced by increases in fabrication output and export GDP (UNIDO, 2005; Herrendorf et al., 2014).

Manufacturing development theoretical literature

As per capita income rises, manufacturing production tends to rise relative to changing factor endowments (Lin, 2012). The country's geographical and demographic characteristics have also influenced progress (Krugman et al., 2012). According to this theory, low-income resource-intensive countries focus on light manufacturing, while high-income countries focus on capital manufacturing (Katz, 2006; Krugman and Wells, 2006; Andreoni, 2013; UNIDO, 2015). However, each country's circumstances necessitate a unique growth structure. This has led to a role for country-specific factors like culture, history and industrial policy (Chang and Lin, 2009). In comparison to traditional production activities, encouraging economic growth and reducing poverty (Lin, 2012). Manufacturing jobs are good jobs. Studies show that employment in firms is a major driver of economic growth, especially in developing countries (UNECA, 2015). Fabrication has grown due to increased capital and technology (UNECA, 2015). In national economic discussions, industrialization has been seen as driving technology. This organization claims that technological advancement and mass production are now intertwined. The technical dynamism and innovative cost-cutting processes allow producers to use it in mass markets (Neuss, 2019). A cluster is a group of firms that share expertise, have access to specialist inputs and a pool of qualified labor and other resources (Zhang et al., 2011). Krugman claims that companies in industrial clusters gain at least three well-known advantages. The affluence of markets and labor pooling are examples (Krugman, 1991). These 'collective efficiency' benefits may allow additional manufacturers to participate in fabrication output that would otherwise be unavailable to them (Schmitz and Nadvi, 1999). It is a growing genre that covers industrial collections and their role in economic progress (Zhang et al., 2011). By enacting selective industrial, technological and trade policies, states have been driving and speeding structural changes in their economies since the 1800s (Rodrik 2007; Chang 2009; Krugman et al., 2012; Lin, 2012). The World Bank, IMF and most economists have maintained their pro-market stance despite the rise of neoliberal policy support (Peet, 2007). Others argue that countries should have selective rules in place to advance their fabrication while reaping the benefits (Cimoli et al., 2009; Rodrik 2004; Bagchi 2012; Scazzieri, 2014). It has a set of requirements. The initial situation should be the most appropriate and correct way to develop policy (Amsden, 2001; Altenburg, 2011). It has gained popularity in the last two decades. There is evidence of the goal of 'New Developmentalism' and 'New Structural Economics,' (NSE),' which share a Keynesian theory with the World Bank's framework (Andreoni, 2013). There is a basic investigative trial in distinguishing fabrication development as two interconnected courses. What is new in NSE? The primary architect, Professor Justin Yifu Lin, says "studies the determinants and dynamics of economic structure using neoclassical methods. Changes in factor endowments and continuous technological innovation drive sustained economic development, according to this theory" (Lin, 2012:5). Whereas a country's top industrial structure is determined by its relative advantage, which is defined by factor endowments at any given time, fabrication expansion is considered inevitable (Lin, 2012; Andreoni, 2013). A mix of "comparative advantage" tracking methodologies and soft and hard set-ups is envisaged by the NSE architecture (Chang and Lin, 2009). A government intervention to correct market failure is accepted on the NSE agenda. Thoughts on how policies will continue to operate in an open market, with the state only intervening

when necessary (Lin, 2012). The macro-level structuralist and Keynesian development approach NDev framework is composed of ten hypotheses (Heterodox economists, 2012). The idea was to promote sustainable growth, according to these experts. However, while markets should be the primary venue for this process, the state must provide the necessary institutions to support it (Stiglitz and Yusuf, 2001). Economic growth requires a national development strategy that takes advantage of globalization's prospects (Rodrik, 2004; Cimoli et al., 2009).

Aside from the periodic overvaluation of the exchange rate, too much reliance on foreign savings hinders the long-term prosperity of the country. Promoting exports, currency adjustments and domestic savings are also critical for predictable growth (Chang, 2004; Huang et al., 2014). How did low-income countries succeed in manufacturing? In the courses of industrial development, countries' performance has varied greatly. These historical achievements have been linked to a variety of strategies for its development of it (Weiss, 2011). Countries have rarely followed the same order in terms of institutional patterns of their manufacturing growth in comparison to recent history (Lin, 2012; Szirmai, 2012). For example, in the nineteenth century, the European economics of industrialization, which followed Britain in nearly identical steps, relied more heavily on the role of financial institutions, such as mobilizing savings for fabrication investment, whereas reinvested returns of firms themselves were more important (Szirmai, 2012; Rocha, 2018). Large multinational and national enterprises were the driving force of sector development in the late nineteenth century in Japan and the mid-twentieth century in Korea. In the case of Taiwan-Chain, the focus was on the smaller and medium-sized enterprises as well as the domestic private sector (Weiss, 2011). While, in the case of China, rich non-resident Chinese (Xu and Yeh, 2013) and foreign investors (Weiss, 2011) have played important roles. One of the game-changers in the path of fabrication progress is the establishment of special economic zones (SEZs). Particularly in the case of China, authorities established a variety of manufacturing and related economic development policies following the open-up and reforms (Sahoo and Bhunia, 2014). In terms of manufacturing development, SSA, excluding South Africa, is the world's largest laggard (Weiss, 2011). From 17% in 1981 to 11% in 2019, MVA as a percentage of GDP has fallen (World bank, 2020; and econstats.com, 2021). This is how these countries perform on average. From 22.7 to 27.5% of total merchandise exports, fabrication output exports have had a depressingly low trend for 24 years. As mentioned previously, East Asia's manufacturing sector is very different.

A lack of MVA share is due to several factors. The first point concerns the region's natural resource abundance (Altenburg, 2011; Weiss, 2011). An unfavorable business climate is the second explanation (Ellis et al., 2021). A country's purchasing power, landlocked or coastal, governance and relationships with neighbors all influence the potential for manufacturing expansion similarities between the two countries (Altenburg and Melia, 2014). Transport, infrastructure and services such as security, water and other essential supplies are costly in Africa, compared to Asia (Weiss, 2011). A lack of trade logistics and unpredictability in electricity supply all threaten the long-term viability of FDI (Chen et al., 2015). The market size influences FDI attraction (Morisset, 2000). This implies that trade agreements within and across regions help attract FDI to Africa (Jaumotte, 2004; Lederman et al., 2010).

Examining the empirical literature

An empirical study has shown the MVA share's relationship to GDP. Various studies using panel data found that credit availability had a significant direct impact on MVA in Kenya, Africa, South Asia and Nigeria (Nzomoi et al., 2012; Samouel and Aram, 2016; Maroof et al., 2018; Saidat and Wasiu, 2019). Evidence from lower-middle-income African countries confirms that private sector credit does not result in significant changes in MVA (Mcmillan et al., 2017; Martins, 2018). A long-term relationship between gross fixed capital formation and industrial value-added has been found in Nigeria using time series data from 1981 to 2015 (Josephine et al., 2017; Victoria, 2019). The study also found that capital development influenced Pakistan's manufacturing growth (Khadaroo and Seetanah, 2007). The Niagara study used 37 years of time-series data to determine the fabrication sector's role in GDP structural changes (Saidat and Wasiu, 2019). The data showed that economic variables like per capita income influenced South Asia's industrial development (Ejaz et al., 2016). In East Asia, an increase in per capita income was reported to have a greater influence on MVA (Jongwanich and Magtibay-Ramos, 2009). The study in Nigeria found that trade openness had a significant impact on the changing characteristics of the fabricating industry's proportion of GDP (Ng and Yeats, 1998; Babatunde, 2009; Saidat and Wasiu, 2019). The fixed effect panel data regression showed that free trade has a significant impact on industrial progress (Udegbunam, 2002). A study in four South Asian countries and another in Niagara using panel data found a significant link between manufacturing growth and trade openness (Ejaz et al., 2016; Josephine et al., 2017; Saidat and Wasiu, 2019). A study by 160 countries confirmed that agriculture has a significant impact on the growth of the manufacturing sector; the findings showed that agriculture and fabrication have a statistically significant positive correlation (Varkey and Panda, 2018). Contrary to another study, the relationship between agriculture and MVA and economic structural

change is inconclusive. Mcmillan et al. (2017) claim that agriculture's value added to the fabrication industry has little impact on sector change. While other Tanzanian research agrees that the former contributes significantly to the manufacturing sector (Shombe, 2005). A study in Mexico found that effective governance measures improve industry (Kraay et al., 1999). Using data from 1981 to 2015, the exchange rate showed a long-term positive relationship with MVA in Nigeria (Victoria, 2019). The equation for manufacturing growth in Africa shows that increasing domestic market size and trade openness are constant factors (Rodrik, 2008; Guadagno, 2012). Due to the state's effective governance service, the macro environment is stable, allowing manufacturers to operate rationally (Altenburg, 2011). Since stable macroeconomic conditions would reduce public debt while appropriate deficits would increase capital access for private manufacturing players (Mazanai and Fatoki, 2012; Samouel and Aram, 2016). These variables may be among the most critical to manufacturing progress in terms of value-added percentage of GDP (Udegbanum, 2002). The government's ability to foster growth in manufacturing and related sectors is also critical (Chamberlain and Smith, 2006). However, empirical researches in low and middle-income African countries confirm that trade openness and governance variables do not significantly affect fabrication development and structural transformation (Mcmillan et al., 2017; Martins, 2018). The study found a positive and negative relationship between inflation and economic progress in developing nations using a panel model (Rodrik, 2008; Martins, 2018). Using time-series data, the SSA study found that independent variables like government incentives and inflation had no significant relationship with manufacturing development

METHODOLOGIES FOR ESTIMATING MVA

Sources of data and measurement

From 1991 to 2019, 69 countries and 30 years were studied to determine the major factors of manufacturing sector development (World Bank, 2020). The research included both quantitative and qualitative longitudinal panel data. The study used secondary data sources. The data came from World Bank, World Development Indictors and EconStats, as well as the Worldwide Governance Indicator, Penn World Table, World Trade Organization and each country's statistics agencies if data on the previously listed international institutions was not accessible. The dependent variable is MVA percent of GDP, whereas the economic independent variables are agriculture value-added (AV), credit access (CA), manufacturing export (ME), Government final consumption expenditure (FC), Trade as a part of GDP (TO), Inflation, GDP deflator (annual percent) (ID), GDP per capita income (GP), governance effectiveness estimate (GE). The most prevalent units are percent share, governance index and per capita income in USD.

Formulation of hypotheses

This study's independent variables are determined by the economic and political variables listed below. Formally, we tested hypotheses in the following ways:

H (1.1): First lag MVA percent of GDP (MVA_lag1) has a significant influence on MVA
H (1.2): In AV has an important effect on MVA.
H (1.3): ME has a considerable impact on MVA.
H (1.4): CA has a substantial influence on MVA.
H(1.5): FC has a significant impact on MVA.
H (1.6): TO has a meaningful effect on the production of MVA.
H (1.7): GP has a significant influence on MVA.
H (1.8): GE has a major impact on MVA.
H (1.9): ID has a significant effect on fabrication value addition.

Econometric estimation method

Before estimating using a one-step system GMM, the study used the fixed-effects model (FE) through the guide of the Housman test. However, the finding has failed due to the model suffered from heteroscedastic and serial correlation. Pesaran's cross-sectional dependence test in the FE model should be tested, according to the study. Long-term panel data may have a problem with cross-sectional dependence. As a result, the regression output indicates that the probability value was less than the desired lower limit of critical value. In addition, the model suffered from Groupwise heteroskedasticity. Hence, this study considers a dynamic panel-data, one-step system GMM model since it includes the lag of the dependent variable as an independent variable. GMM is augmented in one step, it is efficient and it is robust to autocorrelation and heteroscedasticity (Roodom, 2009). The presence of the lagged variable which is dependent on the experiential model indicates that there is a relationship between the error term and the regressors because lagged MVA percentage of GDP on u_{it} is a function of the effect of the country-particular factor. Because of this association, estimation of dynamic panel data Eq. (1) stands from the Nickell 1981; Robertson and Sarafidis 2015 bias, which goes only when T approaches infinity. GMM, as proposed by the authors cited in the previous section, is the preferred estimator in this instance. Endogeneity caused by the correlation between these country-specific effects and the right-hand side regressors is likewise eliminated by the system GMM model. The orthogonality provisions amongst the lagged differenced values of the regressed variable and errors are used in the instant conditions. This presumes that the original disturbances in Eq. (1)—the v_{it}—are not serially correlated and that the differenced error is thus the moving average of first-order; MA (1) with unit root (Baltagi et al., 2009). To that goal, two analytics are calculated employing the Arellano and Bond (1991) GMM technique to test for first and second-order serial correlations in the disruptions. It is the acceptable range the second-order serial correlation is appropriate. The number of moment situations improves with T, which is a unique aspect of GMM dynamic panel data analysis. As a result, a Sargan test is used to test the over-identification limits (Roodom, 2009). The level dynamic GMM estimation treats all variables save the lagged dependent variable as if they were exogenous implies that these variables assuming they are uncorrelated with dependent variable.

The model was modified from (Samouel and Aram, 2016). It was used to see how financial development affected industrialization. As a result, the model was created in the following manner:

$INDUSTRY_{it} = y_0 + y1INDUSTRY_{it}\text{-}1 + y2FIN_{it} + y3FDI_{it} + y4LAMRIG_{it} + y5GOV_{it} + y6REER_{it} + \ldots U_{it}$, (1) With: $Uit = \mu_i + \varepsilon_t + v_{it}$ (Samouel and Aram, 2016:226).

However, in this study case, we used to estimate the determinants

of MVA. Accordingly, the model has been modified as follows:

$INDUSTRY_{it=}$ $MVA_{i,t}$ MVA % of GDP at year t

Therefore: $MVA_{i,t} = \beta_0 + \beta_1 MVA_{i,t-1} + \beta_2 AV_{i,t} + \beta_3 CA_{i,t} + \beta_4 ME_{i,t} + \beta_5 FC_{,t} + \beta_6 TO + \beta_7 ID_{i,t} + \beta_8 GP + \beta_9 GE_{i,t} + U_{it}$

With: $U_{it} = \mu_i + \varepsilon_t + v_{it}$ where $U_{it=}$ disturbance term, $\mu_{i=}$ country individual fixed effect, ε_t effect., v_{it} = idiosyncratic error terms.

According to Baltagi et al. (2009), the presence of the lagged regressor variable in the empirical model indicates that there is a connection between the error term and the regressors since lagged MVA depends on U_{it}, which is a behavior of 'i' the country-specific impact. Due to this relationship, dynamic panel data evaluation of (i) suffers from the Nickell 1981; Robertson and Sarafidis, 2015 bias, which disappears only when T tends to infinity. In this scenario, the chosen estimator is GMM, as defined by Arellano and Bond (1991), which differs from the model to eliminate exceptional condition country effects or any time-invariant country-specialized variable. Roodman (2006) advocates using time dummies variables to improve the utilization of the GMM system approach. Furthermore, only endogenous variables with values of lagged of at least two periods are regarded as sound instruments. It should not surpass the number of groups, so the p-values of the Sargan test of over identifying limits and the Arellano-Bond test for serial association in second-differenced errors should be greater than 0.1, according to him, the test suggests instruments should be jointly valid if they are not connected with the error term (Samouel and Aram, 2016). Other authors use fewer lags to instrument endogenous variables because they believe that if all lags are employed, the number of instruments exceeds the number of groups, making the Sargan test weak and estimations incorrect. The coefficients β1, β2, β3, β4, β5, β6, β7, β8 and β9 in the equation, measure the short and long-run response of MVA share to changes in MVA lagged variable by one period, agriculture value-added (AV), credit access (CA), manufacturing export (ME), Government final consumption expenditure (FC), Trade as a part of GDP (TO), Inflation, GDP deflator (annual percent) (ID), GDP per capita income (GP) governance effectiveness estimate (GE).

RESULTS AND DISCUSSION

MVA comparative descriptive and empirical analysis

MVA share by income levels

According to the countries' income levels, it has been producing numerous things with new models and trends. Looking at the global MVA over the last 30 years, we notice an upward tendency. Table 1 shows the sector value added in 1991 was around 5405 billion $ constant in 2015. In 2005, the value was 8703 billion dollars and in 2019, it was 13837 billion dollars. In terms of income level performance, low-income nations advanced 2.5, 0.32 and 0.33% of the global share in 1991, 2005 and 2019. As can be seen, both shares were modest and decreased from 1991 to 2005, and then remained stable for the rest of the study period. The performance of low- and middle-income countries differed greatly. As shown in the table, lower-middle-income countries have increased by 4.8, 5.6 and 8.1% over time, despite lagging behind upper-middle-income countries. Similarly, higher middle-income countries accounted for 19.7, 26.5 and 39.8% of sector development. They are now manufacturing centers alongside high-income countries. Aside from that, low-income countries have seen a far faster rise in the trend than high-income countries. However, in 1991, 2005 and 2019, the high-income group held 74.9, 63.5 and 51.8% of the share. Despite a gradual decline, the global share of high-income countries remains the highest. The overall trend assessments of manufacturing development indicated that as income levels rise, the probability of having a significant percentage of MVA rises. Increased income and the development of manufacturing have positive correlations.

MVA per capita and economic complexity

Producing more complex goods and acquiring productive knowledge (Hausmann and Hidalgo, 2011). The notion of acquiring productive skills in a country was summarized by Hidalgo and Hausmann (2009) and reviewed by Hausmann and Hidalgo (2011). The variety of a country's fabrication product structure and the originality of its products were discovered to measure economic complexity. Combining the two observations and using the computation procedure yields quantifiable complexity measures through reflections (Hidalgo and Hausmann, 2009). Manufacturing expansion and economic complexity have been directly tied to economic advancement (Hausmann and Hidalgo, 2011). It provided critical insights into various types of economic progress. It correlates positively with a country's production capability and development stage. A log of MVA per capita (constant, 2015 US$) group of countries by income level is shown, using Africa as the region. Figure 1 shows the relationship between high-income, upper-middle-income and low-middle-income countries, as well as Africa. So the color represents the country cluster. Manufacturing value per capita increased with economic complexity. Their color is blue. Based on 2018 statistics, the Log of MVA per capita and ECI are linked. As a result, the blue spots indicated the advanced economies. As can be seen, most countries in this group score above zero on the ECI. This means that these countries had a greater level of MVA understanding. As noted, not all high-income countries have equal ECI. Few had negative ECI scores, whereas some had higher positive values. In this group, Australia had an ECI of -0.53 and a log MAV of 3.5, not far behind Japan and Germany, which had -0.53. Not as diverse as other high-scoring countries' knowledge accumulation. Kuwait had a negative 0.7 ECI and a log MAV of 3.4. This shows that certain countries have higher industrial value-added but lower ECI. The red dots reflect the upper-middle-income group of countries. Despite the logarithm of the MVA is high close to the higher income category in this scenario, the ECI ratings were mixed. Almost half of the 38 countries have a

Table 1. MVA share based on global income level trends.

Countries	MVA(billions, constant 2015$)			MVA (percent)		
Grouping by income	1991	2005	2019	1991	2005	2019
World	5405	8703	13837	100.0	100.0	100.0
Low income	32	28	45	2.5	0.32	0.33
Lower-middle income	260	490	1116	4.8	5.6	8.1
Upper-middle income	1063	2310	5503	19.7	26.5	39.8
High income	**4050**	**5875**	**7173**	**74.9**	**63.5**	**51.8**

Source: Author computation based UNIDO Statistics Data (UNIDO, 2020a).

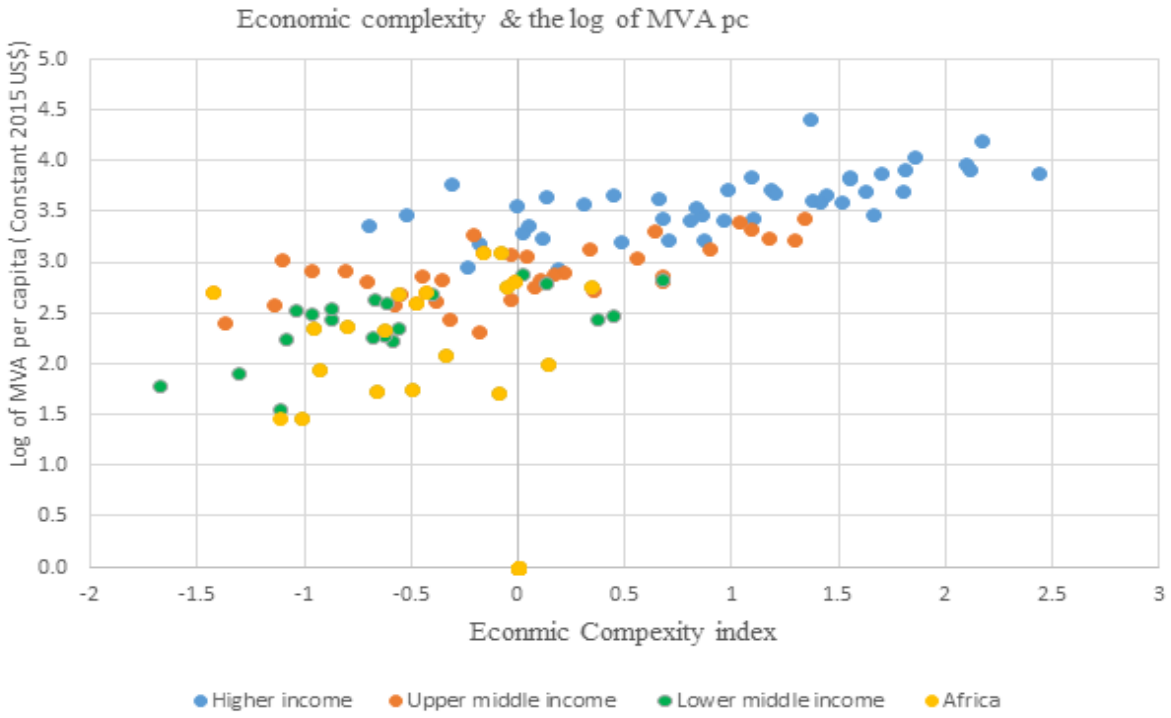


Figure 1. MVA Per Capita and ECI.
Sources: Own computation based on UNIDO Statistics Data Portal (UNIDO, 2020b) and country complexity rankings (2018).

negative ECI score. The graph clearly illustrates that these countries' understanding of the industrial sector and other sources of development are not diverse and limited. Despite the disparities in performance, around 18 countries earned positive ECI, indicating a favorable and reasonably good level of knowledge accumulation among group members. The lower-middle-income nations group is represented by the green color in the third lower-level layer. Thirty-three countries were covered in this category. In terms of the MVA and ECI, they were on the third level. Because they were in the lower-middle-income bracket, their results reflected their degree of development. Similar trends had been seen in the case of Africa, as depicted in the figure. As indicated by the orange color, the majority of countries fell into the lower middle and low-income brackets. The majority of them had lower ratings in both measures. The overall trend of these four classifications of countries based on income levels, MVA and economic complexity index was positive and growing. The tendency has significant implications in that the accumulation of knowledge led to the diversification of the expansion of the manufacturing sector, which in turn led to a significant contribution to fabrication production and then MVA.

Economic and political factors influencing sector development

We identified in the previous discussion that the MVA share of GDP has performed differently in low, middle and high-income nations. Numerous direct and indirect

Table 2. As a percentage of GDP, FDI and credit access to the private sector.

Countries Group	FDI % GDP				Credit Access to private (% GDP)			
	1980	2000	2010	2019	1980	2000	2010	2019
Low income	-0.01	0.82	0.30	0.32	8.2	7.0	10.7	12.2
Lower middle income	0.03	0.01	0.71	0.76	20.2	27.2	42.3	45.2
Upper middle income	0.13	0.33	1.28	0.40	42.0	59.8	77.2	123.3
High income	0.63	4.88	3.29	1.78	84.2	155.9	144.1	147.3

Source: Author computation based on WDI (This data avalaible https://databank.worldbank.org/reports.aspx?source=2&series=NY.GDP.MKTP.KD.ZG&country=, last accessed 6/8/2021)

Table 3. Estimates of government effectiveness, political stability and regulatory quality.

Country group by the level of income	Average government effectiveness: Estimate			Political stability and absence of violence/terrorism: Estimate			Regulatory quality: Estimate		
	1996	2006	2019	1996	2006	2019	1996	2006	2019
Low income	-1.121	-1.089	-1.190	-1.13	-0.96	-1.14	-1.112	-1.045	-1.09
Lower middle income	-0.476	-0.649	-0.563	-0.28	-0.46	-0.40	-0.474	-0.651	-0.55
Upper middle income	-0.23	-0.26	-0.16	-0.15	-0.21	-0.13	-0.205	-0.254	-0.30
High income	0.981	1.024	0.94	0.79	0.80	0.75	1.01	0.01	0.92

Sources: Author computation based on WGI data (Sources for analyses; https://databank.worldbank.org/source/worldwide-governance-indicators, last accessed 6/8/2021).

political and economic factors contribute to the disparities in income-based performance. Among these fundamental factors are economic reasons such as the availability of local private credit to the sector, net FDI outflows, gross fixed capital formation, agriculture value-added and trade. Among the political factors are governance effectiveness, political stability, regulatory quality estimation and others. Let us explain the role of the factors using three examples: FDI net inflow and national access to credit to the sector as economic factors and political factors such as political stability and absence of violence, governance effectiveness and regulatory quality estimates have been included in Tables 2 and 3. These economic indicators have been displayed in Table 2 from 1980 to 2019, to examine the trend over time based on income level. In terms of FDI, low-income nations received -0.01, 0.82, 0.30 and 0.32% of their GDP in 1980, 2000, 2010 and 2019, respectively. The performance has been so poor and it has been a consistent pattern from 2010 to 2019. Similarly, in the same period, these countries' credit to private was 8.2, 7.0, 10.7 and 12.2% of the GDP. In the case of lower-middle-income countries, roughly 0.03, 0.01, 0.71 and 0.76% of FDI from GDP have been achieved. Similarly, the performance of national credit to the private sector percentage of GDP was 20.2, 27.2, 42.3 and 45.2% in 1980, 2000, 2010 and 2019, respectively. In both indicators, countries lower-middle-income, achieved well than the low-income group. Similar patterns have been identified in the group performance of upper-middle and high-income nations in both indicators. As a result, we can conclude that limited credit availability and poor net FDI inflow performance are among the causes of poor MVA share performance in low-income countries around the world. Political issues can either help or hinder the development of industrial value-added and output export. The income level classification of countries was used to examine these indicators. Using World Bank global governance indicators, 28 low-income nations, 50 lower-middle-income countries, 56 upper-middle-income countries and 70 high-income countries were identified. The figures in the table represent the average performance of these countries throughout the specified period. In 1996, 2006 and 2019, the average government effectiveness in low-income nations was -1.12, -1.09 and -1.19, respectively. Over the last 20 years, the performance has been almost constant and very low when compared to other groups. Similarly, the performance of the lower-middle-income governance effectiveness index was -0.48, -0.65 and -0.56 for the same period. The achievements have been higher than those of the low-income group; however, this varies from time to time. While the upper-middle-income countries performed -0.224, -0.257 and -0.160 index, the former two categories of countries performed better. Whereas high-income countries achieved 0.98, 1.02 and 0.94 scores, the rest achieved the lowest. The government effectiveness achievements of these income-grouped countries are directly related to the MVA share as shown in Figure 1. The performance of various income categories has been consistent with what we've identified

Table 4. Summary of statistics.

Variable	Observations	Mean	Std. Dev.	Min	Max
C_id	2,070	35	19.9213	1	69
Year	2,070	2004.5	8.657533	1990	2019
MVA	1,997	12.37191	7.383631	0.2326077	51.0151
MVA_lag1	2,070	1034.5	597.7018	0	2069
AV	2,046	24.32184	12.83552	2.860718	79.04237
CA	1,980	20.9994	18.96557	0	137.9121
ME	1,860	29.52349	28.40021	0	97.27158
FC	1,991	13.74097	5.819058	0.9112346	43.47921
TO	2,042	66.96436	37.8552	-50.9374	347.9965
ID	2,056	52.10927	655.4498	-29.17246	26765.86
GP	2,063	1321.865	970.4978	101.59	4828.626
GE	1,658	-0.7097726	0.7563865	-2.279422	10.56658

Source: Author's computation using Stata software version 14.

here. The same pattern has been detected in estimates of regulatory quality, stability political and the nonappearance of violence. Therefore, these political factors have a direct impact on manufacturing progress; when these indicators raise MVA share, the latter performance also increases; when the former indicator declines, the latter performance decreases. The global manufacturing sector development lessons confirm the existence of positive correlations between these variables.

Low and lower middle income nations MVA determinant factors

As demonstrated in the descriptive analyses subsection of this article, the shapes of fabrication output have stagnated in many nations, particularly in low-income groups. Thus, the study used dynamic panel data to analyze key determining factors that affect product development. To identify the major determinant factors for MVA share to the percent of GDP, the study estimated using the GMM to analyze the panel model for 69 low and lower-middle-income nations from 1990 to 2019, according to World Bank income-based classifications (World Bank, 2020). The countries were preferred based on income levels and data availability appropriate to the study's objectives. This study aims to estimate the relationship between multiple political and economic variables regressors and MVA using the one-step system GMM empirical model.

Empirical estimations and discussion

To analyze the properties of the data for the empirical regression, there is a summary of statistics for the dependent and regressor variables. As shown in Table 4, the statistical summary includes the number of observations, standard deviation, mean, maximum and minimum values. Before moving on to empirical findings and debates, the study provides some key descriptive statistics for the model variables. The variable observations range, with the lowest observation being governance effectiveness estimate (GE) at 1,658 and the largest being the first lag of MVA percent of GDP (MVA_lag1) at 2,070. The other variables fall somewhere in the middle. The mean values in the majority of the variables are greater than the standard deviations. This implies that each country's performance has not been broadly scattered around the mean. As seen in Table 4, the average of each variable varies, with varying minimum and maximum values. The standard deviations of variables such as the first lag of MVA percent of GDP (MVA_lag1), inflation GDP deflator annual percent (ID) and GDP per capita constant 2010 US$ (GP) are very large, indicating the heterogeneity of our panel data, possibly due to differences in country performance. While the standard deviations for government general final consumption spending as a % of GDP (FC), MVA percentage of GDP (MVA) and agriculture value-added percentage of GDP (AV) are 5.8, 7.4 and 12.8, respectively. This suggests that the data for these variables have relatively low deviations.

Correlational matrix

Table 5 shows the correlational matrix results. The link between variables is explained by correlation (r). As shown in the outcomes report, the correlation coefficient between regressors and reliant MVA (percentage of GDP) variables were validated. The table shows the degree and direction of the correlation between the variables. Some of the indicators tend to adhere to a

Table 5. Correlational matrix of the variables star (0.05) sig.

Variable	MVA	MVA_lag1	AV	CA	ME	FC	TO	ID	GP	GE
MVA	1									
MVA_lag1	-0.0619*(0.0056)	1								
AV	-0.2276* (0.0000)	0.0015(0.9458)	1							
CA	0.0758* (0.0009)	0.1174* (0.0000)	-0.4319* (0.0000)	1						
ME	0.2983* (0.0000)	0.0458(0.0484)	-0.2176* (0.0000)	0.3949* (0.0000)	1					
FC	-0.0305 (0.1810)	0.0600* (0.0074)	-0.2727* (0.0000)	0.1097* (0.0000)	-0.1324* (0.0000)	1				
TO	0.0174 (0. 4405)	0.0831* (0.0002)	-0.2329* (0.0000)	0.2675*(0.0000)	0.0500* (0.0322)	0.1822* (0.0000)	1			
ID	-0.0209 (0.3512)	0.0218 (0.3221)	0.0661* (0.0028)	-0.0561* (0.0125)	-0.0348 (0.1353)	0.0147 (0.5110)	-0.0230 (0.3000)	1		
GP	0.2207*(0.000)	-0.0209 (0.3420)	-0.6289* (0.0000)	0.4825* (0.0000)	0.1870* (0.0000)	0.1889* (0.0000)	0.3091* (0.0000)	-0.0296 (0.1801)	1	
GE	0.0266 (0.2885)	-0.0160 (0.0000)	-0.1782* 0.0000)	0.2712*(0.0000)	0.1549* (0.0087)	0.0656* (0.0087)	0.0357(0.1490)	-0.0700* (0.0045)	0.2209* (0.0000)	1

Source: Author's computation using Stata software version 14.

priori assumptions, while others do not. As shown in Table 5, independent variables such as CA, ME, TO, GP and GE have a weak positive correlation with MVA. On the other hand, MVA_ lag1, AV, FC and ID variables are inversely associated with MVA share and have a weak correlation to MVA. This means that neither positive nor negative association situations have a substantial problem with multicollinearity, as the pairwise association coefficient for any of the variables was determined to be more than 0.80 (Gujarati, 2003). The Stata output also displays the P-value test, which determines whether the correlation is statistically significant or not. Some variables, such as the first period lag of MVA, AV, CA, ME and GP, have a very low less than 5% level of significance. This suggests that these variables are significant. This implies that these measures forecast the likelihood that these variables have a non-zero relationship.

Regression results and interpretations

As a result, Tables 6 and 7 present the outcomes of the models estimated respectively. As previously stated, the study used both political and economic aspects to determine the causes of the MVA share of GDP. According to the findings, one political factor has a positive association with the dependent variable. It does not, however, have a significant correlation with the dependent variable. While among economic determinants, manufacturing exports and GDP per capita (constant 2010 US dollars) have had a significant impact on MVA with a 5% significant level in the short run, on average cetris paribus. In terms of the association direction, manufacturing exports and GDP per capita have a positive relationship with the dependent variable. While, at a 5% level of significance, the coefficient of local credit to the private has an adverse impact on MVA. The coefficients of these variables confirm that, on average cetris paribus, a percentage change rise in credit to the private sector as a percent of GDP is related to a 0.281% decrease in the manufacturing sector in the short run at the specified level of significance. In the case of short-term credit, less reap is expected to benefit the manufacturing sector. This research identifies is in accord with the findings of a study conducted on Egyptian firms that found that limited credit access to the export market reduces export participation (Kiendrebeogo and Minea, 2013). While disagree with studies examining the effect of credit availability on MVA in Kenya, Africa, South Asia and Nigeria using panel data found that it had a considerable positive influence on it (Maroof et al., 2018; Saidat and Wasiu, 2019). In the case of manufacturing exports, a percentage increase in this variable is related to a 0.207% increase in MVA at a 5% significant level, assuming all other variables remain constant. This finding has theoretical and empirical foundations, implies that increased export encourages more production and is also consistent with a study conducted in China (Sahoo and Bhunia, 2014). Similarly, a dollar rise in GDP per capita increases the MVA share of GDP by 0.0025% in the short run at a 5% significant level, on average cetris paribus. This indicates that increased income leads to increased capital accumulation, investments, innovation and improved industrial development. This finding agrees with the study of economic variables such as per capita income having a

Table 6. MVA estimation using one-step system GMM in the short-run.

Variable (code)	Blundell-Bond (one-step)	Variables (code)	Blundell-Bond (one-step)
MVA _lag1	0.00285 (0.61)	FC	-0.202 (-0.56)
AV	-0.0817 (-0.75)	GE	0.781 (0.21)
CA	-0.281* (-2.06)	TO	0.0103 (0.41)
ME	0.207* (2.34)	ID	-0.01981 (-1.25)
GP	0.00254* (2.25)	Constant term	10.35 (1.190)
Number of countries (group) /Instrument	60/56	Year dummies	Yes
Observations (N)	1281	AR (2)	0.481
F- statistics	**22.68 (prob)= 0.000**	**Hansen test**	**0.547**

t statistics in parentheses * p<0.05, ** p<0.01, *** p<0.001. The values for the Hansen test, Arellano-Bond test for second-order serial correlation AR (2) and test for first-order serial correlation AR (1) are probability values.
Source: Author computation with Stata 14 statistical package.

Table 7. MVA estimation using one-step system GMM in the long-run.

Independent variable (code)	Blundell-Bond (one-step)
CA	-0.2816419* (-2.06)
ME	0.2071232* (2.34)
GP	**0.0025447* (2.25)**

Notes: t-statistics in parentheses * p<0.05, ** p<0.01, *** p<0.001
Source: Author computation with Stata 14 statistical package.

meaningful impact on the fabrication progress of South Asia (Jongwanich and Magtibay-Ramos, 2009; Ejaz et al., 2016);while disagreeing with an empirical study conducted in Niagara that found that income per capita did not affect sector development (Saidat and Wasiu, 2019). The Arellano-Bond tests for the AR (2) second-order autocorrelation yielded a probability of 0.481. It indicates whether or not it shows serial correlation. Because the outcome is significantly greater than the range of the significant level, this model is not affected by serial correlation. The number of instruments used in the GMM system is 56, which is slightly less than the number of countries (group) 60, while the Hansen test is used to determine the validity of the instrumental variables and the result is 0.547, which is slightly higher than the validity standards suggested by Roodman, 2009 as a rule of thumb. Nonetheless, the test result is within an acceptable range. The model's joint significance is confirmed by F- statistics (Table 6). Only the significant variables have been estimated and presented in Table 7 for the long-run association of the dependent and independent variables. Credit to the private sector, as seen, has a negative association with the dependent variable. At the 5% significant level, a percentage rise in this independent variable is associated with a negative 0.28% increase in MVA in the long term, ceteris paribus. It has a similar effect in the short run. In the case of the long-run, this empirical finding disagrees with examining the effect of credit availability on MVA in Kenya, Africa, South Asia and Nigeria using panel data found that it had a significant positive influence on it (Samouel and Aram, 2013; Saidat and Wasiu, 2019). Whereas, in the long run, at the 5% significant level, a percentage rise in manufacturing exports is associated with a 0.207% increase in MVA. It has the same impact as the short run. It also agreed with the outcomes of a study performed in China to recognize the factors influencing manufacturing development (Sahoo and Bhunia, 2014). Similarly, given other factors constant, a dollar rise in GDP per capita is associated with a 0.0025% increase in the dependent variable in the long run at the 5% significant level and has the same effect in the short run. This is also consistent with South Asian empirical findings (Ejaz et al., 2016). The empirical findings were compared to the study hypotheses. The independent variables CA, ME and GP have a significant impact on MVA, implying that these variables are skewed in favor of the hypotheses, while the study hypothesis was rejected by remined variables.

CONCLUSION AND POLICY IMPLICATIONS

The goal of this article was to look into the underlying causes of poor performance as well as the factors that influence MVA share. Then, draw conclusions and make policy suggestions for sector advancement. Finally, we can draw the following conclusions based on the study findings. Overall trend assessments of manufacturing

development revealed that as income levels rise, the likelihood of having a significant percentage of MVA rises as well. This implies that increased income and increased manufacturing growth are positively related. The level of economic complexity and manufacturing progress are directly related to a country's current and future economic growth. Low-income countries' average value-added share has been declining in terms of MVA share by income level; while lower middle income has been rising. The multi-country study to determine the causes and determinants of MVA using dynamic panel data revealed that the shapes of fabrication output have stagnated in many countries, particularly in low-income groups. In both the low and lower-middle income categories, MVA as a share of GDP has remained nearly constant over time. In these countries, FDI influxes as a percentage of GDP remain stable, with a modestly increasing trend. As a result of the analyses, it is reasonable to conclude that poor FDI performance has been one of the primary reasons for low MVA. Government effectiveness is viewed as a proxy measure for industrial policy management capabilities. When compared to other competitors like low income nations, lower-middle-income groups have a higher average performance. The results of the one-step system GMM regression confirm that only economic determinants, such as manufacturing exports and GDP per capita, have a significant direct impact on MVA, whereas the coefficient of credit to the private sector has an inverse impact in both the long and short run. These empirical findings are largely supported by the theoretical and empirical research discussed this study. Policy implications, as a result, policy interventions are required to increase income and fabrication exports, thereby increasing MVA and credit access for firms in low and lower-middle-income countries should take these findings into account.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

REFERENCES

African Center for Economic Transformation (ACET) (2014). Growth with Depth 2014 African Transformation Report, Accra, Afrobarometer, 2013 and other years. Available at: http://www.afrobarometre.org/

Akamatsu K (1962). The Historical Pattern of Economic Growth in Developing Countries. The Developing Economies 1:3-25.

Altenburg T, Melia E (2014). Kick-starting Industrial Transformation in Sub-Saharan Africa. In Transforming Economies: Making Industrial Policy Work for Growth, Jobs and Development, Salazar-Xirinachs JM, Nübler I and Kozul-Wright R, eds. International Labour Organization. Geneva, pp.355-378.

Altenburg T (2011). Industrial policy in developing countries overview and lessons from seven country cases. German Development Institute, discussion paper 4/ 11 Bonn. Available at: searchgate.net/publication/277853351_Industrial_Policy_in_Developing_Countries_Overview_and_lessons_from_seven_country_cases

Amsden AH (2001). The Rise of the Rest: Challenges to the West from Late-Industrializing Economies. Oxford University Press, Oxford.

Andreoni A (2013). "Manufacturing Development Structural Change and Production Capabilities Dynamics" University of Cambridge, Clare Hall. Available at: https://core.ac.uk/download/pdf/42548033.pdf

Arellano M, Bond S (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. The Review of Economic Studies 58(2):277-297.

Babatunde MA (2009). Can trade liberalization stimulate export performance in Sub-Saharan Africa. Journal of International and Global Economic Studies 2(1):68-92.

Bagchi AK (2012). The Origins of Contextual Political Economy, working paper presented at the CAMHIST, Clare Hall, Cambridge.

Baltagi B, Demetriades P, Law SH (2009). Financial Development and Openness: Evidence from Panel Data. Journal of Development Economics 89(2):285-296.

Chamberlain D, Smith A (2006). Recent Findings on Tax-Related Regulatory Burden on SMMEs in South Africa. Working Paper 06/105, Development Policy Research Unit, University of Cape Town. Available at: http://www.thepresidency.gov.za/docs/pcsa/economic/smith1.pdf

Chang HJ (2004). Institutional Foundations for Effective Design and Implementation of Trade and Industrial Policies in the Least Developed Countries, In: Soludo C., Osita, O. and Chang, H.J. (2004) eds., The politics of trade and industrial policy in Africa: forced consensus? Trenton, N.J. Africa World Press.

Chang HJ (2009). Industrial Policy: Can We Go Beyond an Unproductive Debate? ABCDE, Annual World Bank Conference, Seoul, June.

Chang HJ, Lin J (2009). "Should Industrial Policy in Developing Countries Conform to Comparative Advantage or Defy It?" Development Policy Review 27(5).

Chen G, Geiger M, Fu M (2015). Manufacturing FDI in Sub-Saharan Africa. Washington DC: World Bank.

Cimoli M, Dosi G, Stiglitz J (2009). eds., Industrial Policy and Development. The Political Economy of Capabilities Accumulation, Oxford: Oxford University Press.

Country complexity rankings (2018). ATLAS of center for International Development ECI Growth Lab, at the University of Harvard, https://atlas.cid.harvard.edu/rankings/product, last accessed 11/21/20.

Econstats.com (2021). World Development Indicators, Data. Available at: http://www.econstats.com/wdi/wdiv1151.htm China from 1965-2004.

Ejaz MZ, Ullah A, Khan MU (2016). Determinants of Industrial Growth in South Asia: Evidence from Panel Data Analysis. Available at: https://www.pide.org.pk/psde/pdf/AGM33/papers/M%20Aman%20Ullah.pdf,11/4/20

Ellis DM, McMillan M, Rodrik D (2021). Africa's Manufacturing Puzzle: Evidence from, Tanzanian and Ethiopian Firms". Available at: https://drodrik.scholar.harvard.edu/files/dani rodrik/files/africasmanufacturingpuzzle.pdf

Guadagno F (2012). The Determinants of Industrialization in Developing Countries, 1960-2005, mimeo, UNU-MERIT and Maastricht University P 26.

Gujarati DN (2003). (Basic) Econometrics, International Edition (Fourth Edition), Boston: McGraw.

Hausmann R, Hidalgo CA (2011). The Network Structure of the Economic Output. Journal of Economic Growth 16(4):309-342.

Herrendorf B, Rogerson R, Valentinyi A (2014). Growth and Structural Transformation. In P. Aghion and S.N. Durlauf (eds.), Handbook of Economic Growth, Amsterdam: Elsevier 2(6):855-941.

Heterodox Economists (2012). Ten Theses on New Developmentalism, Brazilian Journal of Political Economy 32(2):336-339.

Hidalgo CA, Hausmann R (2009). "The Building Blocks of Economic Complexity". Proceedings of the National Academy of Sciences of the United States of America, 106(26):10570-10575.

Huang Y, Li R, Wang B (2014). "The Last Battles of China's Financial Reform, Deepening Reform for China's Long-Term Growth and Development", Australian National University, ANU Press pp. 231-250.

Jaumotte F (2004). Foreign Direct Investment and Regional Trade Agreements: The Market Size Effect Revisited, IMF Working Paper, WP/04/206.

Jongwanich J, Magtibay-Ramos N (2009). “Exports Determinants of Structural Changes of Food Exports from Developing Countries, ADB Economics Working Paper Series, Asian Development Bank.
Josephine OI, Chidozie AU, Charles OA (2017). Determinants of Manufacturing Sector Growth in Nigeria, https://www.academia.edu/37887771/paper_determinants_of_manufacturing_sector_growth_in_nigeria
Katz JS (2006). Indicators for Complex Innovation Systems. Research Policy 35:893-909.
Khadaroo AJ, Seetanah B (2007). Foreign Direct Investment and Growth: New Evidence from Sub-Saharan African Countries. The University of Mauritius.
Kiendrebeogo Y, Minea A (2013). Financial Factors and Manufacturing Exports: Theory and Firm-level Evidence From Egypt. ffhalshs-00710718v2f. Available at: https://halshs.archives-ouvertes.fr/halshs-00710718v2/document
Kraay A, Zoido-Lobaton P, Kaufmann D (1999). Aggregating Governance Indicators. The World Bank, Washington.
Krugman P, Obstfeld M, Melitz M (2012). International Economics Theory and Policy, Ninth Edition, Harvard University, Pearson.
Krugman P, Wells R, (2006). Macroeconomic, Princeton University, Worth publishers, 41 Madison Avenue New York, NY 10010.
Krugman P (1991). Geography and Trade Cambridge, MA: MIT Press.
Lederman D, Mengistae T, Xu LC (2010). Microeconomic Consequences and Macroeconomic Causes of Foreign Direct Investment in Southern African Economies. Washington, DC: World Bank.
Lin JY (2012). New Structural Economics A Framework for Rethinking Development and Policy, The World Bank, Washington DC.
Lin JY (2018). Industrialization: Lessons from China for North Africa. Africa Economic Brief, Volume 9, Issue 2, Vice Presidency for Economic Governance and Knowledge Management.
Lin JY (2011). From Flying Geese to Leading Dragons: New Opportunities and Strategies for Structural Transformation in Developing Countries. WIDER Annual Lecture 15, Helsinki: UNU-WIDER. (A shorter version of this paper is forthcoming in Global Policy).
Lin JY, Monga C (2010). The Growth Report and New Structural Economics. Policy Research Working Papers Series 5336, World Bank, Washington, D.C. (Reprinted in chapter II of this volume).
Maroof Z, Hussain S, Jawad M, Naz M (2018). Determinants of Industrial Development: a Panel Analysis of South Asian Economies”, Springer Nature B.V. Available at: https://www.researchgate.net/publication/328515215
Martins P (2018). Structural Change: Pace, Patterns and Determinants, 2018 John Wiley and Sons Limited. Available at: http://www.wileyonlinelibrary.com/journal/rode last
Mazanai M, Fatoki O (2012). “Access to Finance in the SME Sector: A South African Perspective”, Asian Journal of Business Management 4(1):58-67.
McMillan M, Rodrik D, Verduzco-Gallo Í (2014). “Globalization, Structural Change and Productivity Growth”, with an Update on Africa, in World Development 63:11-32. Available at: https://tinyurl.com/ycuty2q2
McMillan M, Rodrik D, Sepulveda C (2017). Structural Change, Fundamentals and Growth: A Framework and Country Studies. Washington D.C: International Food Policy Research Institute.
Morisset J (2000). Foreign Direct Investment in Africa: Policies also Matter, Policy References 43 Research Working Paper Series 2481, The World Bank.
Neuss L (2019). “The Drivers of Structural Change. Journal of Economic Surveys 33(1):309-349.
Ng F, Yeats AJ (1998). Good Governance and Trade Policy: Are They the Keys to Africa’s Global Integration and Growth? The World Bank, Washington.
Nickell S (1981). Biases in Dynamic Models with Fixed Effects. Econometrica 49:1417-1426.
Nzomoi JN, Were M, Rutto N (2012). Assessing the Impact of Private Sector Credit on Economic Performance: Evidence From Sectoral Panel Data for Kenya. International Journal of Economics and Finance 4(3):182-190.
Paolera G, Amorocho X, Musacchio A (2018). The Industrialization of South America Revisited: Evidence from Argentina, Brazil, Chile and Colombia, 1890-2010”, Working Paper 24345, National Bureau of Economic Research. Available at: https://www.nber.org/system/files/working_papers/w24345/w24345.pdf
Peet R (2007). The Unholy Trinity, the IMF, World Bank and World Trade Organization, Second Edition, Zed Books, London-New York.
Pisano G, Shih W (2009). Restoring American Competitiveness, Journal Harvard business review, Volume 87. Available at: https://www.researchgate.net/publication/295137889_Restoring_American_Competitiveness/citation/download
Robertson D, Sarafidis V (2015). IV estimation of panel with factor residuals. Journal of Econometrics 185(2):526-541.
Rocha IL (2018). “Manufacturing as a Driver of Economic Growth”, PSL Quarterly Review 71(285):103-138.
Rodrik D (2004). Industrial Policy for the Twenty-First Century. Paper prepared for UNIDO. John F. Kennedy School of Government, Boston, MA.
Rodrik D (2011). The Future of Economic Convergence, NBER Working Paper Series, No. 17400.
Rodrik D (2008). “The Real Exchange Rate and Economic Growth, Brookings Papers on Economic Activity, Economic Studies Program. The Brookings Institution 39(2 (Fall)):365-439.
Rodrik D (2007). Normalizing Industrial Policy. A Paper prepared for the Commission on Growth and Development, World Bank, Washington, DC.
Rodrik D (2017). Growth Without Industrialization? Project Syndicate. Available at: https://www.projectsyndicate.org/commentary/poor-economies-growing-without-industrializing-bydani-rodrik-2017-10?barrier=accesspaylog
Roodom D (2009). How to do xtabond2: An introduction to difference and system GMM. the Stata Journal , pp. 86-136.
Rosenstein-Rodan P (1984). Natura Facit Saltum: Analysis of the Disequilibrium Growth Process/ Meier G.M.
Sahoo P, Bhunia A (2014). China's Manufacturing Success: Lessons for India. IEG Working Paper No. 344 pages 1-43.
Saidat OA, Wasiu OI (2019). Determinants of Structural Changes in Manufacturing Sector in Nigeria Published by Dimitrie Cantemir Christian University/Universitaria Publishing House.
Samouel B, Aram B (2016). The Determining Factors of Industrialization in Africa. European Scientific Journal April 2016 /SPECIAL/ edition ISSN: 1857 – 7881 (Print) e - ISSN 1857- 7431.
Scazzieri R (2014). Increasing returns: towards a structural theory, Structural Change and Economic Dynamics. Available at: https://siecon3-607788.c.cdn77.org/sites/siecon.org/files/media_wysiwyg/scazzieri.pdf
Schmitz H, Nadvi K (1999). Clustering and Industrialization: Introduction. World Development 27(9):1503-1514.
Shombe NH (2005). Causality Relationship Between Total Exports with Agricultural and Manufacturing GDP in Tanzania. Institute of Development Economics, Discussion Paper No.13.
Signé L (2018). The Potential of Manufacturing and Industrialization in Africa Trends, Opportunities and Strategies. Available at: https://www.brookings.edu/wp-content/uploads/2018/09/Manufacturing-and-Industrialization-in-Africa-Signe-20180921.pdf
Stiglitz J (2017). Structural Transformation, Deep downturns and Government policy, the number working paper series. National Bureau of Economic Research pp. 1-15.
Stiglitz J, Yusuf S (2001). Rethinking the East Asia Miracle, Washington, D.C.: World Bank; New York: Oxford University Press.
Szirmai A (2012). “Industrialization as an Engine of Growth in Developing Countries, 1950-2005. Structural Change and Economic Dynamics 23(4):406-420.
Udegbunam RI (2002). Openness, Stock Market Development and Industrial Growth in Nigeria”. The Pakistan Development Review 41(1):69-92.
United Nations Commission on Trade and Development (UNCTA) (2015). “Strengthening Linkages Between Domestic and Foreign Direct Investment in Africa”, Note by the UNCTAD Secretariat, 17 April. (Geneva).

United Nations Industrial Development Organization (UNIDO) (2005). Capability building for catching up, Industrial Development Report, Vienna.
United Nations Industrial Development Organization (UNIDO) (2015). Enhancing the Quality of Industrial Policies, Conceptual Framework Motivation and Background for the EQuIP Toolbox. Available at: http://capacitydevelopment.unido.org/wp-content/uploads/2015/10/crash_course.pdf
United Nations Industrial Development Organization (UNIDO) (2017). Understanding African Experiences in Formulating and Implementing Plans for Emergence Growing Manufacturing Industry in the Case Study Ethiopia. Available at: https://www.undp.org/content/dam/ethiopia/docs/
United Nations Industrial Development Organization (UNIDO) (2018). Demand for Manufacturing: Driving Inclusive and Sustainable Industrial Development Report 2018, UNIDO ID/448. Available at: https://www.unido.org/sites/default/files/files/2017
United Nations Industrial Development Organization (UNIDO) (2020a). Statistics Data. https://www.unido.org/researchers/statistical-databases
United Nations Industrial Development Organization (UNIDO) (2020b). Statistics Data Portal https://stat.unido.org/database/CIP%202020?_ga=2.52705579.2019437668.1601910291-1758033608.1566701415 (Accessed 11/14/20).
Varkey RS, Panda PK (2018). Inter-Sectoral Growth Linkages and Their Implications for Agriculture: Evidence from the Indiana States. Millennial Asia 9(3):262-277.
Victoria KS (2019). Determinants of Manufacturing Sector Performance and Its Contribution To Gross Domestic Product In Nigeria, *Munich Personal RePEc Archive*. Available at: https://mpra.ub.uni-muenchen.de/93293/
Weiss J (2011). The Economics of Industrial Development. New York: Routledge.
World Bank (2018a). World Development Report. Available at: https://databank.worldbank.org/reports.aspx?source=2andseries=NY.GDP.MKTP.KD.ZGandcountry=#
World Bank (2018b). Poverty and Shared Prosperity; Piecing Together Poverty Puzzle, 1818 H Street NW, Washington DC 20433.
World Bank (2020a). World Development Indicators. Available at: https://databank.worldbank.org/reports.aspx?source=2andseries=NY.GDP.MKTP.KD.ZGandcountry=
World Bank (2021a). Helping to Fight Poverty and Improve Living Standards in Ethiopia. Goals include promoting rapid economic growth and improving service deliver. Available at https://www.worldbank.org/en/country/ethiopia/overview
World Bank (2020b). World Development Indicators. Available at: http://data.worldbank.org/country/Ethiopia
World Bank (2021b). Global Governance Indicators. Available at: https://databank.worldbank.org/reports.aspx?source=2andseries=NY.GDP.MKTP.KD.ZGandcountry=#
Xu Z, Yeh A (2013). Origin Effects, Spatial Dynamics and Redistribution of FDI In Guangdong, China. Tijdschrift voor economische en sociale geografie 104(4):439-455.
Yang Y (2014). The Chinese Growth Miracle China" Center for Economic Research, National School of Development, Peking University, pp. 961-921.
Zhang X, Moorman L, Ayele G (2011). “Infrastructure and Cluster Development: A Case Study of Handloom Weavers in Rural Ethiopia”, Journal of Development Studies Publication. Ethiopian Development Institute, Addis Ababa, Ethiopia. Available at: http://www.tandfonline.com/loi/

Vol. 14(3), pp. 46-61, July-September 2022
DOI: 10.5897/JEIF2022.1175
Article Number: 93B51C069533
ISSN 2006-9812

http://www.academicjournals.org/JEIF

ACADEMIC JOURNALS
expand your knowledge

Journal of Economics and International Finance

Full Length Research Paper

The impact of import substitution policy on trade and exchange rate: An empirical analysis from Ghana

Joseph Agyapong[1]* and Suleman Ibrahim Anyars[2]

[1]Faculty of Economics, FernUniversität in Hagen, Germany.
[2]Department of Economics, Kwame Nkrumah University of Science and Technology, Ghana.

Received 1 June, 2022; Accepted 1 August, 2022

This research examines the impact of import substitution policy on the trade balance and exchange rate in Ghana by employing the macroeconomic variables – inflation rate and interest rate. For a robustness check, the policy is analyzed using the augmented trade balance and magnitude of import substitution approaches. The study utilizes quarterly data from 1990Q1 to 2021Q1 and applies the Johansen cointegration test and vector error correction model to estimate the dynamics of the policy impact. The results show that the import substitution policy boosts the capacity of domestic production and improves the trade balance. Also, the study reveals that both the augmented trade balance and magnitude of import substitution and international reserves have a symmetric negative impact on the exchange rate at a statistically significant level of 1%, ceteris paribus. This implies that the implementation of the import substitution policy would ensure the appreciation or stabilization of the domestic currency value in Ghana without depleting the international reserves in the long-run.

Key words: Exchange rate; trade balance; international reserves; inflation rate; interest rate; augmented trade balance; magnitude of import substitution.

INTRODUCTION

Historically, between 1992 and 2017, Ghana suffered from a trade deficit. The trade balance in Ghana started improving in 2007 when Tullow Oil and Kosmos Energy discovered oil in commercial quantities in the Western region. As of 2017, Ghana has been observing a trade surplus (See Figure A1 in the Appendix for illustration). However, the problem still holds that the exportation has merely been primary commodities while the importation level has been increasing endangering the survival of infant domestic industries (Banson et al., 2015). This has been a major factor in the Ghana Cedis' depreciation since the importers demand more of the United States dollar (USD) for trading (Bhattarai and Armah, 2013). Hence, the government has to intervene with policies to support the industries. Government intervention ensures measures are adequately enforced to promote the growth and development of localized industries (Steel, 1972; Todaro, 1994; Adelman and Yeldan, 2000; Jackson and Jabbie, 2021).

In a response to difficulties in exchange rates, trade imbalances and economic growth, many developing countries adopted a policy that intends to substitute

*Corresponding author. E-mail: josephayapong06@gmail.com.

imported goods with domestically produced goods (Steel, 1972). This policy is termed an import substitution policy. However, it failed after it was regarded by the political leaders as a political weapon and not a coherent economic policy that seeks the development of the industrial sector (Mendes et al., 2014). Earlier researchers have employed tariffs, quotas, embargoes, and import licensing as instruments for import substitution strategies (Yilmazkuday, 2003). These instruments are more for protectionist policies, prone to retaliation from other countries and negatively affect welfare (United States International Trade Commission, 2011). There is still a debate about whether the adoption of an import substitution policy is best for developing countries (Jackson and Jabbie, 2021). However, the least has been said about how import substitution policy through the instruments of macroeconomic variables – inflation and interest rates could be used to stabilize the exchange rate in Sub-Saharan Africa by boosting local industrial production. The authors, therefore, seek to fill the research gap in the macroeconomic concept of the import substitution strategy.

The first objective of this study is to examine the impact of the import substitution policy on the exchange rate and trade balance in Ghana. The second goal is that the authors attempt to propose a policy direction by recommending the appropriate import substitution instrument to ameliorate the devastating impact of imports on the Ghanaian economy.

That is, the research contributes to investigating how the government could intervene in domestic production through the use of macroeconomic variables – inflation and interest rate as policy instruments. The authors employ inflation rate and interest rate due to their significant impacts on production in most African economies including Ghana. Theories suggest a negative relationship between production and inflation level and interest rate (Adebiyi and Babatope-Obasa, 2004). Therefore, the study seeks to ascertain if the government could use them as policy tools to boost producers' capacity in Ghana.

Ghana is chosen as the domestic country for this research because the country practices an inflation-targeting flexible exchange rate regime. Trend analysis shows that Ghana's exchange rates are explosively higher which implies that the Ghana Cedis have been depreciating (See Figure A1 in the Appendix for illustration). This makes it more suitable to examine the policy implication of import substitution. The study employs the Vector Error Correction (VEC) models as the estimation strategies since they are relevant in analyzing the dynamics among the variables. The study performs a robustness check of the import substitution strategy in two approaches. In the first approach, the impact of the import substitution strategy was analyzed using the trade balance (augmented trade balance) and the second approach applies the magnitude of the import substitution.

The research questions include: How does the import substitution policy impact the exchange rate, trade balance and international reserves in Ghana? What are the dynamics of impact on the import substitution, exchange rate and international reserves? Are interest rates and inflation levels significant instruments in achieving the import substitution policy in Ghana? Our empirical findings suggest that the augmented trade balance and magnitude of import substitution and international reserves have a symmetric negative impact on the exchange rate, ceteris paribus. This implies that the implementation of the import substitution policy would cause the domestic currency in Ghana to appreciate.

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

Exchange rate, trade balance and international reserves

Understanding the link between exchange rate, trade balance and international reserves enhances policy makers in devising international finance and trade policies (Hacker and Hatemi, 2003; Yol and Baharumshah, 2005). The trade balance as represented in Equation (1) stipulates the difference between the monetary value of total export and import. Trade balance responds to the exchange rate shock via either the price or quantity (Hacker and Hatemi, 2003; Krugman and Obstfeld, 2009).

$$tb_t = ex_t - im_t \quad (1)$$

where in log form tb_t is the trade balance, ex_t and im_t total export and import respectively.

The price and quantity components of the trade balance react differently over time when the exchange rate changes.

Whereas the price of tradable goods responds quickly to exchange rate shock at a higher magnitude in the short-run, the quantity of good dominates in the long-run and causes a reversal of the trade balance. For instance, other things being equal, when a country's exchange rate increases (depreciation of the local currency) the price of domestic export becomes cheaper for foreigners on the international market and vice versa. On the contrary, the increase in the exchange rate causes the price of importation to be expensive for the domestic country and vice versa. Hence, the price effect in reaction to exchange rate increment in the short-run leads to a positive trade balance.

In the long-run, the reduction in the importation such as intermediate goods adversely affects domestic production which makes the quantity of domestic export to fall.

Hence, the long-run adjustment of the quantity impact causes a reversal in the trade balance. The exchange rate and trade balance link get complex when the J-curve effect is considered. The J-curve points out that price elasticities for import and export demand expectedly adjust over time. It is assumed that import and export demand elasticity initially falls and gets higher over time when the exchange rate rises. This leads to a negative trade balance in the initial stage and with time turns to a positive trade balance (Hacker and Hatemi, 2004; Feenstra and Robert, 2014).

One strategy in international trading according to Prebisch (1962) is that when a country lacks the required USD to pay for its pertinent imports, it imports goods that are payable in the currencies received in the export payments.

However, in the case when the export payment is insufficient to offset important imports the central bank uses the international reserves as a provision. Hence, a positive trade balance that results from a reduction in total imports leads to an increase in international reserves.

Existing studies have demonstrated that the excessive imports carried out in developing countries, particularly in Africa pose a threat to the fluctuations in the exchange rate of many countries. For instance, Sekkat and Varoudakis (2000) found significant responsiveness of Sub-Saharan Africa (SSA)-manufactured exports to real exchange rate-induced incentives. Again, they reveal that exchange rate mismanagement in SSA has reduced exporters' incentives to increasingly penetrate the foreign markets. Meniago and Eita (2017) have contributed that there is a positive relationship between imports and exchange rate changes in SSA. However, the degree of responsiveness seems to be extremely low. Exchange rate volatility is also proven to have a significant impact on trade in SSA (Baum and Caglayan, 2006; Senadza and Diaba, 2017).

Igue and Ogunleye (2014) engaged the vector error correction methodology to examine the long-run relationship that exists between trade balance and real exchange rate, Gross Domestic Product (GDP) and world income in Nigeria. The finding lends support to the Marshall-Lerner Condition implying that depreciation of the exchange rate has a positive effect on the trade balance in the long-run. However, Oluyemi and Isaac (2017) revealed contrary results. They found that the exchange rate is not affected by the activities of imports and exports in Nigeria.

In Ghana, Bhattarai and Armah (2013) applied the cointegration analysis to find a stable long-run relationship between imports, exports and the real exchange rate. The elasticity of imports and exports in the short-run turn causes the devaluation of the Ghana Cedi. Okyere and Jilu (2020) used a similar approach to examine the impact of export and import on the economic growth of Ghana using data from 1998 to 2018. The study found that there is no significant relationship between imports in international trade and Ghana's GDP growth. However, exports have a significant causal relationship with Ghana's GDP growth. This analysis is supported by Kwame and Omane-Adjepong (2017) who applied the J-Curve to examine the effect of real exchange rate movements on Ghana's external trade performance. They found that there exists inelastic responses of export and import demand to real exchange rate changes. There exhibited a steady long-run relationship between real exchange rate changes and trade balance. Additionally, the study found an asymmetric impact of real exchange rates on the trade balance.

An investigation of the determinants of Ghana's trade balance shows a negative relationship with domestic prices. It further suggests that the depreciation of the Ghana Cedi does not improve the trade balance (Akoto and Sakyi, 2019).

This suggests that the bank of Ghana should manage to reduce inflation which would support local producers to increase production (Antwi et al., 2020; Obuobi et al., 2020). Having discussed how the changes in the exchange rate affect trade balance, it is worth revealing that a change in a country's export and import could also affect its exchange rate.

Import substitution strategy

From the 1950s to the 1970s most development economists incorporated the strategy of substituting imported goods with domestically produced goods which buttresses developing countries to reinforce growth (Edwards, 1993). This is known as the import substitution strategy. According to Bruton (1998), import substitution could support a developing economy that suffers from price distortions, under-utilization capacity, frequent inflation and balance of payment problems to minimize these challenges. Usually, the import substitution strategy is government intervention in domestic production via policy instruments (Yilmazkuday, 2003).

In this research, it was assumed that export is equivalent to domestic production. Export is then formulated as a function of macroeconomic variables – inflation rate and interest rate. That's, we investigate how the interest rate and inflation level could be used as policy tools to boost the capacity of domestic production. These two macroeconomic variables are regarded as determinants of export (Ahmad, 1976; Yilmazkuday, 2003) in a linear regression below:

$$ex_t = \beta_0 + \beta_1 inf_t + \beta_2 lint_t + \mu_t \quad (2)$$

where ex, $lint$ and inf are export, lag interest rate and inflation at time t respectively. All the variables are in the log form except the interest rate. Equation (2) is termed

augmented export and it gives the basis of the import substitution strategy. The implication is that central banks respond to a higher relative price thus inflation by increasing interest rates and vice versa. The higher interest rate in turn leads to a higher cost of capital or borrowing, which adversely affects domestic production and export (Taylor, 1993; Agyapong, 2021). Moreover, Williamson and Williamson (1983) states that higher import prices generate overall inflation which reduces the trade balance. Equation (2) indicates that there is a negative relationship between export and interest rates and inflation. We now extract the augmented trade balance as our first approach to measure the impact of the import substitution policy as in Equation (3):

$$augtb_t = augex_t - im_t \quad (3)$$

where $augtb_t$ is the augmented trade balance, $augex_t$ is augmented export at time t.

Following the proposed methodology by Chenery (1960), we further measure import substitution policy by comparing the import coefficient in the period when there is no policy augmentation on domestic production and the period when the domestic production is augmented with the interest rate and inflation level. The import coefficient is explained to be the relative import to total supply at a period. It could also be said to be the proportion of the total supply that is imported into the domestic market (Chenery, 1960). In developing economies, the relative of imports to total supply is so high that import substitution could serve as an optimal channel to increase domestic production (Ahmad, 1976). To examine the impact of the interest rate and inflation level being used as policy instruments, we subtract the relative import to the augmented total supply from the relative import to the realized total supply (thus, total supply without augmentation). This is represented in Equation (4) below:

$$dimco_t = \frac{im_t^0}{z_t^0} - \frac{im_t^0}{z_t^{aug}} \quad (4)$$

where $dimco_t$ is the difference in import coefficient, im_t^0 is realized total import. z_t^0 and z_t^{aug} are realized total supply and augmented total supply respectively. t denotes time. z_t^0 is $(ex_t + im_t)$ whereas $z_t^{aug}$is $(augex_t + im_t)$. $\frac{im_t^0}{z_t^0}$ and $\frac{im_t^0}{z_t^{aug}}$ represent realized import coefficient and augmented import coefficient respectively. The import substitution is observed in Equation (4) at a given time when $dimco_t$ is positive. That is, the positive increase in $dimco_t$ which explains that import substitution occurs when there is a fall in the relative imports to the augmented total supply emanating from the policy instruments' impact on the export (domestic production).

To a certain extent, the ratio of imports to the augmented total supply falls since the instrumental policies revamp the domestic production capacity to substitute the imported goods to meet the internal demand. This strategy creates a resilient economy that generates increasing welfare (Bruton, 1998). It was further examined that the policy intensity was by measuring the magnitude of import substitution in an absolute term as shown in Equation (5) and this becomes our second approach.

$$mis_t = (dimco_t)z_t^{aug} \quad (5)$$

where mis_t represents the magnitude of import substitution at time t.

The economic impact of the import substitution strategy on developing economies is such that, it enhances domestic production of consumption goods thereby reducing the importation of final goods. The reduction in the level of importation ceteris paribus leads to a trade balance surplus. Moreover, suppose the government controls the importation of intermediate goods used in producing final goods in the local economy. The reduction in the importation of final goods limits pressure on demand for foreign currency such as the USD, and this leads to an appreciation of the value of the domestic currency (a fall in the currency exchange rate).

The import substitution policy has been recommended in several studies. Nurhaliq and Masih (2016) and Babatunde et al. (2019) have discussed import substitution as a strategy the government could adopt in achieving economic growth in developing countries. Adewale (2017) examines the relationship between import substitution industrialization (ISI) and economic growth in the group of BRICS (Brazil, Russia, India, China and South Africa). The study revealed that ISI policy catalyzes the industrialization process in the short-run. Specifically, the cointegration tests show evidence of a long-run relationship between real growth and indicators of import substitution.

With the import substitution and exchange rate movement, Moreira et al. (2017) conducted research on Latin America and the Caribbean and found a significant relationship between domestic currency depreciation and a reduction in import penetration. This suggests that the import substitution strategy is recommended when the local currency keeps depreciating. This study extends the literature and explores policy directions that incorporate macroeconomic variables for import substitution through the research hypotheses below.

Hypothesis 1 (H_1): Interest rate and inflation rate are significant instruments for import substitution strategy

From hypothesis 1, the inflation level and interest rate are estimated to have a negative relationship with domestic

production (export) (Adebiyi and Babatope-Obasa, 2004). Therefore, if the Government intervene or the central bank manage the inflation level and interest rate to an appropriate level it would increase local production to meet the internal demand for goods. This is expected to reduce the level of importation of consumer goods which ensures an improvement in the country's trade balance and drives an import substitution strategy.

Hypothesis 2 (H_2): Import substitution policy has a significant negative impact on the exchange rate

In this Hypothesis 2, an increase in the country's total supply was expected to result from an upsurge in domestic production (export) which is improved by the macroeconomic variables – inflation level and interest rate. This domestic production improvement reduces the level of importation and demand for foreign currencies for international trading. Hence, this hypothesis test that an increase in the augmented trade balance and the magnitude of import substitution lead to a fall in the country's exchange rates.

Hypothesis 3 (H_3): Import substitution boosts the central bank's international reserves

Having explained that advancement of the import substitution leads to a reduction in the level of importation in a country. It implies that the central banks would not be compelled to use the international reserves as a provision to pay for imported goods (Prebisch, 1962). In this vein, the hypothesis test that the import substitution policy amplifies the central bank's international reserves.

Empirical framework

Data description

Quarterly data which span from the period 1990Q1 to 2021Q1 in Ghana were used. This gives a total observation of 125. The variable data used in this study include the exchange rate (Ghana Cedis (GHS) per the United States dollar (USD); exports and imports quoted in USD; international reserves which represent the central bank's International Reserves and Liquidity, Reserves, Official Reserve Assets, Special Drawing Rights (SDRs) and USD. For the availability of data, the 3-months Treasury bill rate is used as Ghana's interest rate. The inflation level is computed from the Consumer Price Index (CPI) as the 4-quarter difference of the CPI thus $\ln(CPI_t) - \ln(CPI_{t-4})$. All the variable data are extracted from the Thomson Reuters DataStream except the international reserves which are sourced from the IMF's International Financial Statistics (IFS).

METHODOLOGY

Vector Error Correction Model (VECM)

The Vector Error Correction Model (VECM) is employed in this study. The VECM is a multivariate dynamic model that entrenches a cointegrating equation. It is important when the variables used to conduct the research are integrated in order 1 (I (1)) thus if the variables are stationary at the first difference and exhibit a linearly independent cointegrating relationship. The cointegration test is such that if the residuals of the linear regression of the system variables are stationary (I (0)) then the variables are cointegrated. The cointegration term of VECM is economically imperative in investigating the long-run relationship between the exchange rate, trade balance, import substitution and international reserves. Since the research uses three system variables, identifying the rank of cointegration for the VECM is important, hence Johansen (1988) and Johansen and Juselius (1992) cointegration and VECM approaches are applied.

Their methodology makes it flexible to determine the cointegration rank for the VECM. The Vector Error Correction Model is represented in Equation (6) below:

$$\Delta Y_t = CD_t + \Pi Y_{t-1} + \Gamma_1 \Delta Y_{t-1} + \cdots + \Gamma_{p-1} \Delta Y_{t-p} + u_t \quad (6)$$

where ΔY_t is the first difference of Y, which in this study include; exchange rate, trade balance, augmented trade balance, the magnitude of import substitution and international reserves. Π is the coefficient matrix of the cointegrating relationships. Γ_i is the coefficient matrix of ΔY_{t-p}. The coefficient matrix has up to $p-1$ which implies that the system variables are shortened by one lag since VECM takes the difference of the variables. C is the coefficient matrix of a vector of deterministic term d_t. $u_t \sim \mathcal{N}(0, \Sigma)$ is an error term that is assumed to be normally distributed with zero mean and a variance-covariance matrix Σ.

ΠY_{t-1} is the first lag of the error correction terms (ECT) which represents long-term relationships among non-stationary level variables and has to be stationary for u_t to be white noise. Π is decomposed into $\alpha\beta'$where α is a matrix that measures the load or speed at which the system variables adjust to the deviations from the long-run equilibrium; whereas, β according to the Johansen normalization restriction contains the cointegration or equilibrium matrix that ensures that the system variables converge with the long-run equilibrium state. In this study, the restriction is on the exchange rate variable. The signs of the coefficients of the independent variables are reversed in interpreting the Johansen normalization restriction.

Johansen proposes two distinct likelihood ratio tests for the reduced rank of the Π matrix, which include the trace test and maximum eigenvalue test. These two tests are represented in the respective Equations (7) and (8) below:

$$J_{trace} = -T \sum_{i=r+1}^{n} \ln(1 - \hat{\lambda}_i) \quad (7)$$

$$J_{max} = -T ln(1 - \hat{\lambda}_{r+1}) \quad (8)$$

where $\hat{\lambda}_i$ denotes the i^{th} largest canonical correlation and T is the sample size. The null hypothesis of the trace test is that there are at most r ($\leq$ r) cointegrating vectors against the alternative hypothesis of n ($\geq$ r + 1) cointegrating vectors.

Simply put, the null hypothesis of no cointegration is rejected if the trace statistic is greater than the critical value. The null hypothesis of the maximum eigenvalue test also states that there are r cointegrating vectors against the alternative hypothesis of r +1 cointegrating vectors. In this research, only the results of the trace test are provided.

Table 1. Summary statistics.

Variable	Obs.	Mean	Std. Dev	Min	Max	ADF Test	
						Level	First Diff.
Exchange rate	125	-0.3624	1.5269	-3.4689	1.7510	-3.0010**	-6.2570***
Export	125	6.8128	0.9567	5.5388	8.4345	-0.3700	-14.4230***
import	125	7.1470	0.8232	4.8287	8.4641	-1.6390	-12.3560***
Trade balance	125	-0.3342	0.4170	-1.0444	0.9007	-3.3660**	-14.2460***
Inflation rate	125	0.1658	0.1003	-0.0026	0.5316	-2.1030	-5.7000***
Interest rate	125	23.0382	9.8450	9.3800	46.0000	-1.4720	-6.0730***
International reserves	125	2.7008	2.4399	-3.7400	6.1400	-3.7650***	-15.4460***
Augmented export	125	6.8128	0.5853	5.1983	7.6536	-1.4240	-5.3680***
Augmented trade balance	125	-0.3342	0.6874	-1.6443	1.8220	-2.2970	-9.6720***
Magnitude of import substitution	125	0.0049	0.3854	-0.6396	0.8130	-1.4440	-9.3640***

*, **, *** are statistically significant at 10%, 5% and 1% respectively. The ADF test for unit root is performed with the assumption that the variables follow a constant term.
Source: Authors

Table 2. Linear autocorrelation.

	Er	ex	im	tb	inf	lint	ir	augex	augtb	mis
er	1.0000									
ex	0.8738	1.0000								
im	0.8926	0.9009	1.0000							
Tb	0.2428	0.5158	0.0929	1.0000						
Inf	-0.5235	-0.5443	-0.4892	-0.2831	1.0000					
lint	-0.4854	-0.5715	-0.5436	-0.2380	0.6676	1.0000				
ir	0.4203	0.5842	0.4578	0.4366	-0.2574	-0.1930	1.0000			
augex	0.5491	0.6119	0.5683	0.2819	-0.8896	-0.9340	0.2419	1.0000		
augtb	-0.6013	-0.5578	-0.7135	0.1288	-0.1717	-0.1443	-0.3422	0.1710	1.0000	
mis	-0.6678	-0.7811	-0.6843	-0.4412	-0.0133	-0.0147	-0.5544	0.0554	0.8326	1.0000

the exchange rate, ex: export, im: import, tb: trade balance, inf: inflation rate, lint: lag interest rate, ir: international reserves, augex: augmented export, augtb: augmented trade balance, mis: magnitude of import substitution.
Source: Authors

EMPIRICAL RESULTS

Summary statistics

Table 1 reports the mean, standard deviation, minimum, maximum and unit root test for all the variables in the study. The interest rate has the highest mean of 23.0382 whereas the exchange rate has the lowest mean of **-** 0.3624. The most dispersed variable is the interest rate (9.8450**)** and the least dispersed variable is the inflation rate (0.1003). Moreover, the variable with the highest maximum value is the interest rate of 46.0000 and the variable with the least value is the inflation rate of 0.5316. Finally, the variable with the highest minimum value is the interest rate of 9.3800 and the variable with the lowest minimum value is international reserves of -3.7400.

The Augmented Dickey-Fuller (ADF) test for unit root with a specification of a constant term shows that only the exchange rate, trade balance and international reserves are stationary at the level. It is observed that all the variables are stationary at the first difference.

The linear correlation results presented in Table 2 show that the inflation rate (-0.5443) and interest rate (-0.5715) negatively correlate with export. More so, the inflation rate and interest have a negative effect with augment trade balance, the magnitude of import substitution and international reserve. We also observe the augmented trade balance (-0.6013) and magnitude of import substitution (-0.6678) negatively correlate with the exchange rate.

Table 3. Optimal lag for exchange rate, trade balance and international reserves.

	1	2	3	4	5	6	7	8	9
AIC	-8.2145	-8.4455*	-8.3592	-8.2649	-8.1367	0.0003	-7.9825	-7.9341	-7.8289
HQ	-8.0989	-8.2431	-8.0701	-7.8891	-7.6742	-7.5042	-7.3465	-7.2114	-7.0194
SC	-7.9297	-7.9470	-7.6470	-7.3391	-6.9973	-6.7004	-6.4158	-6.1537	-5.8349
FPE	0.0003	0.0002	0.0002	0.0002	0.0003	0.0003	0.0003	0.0004	0.0000

* denotes the selected optimal lag.
Source: Authors

Table 4. Johansen cointegration test for exchange rate, trade balance and international reserves.

Maximum rank	Parms	LL	Eigenvalue	Trace statistic	5% critical value
0	9	-33.0807		26.4234	24.3100
1	14	-24.8612	0.1251	9.9843*	12.5300
2	17	-20.6344	0.0664	1.5308	3.8400
3	18	-19.8690			

* denotes the cointegration rank.
Source: Authors

Table 5. Johansen normalization imposed restriction for exchange rate, trade balance and international reserves.

	Coefficient	Std. Error	Prob. Value
er	1		
tb	7.5024	3.7489	0.0480
ir	-2.2423	0.6393	0.0000
constant	10.0474		

er, tb, ir represents exchange rate, trade balance and international reserve respectively.
Source: Authors

Exchange rate, trade balance and international reserves

Optimal lag for exchange rate, trade balance and international reserves

The information criteria used in selecting the lag order include Akaike Information Criterion (AIC(n)), Hannan-Quinn Information Criterion (HQ(n)), Schwarz Information Criterion (SC(n)) which is the same as Bayesian Information Criterion (BIC(n)) and Final Prediction Error (FPE(n)). From Table 3, all the information criteria provide the same optimal lag length of 2 for estimating the model.

Johansen cointegration test for exchange rate, trade balance and international reserves

To show if there is an existence of a long-run relationship between the exchange rate, trade balance and international reserves, a cointegration test was conducted for the study using the Johansen cointegration test with no constant. The trace statistic results in Table 4 show that there is a maximum cointegration rank of 1 in the system variables. This implies that at most one equation is cointegrated.

Johansen normalization imposed restriction for exchange rate, trade balance and international reserves

The Johansen normalization results in Table 5 illustrate that in the long-run trade balance has a negative (-7.5024%) impact on Ghana's exchange rate which is significant at a 5% level.

That is, a trade surplus would cause the Ghana Cedis to appreciate (a fall in the exchange rate) in the long-run. Whereas international reserves have a positive (2.2423%) impact on Ghana's exchange rate and it is 1% significant. This means that trade balance and international reserves are statistically significant in estimating the long-run dynamics in the exchange rate.

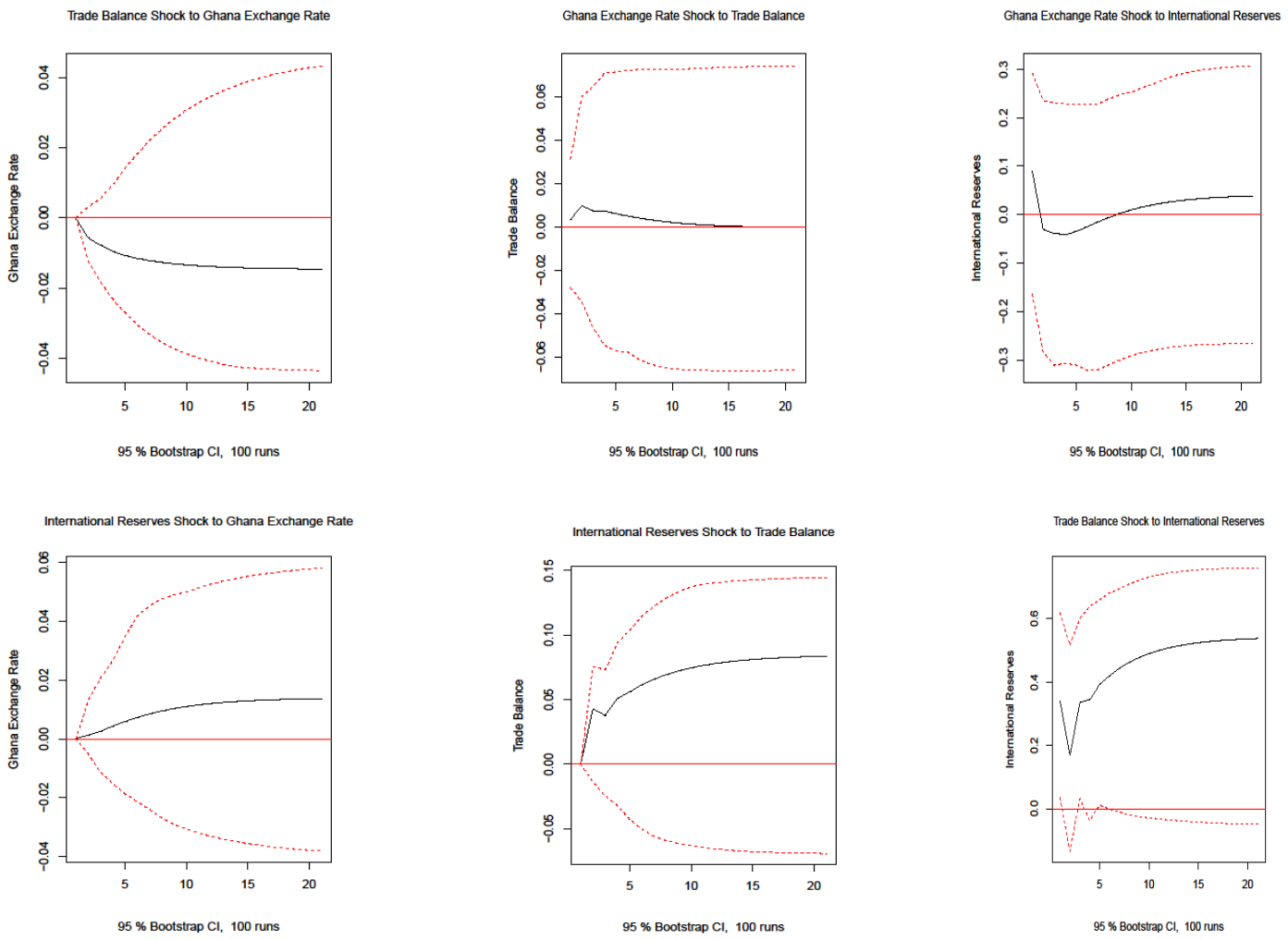


Figure 1. Impulse response function for exchange rate, trade balance and international reserves.
Source: Authors

All things being equal, the two variables have proven to have an asymmetric impact on Ghana's exchange rate.

Impulse response function for exchange rate, trade balance and international reserves

In macroeconomics, it is imperative to illustrate the dynamic response of variables to shocks from other variables. This is relevant for policy implications.

From Figure 1, the exchange rate negatively responds to a change in the trade balance and observes a persistent fall over time. Contrary to the trade balance shock, an exchange rate shock causes Ghana's trade balance to initially jump and then persistently fall in the second quarter to equilibrium. This result is consistent with the price and quantity effect explained under the theoretical framework (Hacker and Hatemi, 2003; Krugman and Obstfeld, 2009). The international reserves respond to the exchange rate shock in Ghana by falling temporarily and then spiking after the second quarter. There is a persistent rise in Ghana's exchange rate when a shock sets into the international reserves.

Examining the international reserves shock to trade balance, there is an increase in trade surplus and it quickly falls between the second and third quarter within the positive margin then persistently rise above the equilibrium. Moreover, the international reserves respond to the trade balance impulse by initially falling until the second quarter and then gradually rising in the long-run.

Exchange rate, augmented trade balance and international reserves

This presents the results of the first approach in

Table 6. Augmented export regression results.

ex	Coefficient	Newey-West Std. Err	t-Statistic	Prob. Value
constant	8.1177	0.1584	51.2600	0.0000
inf	-2.8008	0.7638	-5.4100	0.0000
lint	-0.0365	0.0067	-3.6700	0.0000
Number of Observations:		125		
F(2, 122):		60.73		
Prob > F:		0.0000		

ex, inf and lint represent export, inflation and interest rates.
Source: Authors

Table 7. Optimal Lag for Exchange Rate, Augmented Trade Balance and International Reserves.

	1	2	3	4	5	6	7	8	9
AIC	-8.0605	-8.3409	-8.3420*	-8.3057	-8.1731	-8.0965	-7.9199	-7.9199	-7.8283
HQ	-7.9449	-8.1386	-8.0529	-7.9299	-7.7105	-7.5472	-7.3803	-7.1972	-7.0189
SC	-7.7756	-7.8424	-7.6299	-7.3799	-7.0336	-6.7434	-6.4496	-6.1396	-5.8343
FPE	0.0003	0.0002	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003	0.0004

*denotes the selected optimal lag.
Source: Authors

examining the impact of the import substitution policy.

Augmented export

The realized export level was regressed on the import substitution policy drivers which are inflation and interest rates.

The estimated (augmented) export provides a basis for examining how the import substitution strategy could be achieved via the macroeconomic variables. In ensuring that the regression provides robust results, the Newey-West Standard Errors is applied. Although the variables used in the regression are integrated order one (*I* (1)), it could still run a valid regression because they are cointegrated (Appendix Table A1). The existence of cointegration between the variables ensures that the nonstationarity is explained and the residuals become stationary. The results in Table 6 show that both interest rate (-0.0365%) and inflation (-2.8008%) have a significant negative impact on export at a 1% significance level. This implies that a fall in inflation and interest rates would cause the export to increase and vice versa. These results support that inflation and interest rates are good instruments for import substitution.

Optimal lag for exchange rate, augmented trade balance and international reserves

Table 7 reports an optimal lag length of 3 for these system variables based on the AIC information criteria.

Johansen cointegration test for exchange rate, augmented trade balance and international reserves

The Johansen cointegration test with trace statistics under a constant trend is carried out for the exchange rate; augmented trade balance and international reserves and the results are presented in Table 8. The results display that there exists a maximum cointegration rank of 1.

Johansen normalization imposed restriction for exchange rate, augmented trade balance and international reserves

The long-run dynamics which is more relevant for policy analysis is reported in Table 9. The Johansen normalization results provide evidence that the import substitution strategy could achieve the target of stabilizing the exchange rate or appreciating the domestic currency in the long-run. This is parallel to the long-run negative impact of the augmented trade balance on the exchange rate. Specifically, Table 9 depicts that a percentage increase in the augmented trade balance would cause a 5.2633% decrease in the exchange rate at a 1% significant level. Similarly, a percentage increase in international reserves would cause the exchange rate to decrease by 0.7990% in the long-run at a 5% significant

Table 8. Johansen Cointegration Test for Exchange rate, Augmented Trade Balance and International Reserves.

Maximum rank	Parms	LL	Eigenvalue	Trace statistic	5% critical value
0	21	-18.3040		29.9791	29.6800
1	26	-8.9726	0.1419	11.3163*	15.4100
2	29	-5.0258	0.0627	3.4227	3.7600
3	30	-3.3145	0.0277		

*denotes the cointegration rank.
Source: Authors

Table 9. Johansen Normalization Imposed Restriction for Exchange rate, Augmented Trade Balance and International Reserves.

	Coefficient	Std. Error	Prob. Value
er	1.0000		
augtb	5.2633	1.0970	0.0000
ir	0.7990	0.3223	0.0130
constant	-0.8173		

er, augtb, ir represents exchange rate, augmented trade balance and international reserve.
Source: Authors

level. This shows that both augmented trade balance and international reserves have a symmetric impact on Ghana's exchange rate.

Impulse response function for exchange rate, augmented trade balance and international reserves

From Figure 2 a shock in augmented trade balance causes negative changes in the exchange rate but rises in the tenth quarter and then stabilizes from the thirteenth quarter. Contrary to the augmented trade balance shock, an exchange rate shock causes Ghana's augmented trade balance to initially fall then rise from the sixth quarter and remain negative. The early fall of the augmented trade balance corresponds to the initial stage of the J-curve effect (Hacker and Hatemi, 2004; Feenstra and Robert, 2014). However, it remains negative in the long-run. The international reserves respond to exchange rate shock by falling temporarily and then spiking after the second quarter. There is initial stability in Ghana's exchange rate and then rises from the fourth quarter and stayed persistently stable from the tenth quarter when a shock sets into the international reserves. Examining the international reserves shock to the augmented trade balance, the augmented trade balance responds negatively and falls throughout. Moreover, international reserves respond to the trade balance shocks by initially falling until the second quarter then gradually rising and then falling through in the long-run.

Exchange rate, magnitude of import substitution and international reserves

This part provides results on the second approach of examining the impact of the import substitution policy.

Import coefficients

The import coefficients as illustrated in Equation (4) are demonstrated in Figure 3 to give a clear picture or trend of the import substitution strategy. From Figure 3, the import substitution strategy is observed when the realized import coefficient curve (the black curve) outweighs the augmented import coefficient curve (the red curve) and vice versa. This demonstrates the impact of the interest rate and inflation level being used as policy instruments. Here, the trend of the import substitution policy that results from the interest rate and inflation is well captured by the magnitude of import substitution (Equation (5)).

Largely, the research shows that an import substitution policy is observed when the magnitude of the import curve (the blue curve) is above zero or steady-state. Figure 3 depicts that the import substitution policy is observed from 1990 to 1995. However, the policy is not practiced between 1995 and 1997 but it spikes after 1997 and then falls in 2000. The import substitution is consistently observed from 2001 to 2007 and started falling due to the global financial crises. From 2011 to 2021 import substitution has not been observed in

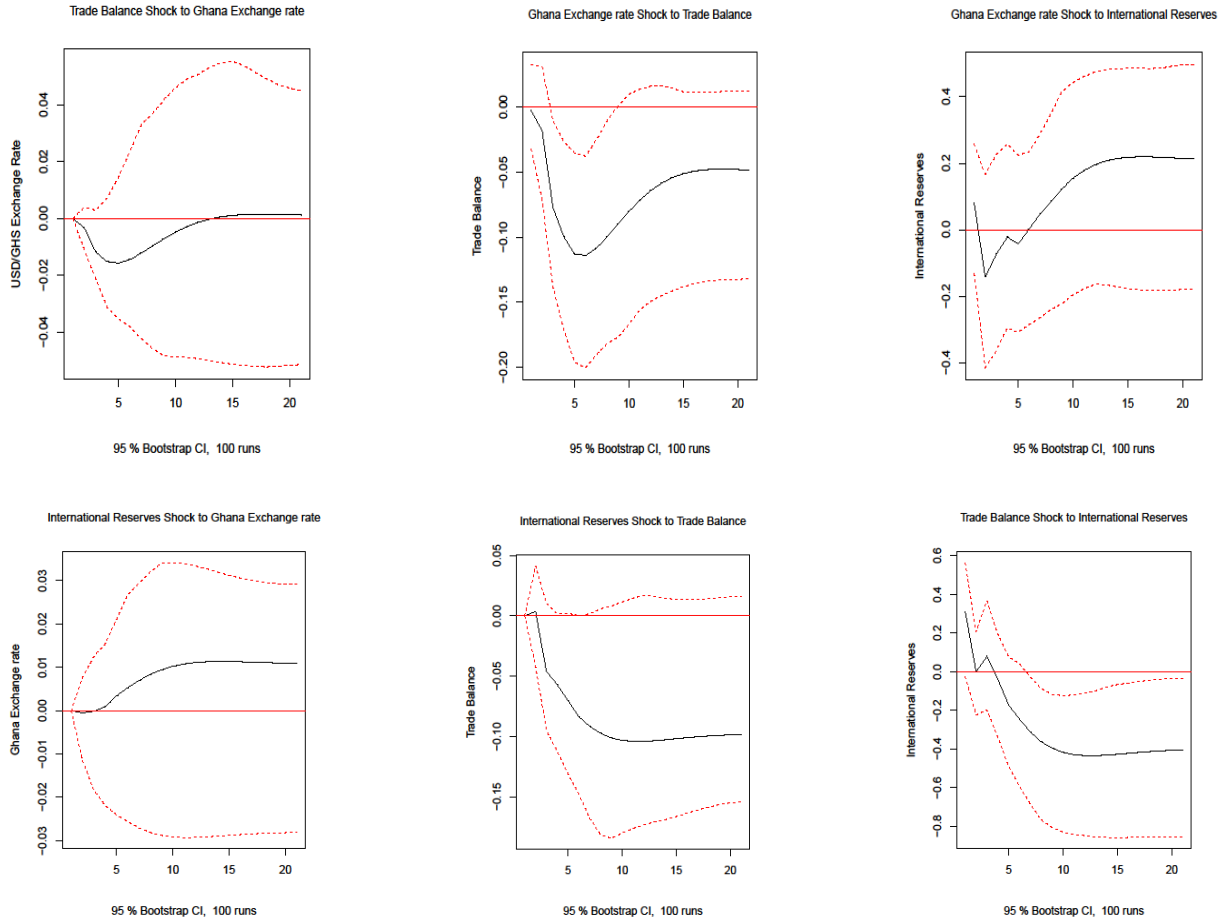


Figure 2. Impulse response function for exchange rate, augmented trade balance and international reserves.
Source: Authors

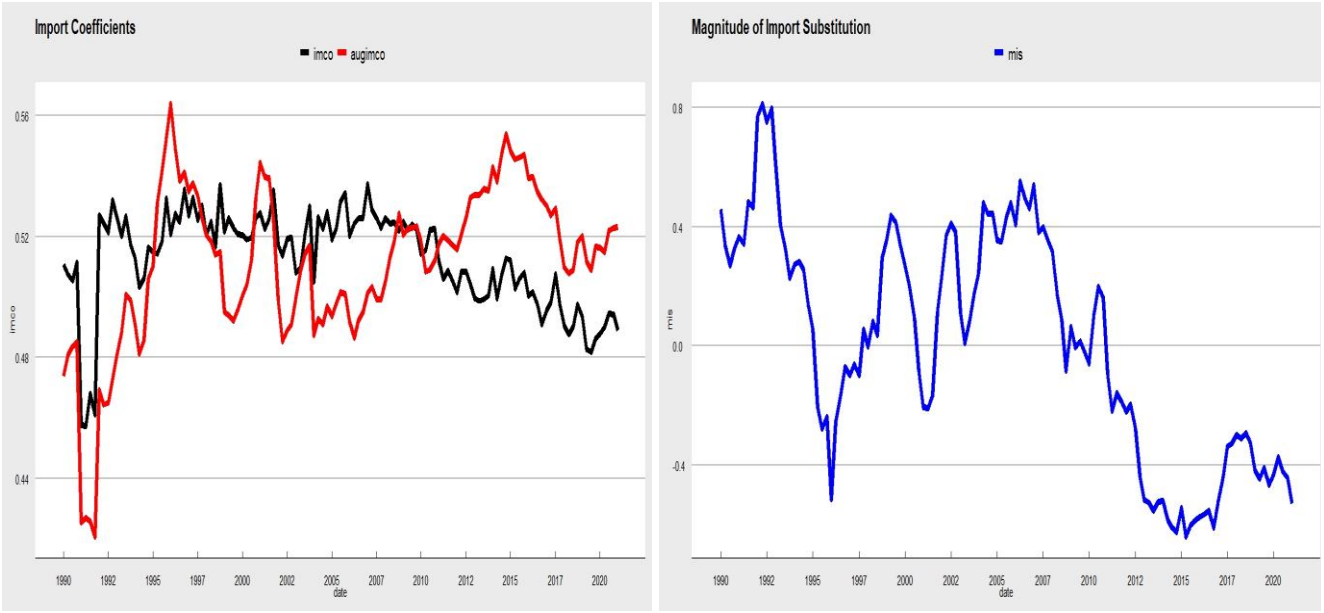


Figure 3. Import coefficients and magnitude of import substitution.
Source: Authors

Table 10. Optimal Lag for Exchange Rate, Magnitude of Import substitution and International Reserves.

	1	2	3	4	5	6	7	8	9
AIC	-9.5122	-9.7476*	-9.6849	-9.6436	-9.5287	-9.4710	-9.4124	-9.3150	-9.2741
HQ	-9.3965	-9.5452	-9.3959	-9.2678	-9.2678	-8.9217	-8.9217	-8.5923	-8.4646
SC	-9.2273	-9.2491	-8.9728	-8.7178	-8.3893	-8.1179	-7.8457	-7.5347	-7.2801
FPE	-7.3953	5.8464	0.0001	6.5026	7.3119	7.7749	8.2856	9.1935	9.6602

*denotes the selected optimal lag.
Source: Authors

Table 11. Johansen cointegration test for exchange rate, magnitude of import substitution and international reserves.

Maximum rank	Parms	LL	Eigenvalue	Trace statistic	5% critical value
0	9	72.4839		26.3317	24.3100
1	14	81.0498	0.1300	9.1999*	12.5300
2	17	85.2656	0.0663	0.7683	3.8400
3	18	85.6498	0.0062		

* denotes the cointegration rank.
Source: Authors

Table 12. Johansen normalization imposed restriction for exchange rate, magnitude of import substitution and international reserves.

	Coefficient	Std. Error	Prob. value
er	1		
mis	11.2673	4.0100	0.0000
ir	1.7619	3.8400	0.0000
constant	-5.4796		

er, mis, ir represents exchange rate, magnitude of import substitution and international reserve.
Source: Authors

Ghana.

Optimal lag for exchange rate, magnitude of import substitution and international reserves

The AIC(n) information criteria of lag 2 are selected as the optimal lag length to analyze this part. Details of the information criteria are provided in Table 10.

Johansen cointegration test for exchange rate, magnitude of import substitution and international reserves

The trace statistics of the Johansen cointegration test with no constant reported in Table 11 show that a maximum cointegration rank of 1 exists among the exchange rate, the magnitude of import substitution and international reserve. This means that at most one equation shows the existence of a long-run relationship among the variables.

Johansen normalization imposed restriction for exchange rate, magnitude of import substitution and international reserves

The long-run dynamic is demonstrated in Table 12. The Johansen normalization results confirm that a 1% increase in the magnitude of import substitution makes the exchange rate to fall by 11.2673% at a 1% significant level. This means that in the attempt by the central bank to stabilize or appreciate the Ghana Cedis an import substitution policy as explained in this study could be implemented.

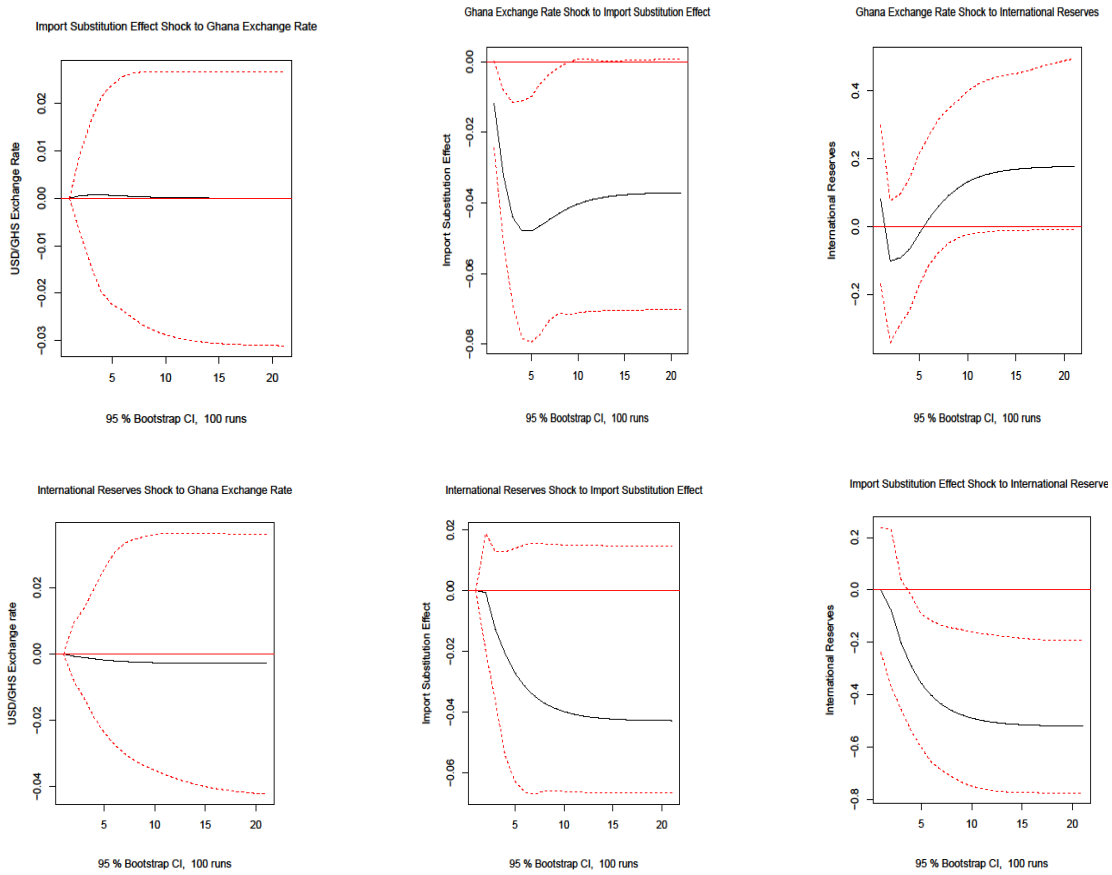


Figure 4. Impulse response function for exchange rate, magnitude of import substitution and international reserves.
Source: Authors

Unlike the long-run effect of the international reserves explained in the case when the original trade balance is applied, the occurrence of the import substitution policy affects the international reserves to negatively impact Ghana's exchange rate in the long-run.

The results indicate that a 1% rise in international reserves causes the exchange rate to fall by 1.7619% at a 1% significant level. This shows that import substitution policy and international reserves in Ghana have a symmetric impact (negative impact) on the value of the Ghana Cedis, ceteris paribus.

Impulse response function for exchange rate, magnitude of import substitution and international reserves

From Figure 4, a shock (increase) in the magnitude of import substitution slightly jumps the exchange rate above the steady-state and falls back over time. The policy ensures a long-run stabilization of the exchange rate. The magnitude of import substitution negatively responds to the exchange rate shock. It temporarily declines and begins rising in the fifth quarter beneath the steady-state. The international reserves respond to exchange rate shock by falling temporarily to negative and then spiking after the second quarter above the steady-state. There is a persistent rise in the exchange rate below the steady-state when a shock sets into the international reserves. Also, the magnitude of import substitution persistently falls below the steady-state at a larger margin in response to impulse from international reserves. The function displays a similar effect on the international reserves when there is a shock in the magnitude of import substitution.

DISCUSSIONS AND POLICY IMPLICATIONS

The study explores the impact of import substitution policy on the trade balance, exchange rate and international reserves by applying the macroeconomics variables – inflation rate and interest rates as policy instruments. The relevance of the macroeconomic variables as policy drivers are demonstrated in the study as the two variables have a significantly negative impact

on export (domestic production). This corresponds to the research by Adebiyi and Babatope-Obasa (2004). The idea of the study is to examine how the policy could boost domestic production of consumption goods to meet internal demand thereby reducing the importation of final goods. For robustness check, the performance of the import substitution policy is analyzed through the augmentation of trade balance and magnitude of import substitution.

The performance of the trade balance in stabilizing the exchange rate improves when the central bank applies the inflation rate and interest rate as instruments in supporting the local industries. The augmented trade balance stabilizes the performance of the domestic currency in the long-run significantly better than without the implementation of the import substitution. Extensively, the policy changes the long-run impact of the international reserves on the exchange rate from positive in the case of trade balance without the policy instruments to negative when the trade balance is augmented with the policy instruments.

This implies that the macroeconomic variables – inflation rate and interest rates employed in this research to stimulate import substitution in Ghana would work to stabilize the value of the Ghana Cedi or appreciate it. To a larger extent, the policy could revive the economy and set a platform for boosting production, expanding exports and eventually stabilizing the exchange rate. This would, moreover, help reduce the persistent call for external management of the economy such as IMF due to the devastating impact on the economy caused by the turbulence in the exchange rate.

The study reveals long-run dynamics that support that the magnitude of import substitution and international reserves in Ghana have a symmetric negative impact on the Ghanaian exchange rate, ceteris paribus. Furthermore, the study suggests that import substitution responds to the wave of currency devaluation in Ghana by stabilizing the value of the domestic currency in the long-run without depleting the Central Bank's international reserves.

From the empirical results and what have discussed so far, it is established that inflation and interest rates have a negative correlation with the import substitution policy. The policy implication is that during inflationary periods, banks respond by increasing their lending (interest) rates to offset their cost. Higher interest rates imply higher capital costs which discourage domestic producers from taking loans from the banks to expand production (Abor and Biekpe, 2007).

Also, the inflationary periods make input costs more expensive for the firm. Hence, for the government to achieve a stabilized exchange rate economic growth measures should be considered to ensure that the inflation rate goes down or does not exceed the target. Moreover, we recommend that the Central Bank reduce interest rates to encourage producers to take loan capital to boost domestic production. In a more specific approach, we suggest the Central Bank encourages commercial banks to charge preferential interest rates on all loans that intend to support domestic producers (Adebiyi and Babatope-Obasa, 2004).

In appendage to the interest rates reduction, as indicated by Adelman and Yeldan (2000), who suggest that the government expand the domestic supply of funds to producers through the promotion of the establishment of more development banks, the creation of financial intermediaries that would ensure the transfer of finance to the industries.

CONCLUSION AND RECOMMENDATION

This study examined the impact of import substitution policy on the trade balance, exchange rate and international reserves. The macroeconomic variables – inflation and interest rates were employed as the import substitution instruments (Ahmad, 1976; Yilmazkuday, 2003). This study contributes to the discussion on the persistent search for a suitable remedy for the worrying fluctuations of the country's currency value. Thus, the study does not only fill the gap in literature but also provides sound empirical evidence to inform policy actions and recommendations. The effect of the import substitution policy has been demonstrated clearly through the augmentation of the trade balance and the magnitude of import substitution.

The study revealed that the augmented trade balance and magnitude of import substitution and the international reserves have a symmetric negative impact on the exchange rate in the long-run. That is, an improvement in the import substitution would cause a fall in the exchange rate. Specifically, while the policy contributes to improving the domestic currency value, the central bank's international reserves (import cover) also recover.

By and large, the import substitution policy makes the domestic producers capacitated to expand domestically produced goods which helps the country to achieve a stabilized exchange rate and reinforce growth (Ahmad, 1976; Edwards, 1993; Jackson and Jabbie, 2021). Hence, it was recommend that for the government to stabilize the exchange rate or appreciate the domestic currency value, more attention should be directed to instituting policies that would help boost domestic production in the import substitution industries. Although the study has given enough evidence of the impact of the import substitution policy, getting data on Ghana's industrial production index was a challenge. A better analysis of the policy would be embedded in knowing the industrial production index. Hence, we suggest this should be considered in future research on the topic.

ACKNOWLEDGMENT

The authors express their gratitude to Joscha Beckmann

for his helpful comments and support for this paper.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

REFERENCES

Abor J, Biekpe N (2007). Small business reliance on bank financing in Ghana. Emerging Markets Finance and Trade 43(4):93-102.

Adebiyi MA, Babatope-Obasa B (2004). Institutional framework, interest rate policy and the financing of the Nigerian manufacturing sub-sector. In Forum on African Development and Poverty Reduction: The macro-micro linkage, held at Lord Charles Hotel, Somerset West, South Africa, from (Volume 13).

Adelman I, Yeldan E (2000). Is this the end of economic development?. Structural Change and Economic Dynamics 11(1-2):95-109.

Adewale AR (2017). Import substitution industrialisation and economic growth–Evidence from the group of BRICS countries. Future Business Journal 3(2):138-158.

Agyapong J (2021). Application of Taylor rule fundamentals in forecasting exchange rates. Economies 9(2):93.

Ahmad J (1976). Import Substitution and the Growth of Exports An Econometric Test. Revue économique pp. 286-296.

Akoto L, Sakyi D (2019). Empirical analysis of the determinants of trade balance in post-liberalization Ghana. Foreign Trade Review 54(3):177-205.

Antwi S, Issah M, Patience A, Antwi S (2020). The effect of macroeconomic variables on exchange rate: Evidence from Ghana. Cogent Economics & Finance 8(1):1821483.

Babatunde OA, Bashir AO, Ganiyu YO (2019). Exchange rate, trade balance and growth in nigeria: an asymmetric cointegration analysis. The Journal of Developing Areas 53(4).

Banson K, Muthusamy G, Kondo E (2015). The import substituted poultry industry; evidence from Ghana. Hekyll.services.adelaide.edu.au

Baum CF, Caglayan M (2006). Effects of exchange rate volatility on the volume and volatility of bilateral exports. Boston College, Department of Economics.

Bhattarai KR, Armah M (2013). The effects of exchange rate on the trade balance in Ghana: Evidence from co-integration analysis. African Journal of Business Management 7(14):1126-1143.

Bruton HJ (1998). A reconsideration of import substitution. Journal of economic literature 36(2):903-936.

Chenery HB. (1960). Patterns of industrial growth. The American economic review 50(4):624-654.

Edwards S (1993). Openness, trade liberalization, and growth in developing countries. Journal of economic Literature 31(3):1358-1393.

Feenstra T, Robert A (2014). International Macroeconomics. New York, NY: Worth Publishers ISBN 978-1-4292-7843-0. pp. 261-264.

Hacker RS, Hatemi JA (2003). Is the J-curve effect observable for small North European economies?. Open economies review 14(2):119-134.

Hacker RS, Hatemi JA (2004). The effect of exchange rate changes on trade balances in the short and long run: Evidence from German trade with transitional Central European economies. Economics of transition 12(4):777-799.

Igue NN, Ogunleye TS (2014). Impact of real exchange rate on trade balance in Nigeria. African Development Review 26(2):347-358.

Jackson EA, Jabbie MN (2021). Import Substitution Industrialization (ISI): An approach to global economic sustainability. In Industry, Innovation and Infrastructure. Cham: Springer International Publishing pp. 506-518.

Johansen S (1988). Statistical analysis of cointegration vectors. Journal of economic dynamics and control 12(2-3):231-254.

Johansen S, Juselius K (1992). Testing structural hypotheses in a multivariate cointegration analysis of the PPP and the UIP for UK. Journal of econometrics 53(1-3):211-244.

Krugman PR, Obstfeld M (2009). International economics: Theory and policy. Pearson Education.

Kwame Akosah N, Omane-Adjepong M (2017). Exchange rate and external trade flows: empirical evidence of J-curve effect in Ghana. mpra.ub.uni-muenchen.de

Mendes APF, Bertella MA, Teixeira RF (2014). Industrialization in Sub-Saharan Africa and import substitution policy. Brazilian Journal of Political Economy 34(1):120-138.

Meniago C, Eita JH (2017). Does Exchange Rate Volatility Deter Trade in Sub-Saharan Africa?. International Journal of Economics and Financial Issues 7(4):62-69.

Moreira MM, Pierola MD, Sánchez-Navarro D (2017). Exchange rate devaluation and import substitution in Latin America and the Caribbean. Nota técnica del BID (1275).

Nurhaliq P, Masih M (2016). Export orientation vs import substitution: which strategy should the government adopt? Evidence from Malaysia. mpra.ub.uni-muenchen.de

Obuobi B, Nketiah E, Awuah F, Agyeman FO, Ofosu D, Adu-Gyamfi G, Amadi AG (2020). Impact of currency redenomination on an economy: An evidence of Ghana. International Business Research 13(2):62-73.

Okyere I, Jilu L (2020). The impact of export and import to economic growth of Ghana. European Journal of Business and Management 12:130.

Oluyemi O, Isaac ED (2017). The effect of exchange rate on imports and exports in Nigeria from January 1996 to June 2015. International journal of economics and business management 3(2):66-77.

Prebisch R (1962). The economic development of Latin America and its principal problems. Economic Bulletin for Latin America. repositorio.cepal.org

Sekkat K, Varoudakis A (2000). Exchange rate management and manufactured exports in Sub-Saharan Africa. Journal of Development Economics 61(1):237-253.

Senadza B, Diaba DD (2017). Effect of exchange rate volatility on trade in Sub-Saharan Africa. Journal of African Trade 4(1-2):20-36.

Steel WF (1972). Import substitution and excess capacity in Ghana. Oxford Economic Papers 24(2):212-240.

Taylor JB (1993). Discretion versus policy rules in practice. In Carnegie-Rochester conference series on public policy-39. North-Holland pp. 195-214.

Todaro MP (1994). Economic Development (5th Edition). New York and London: Longman.

United States International Trade Commission (2011). The Economic Effects of Significant U.S. Import Restraints, Washington, DC, Government Printing Office. 4253:332-325.

Williamson J, Williamson RC (1983). Open Economy & World Economy. New York: Basic Books.

Yilmazkuday H (2003). Export promotion vs. import substitution. Import Substitution. papers.ssrn.com

Yol MA, Baharumshah AZ (2005). The effect of exchange rate changes on trade balances in North Africa: Evidence. In International Trade and Finance Association Conference Papers. bepress pp. 46.

Appendix

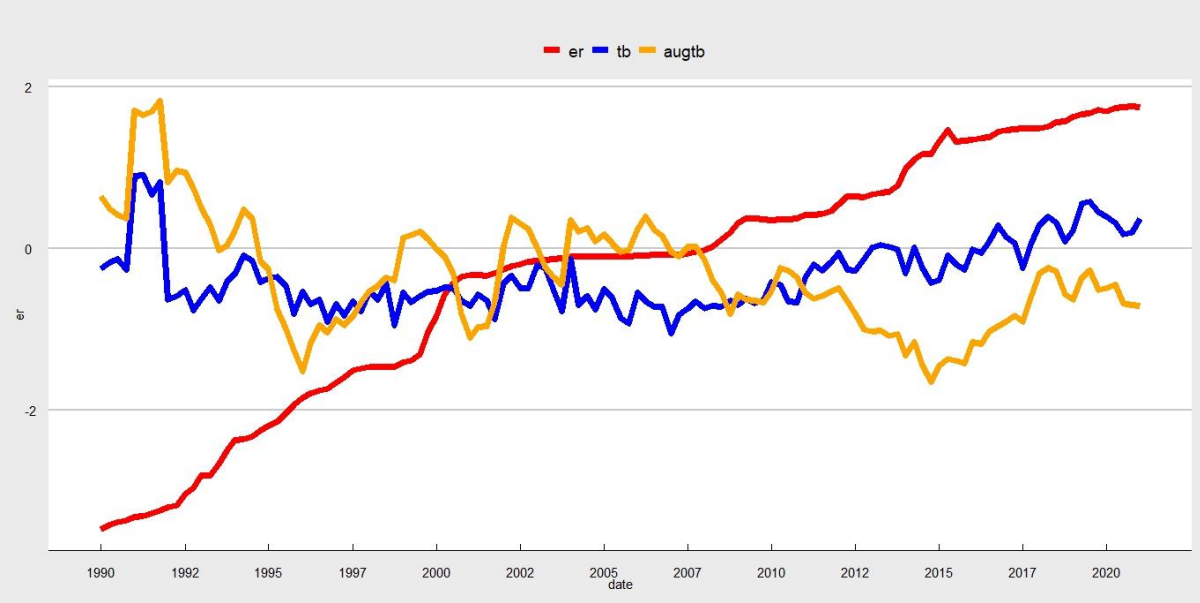


Figure A1. Logarithms of trends of the exchange rate (er), trade balance (tb) and augmented trade balance(augtb).
Source: Authors

Table A1. Johansen cointegration test for export, inflation rate and lag interest rate.

Maximum Rank	Parms	LL	Eigenvalu	Trace statistic	5% critical value
0	12	66.9641		44.2638	29.6800
1	14	79.3453	0.2085	15.5014	15.4100
2	17	87.0934	0.1184	0.0052*	3.7600
3	18	87.0960	0.0000		

* denotes the cointegration rank of 2.
Source: Authors

Vol. 14(3), pp. 62-78, July-September 2022
DOI: 10.5897/JEIF2019.0987
Article Number: 0F7319969729
ISSN 2006-9812

http://www.academicjournals.org/JEIF

ACADEMIC JOURNALS
expand your knowledge

Journal of Economics and International Finance

Full Length Research paper

The nexus between savings and investment in the East African Community: Co-integration and error correction models

Jalloh Mamoud Abdul

Department of Economics, College of Business and Economics, University of Rwanda, Kigali, Rwanda.

Received 12 July, 2019; Accepted 24 April, 2020

This study examines the effect of savings on investment in East African countries in the face of the recent reduction in trade barriers and other regional integration policies. The findings reveal that among all the regions in Africa, East Africa had the lowest household saving for the period 2000-2016 and only Burundi and Kenya savings and investment rates were co-integrated. The policy implication is that the domestic saving rates significantly drive economic growth via investment in only Burundi and Kenya. In addition, there was weaker impact of savings on investment in the East African Community (EAC) due to flexible capital mobility and harmonized government policies. These findings also corroborate the Solow model that capital accumulation (saving) is not the main driver of economic growth (investment) but rather exogenous technological progress. The study therefore recommends that knowledge, education and skills of the labor force, number of years of schooling, learning by doing, the strength of property rights, the quality of infrastructure, cultural attitudes towards entrepreneurship and work should be improved in the EAC.

Key words: Savings, investment, capital mobility, co-integration, economic growth.

INTRODUCTION

The high economic growth of the newly industrialised countries (NICs) of East Asia has caused heated debate about the impact of domestic savings on investment in Sub-Sahara Africa countries, which despite various economic reforms are trapped in poverty. According to the World Bank's African Development Indicators, gross domestic savings as a fraction of GDP across Africa is relatively low. It roughly stood at 20, 17 and 21% in the 1980s, 1990s and 2000s, respectively. Comparatively, these figures were 28, 32 and 37% respectively for Asian countries over the same periods. There is increasing beliefs that saving increases investment which in turn leads to sustainable economic growth. Feldstein and Horioka (1980) discover that domestic saving and investment are strongly correlated in 21 industrialised countries since in the real world, there are significant barriers to capital mobility and this may partly be as a result of some government protectionism policies.

Furthermore, Young (1995) uses detailed growth accounting to argue that the higher growth in the NICs is almost entirely due to rising saving- investment, increasing labour force participation, and improving

E-mail: abdulmoud99@gmail.com.

Table 1. Annual average Gross Domestic Saving of African Regions % share of GDP (1980-2016).

Region	1980-1984	1985-1989	1990-1994	1995-1999	2000-2016
East Africa	5.8	9.0	5.6	4.8	2.8
South Africa	-3.0	6.7	10.9	4.1	17.9
Central Africa	9.9	9.1	11.9	15.2	28.3
North Africa	22.1	22.6	13.8	14.3	19.2
West Africa	6.1	7.8	8.0	7.7	9.7
Total	8.2	10.0	10.0	9.2	15.6

Source: World Development Indicators (2019).

labour quality (in terms of education) and not due to rapid technological progress and other forces affecting the Solow residual. This study thus supports the Solow model of economic growth states that countries will always converge to their balanced growth paths and that poorer countries will catch up with richer ones if all the additional savings are invested locally, since the marginal product of capital in that country is higher than that in other countries and there is no incentive to invest abroad. Like Romer (2012) and Helliwell (1998) find out that the saving-investment correlation is much weaker across regions than across countries. This implies that with removal of restrictions on capital and labour mobility, countries in a regional bloc tend to conditionally convergence at a steady economic growth path than countries in autarky.

In the past three decades, East African's national governments have taking steps to prevent large imbalances between aggregate saving and investment, but such imbalances can develop in the absence of government intervention. Among other macroeconomic convergence criteria, the EAC protocol requires partner states prior to joining the East African Monetary Union to have domestic savings as a percent of GDP of least 20%. Although compared to other regions in Africa, East Africa has the lowest saving rates as shown in Table 1; it is far outperforming other regions in terms of investment. Since the strong relationship between saving and investment in the East Asia differs from the predictions of a natural baseline model, there is need to examine whether those associations also exist in The East African Community (EAC) with their widening and deepening social, economic and political co-operation through a Customs Union in 2005, a Common Market in 2010, proposed Monetary Union in 2024 and a Political Federation of the East African States at in a distant future. Hence, there is flexible capital, goods and services, and people movement presently among the Partner States of Burundi, Kenya, Rwanda, Tanzania and Uganda. To this extent, this study investigates whether domestic saving impacts investment in the East African community. The rest of this study is organized as follows. Section 2 provides a brief summary of the literature review. The data and methodology are presented in Section 3. Section 4 presents the discussion of the research results. The final section gives conclusions and policy recommendations on improving domestic savings and investment in the EAC.

LITERATURE

The workhouse theory of this study is the Solow-Swan Growth Model (commonly known as Solow Model) which postulates that sustained increase in capital investment rises economic growth only transiently and that in thelong run only differences in technological change cause variation in GDP growth across countries/regions. This is because countries/regions with high marginal rate of return on capital tend to initially attract more investment funds, especially from developed nations that have reached a relatively low return on investment. The model however argues further that as the economies grow, people accumulate wealth through high rates of savings. This, coupled with reduction in investible projects, leads to demand for capital to fall and gradually the region or countries converge to their balanced steady growth paths. Further, Romer (2012) opines that over time developing countries are expected to conditionally converge to developed countries' growth path as the marginal products of investment across the world convergence due to high savings and low incentives elsewhere.

According to the Solow Model thus, the EAC countries are anticipated to have similar living standards (measured by GDP per capita) and form an economic convergence club as a result of regional economic integration. In the absence of barriers to capital movement, there is no reason to expect countries with high saving rates to also have high investment, labour productivity or GDP growth rates in the long run because they may invest in other countries with higher marginal product of additional capital and cheap labour supply.

A lot of empirical researches have been done in both developed and developing countries on the nexus between domestic savings rate and investment. However, there still remains a significant knowledge gap due to the growing divergence in saving and investment between and

across countries, falling saving rates in major OECD countries (despite huge investment) on one hand and on the other hand, the vital role of investment in the NICs of East Asia. This section presents a summary of empirical works on the nexus between Saving-Investment in and across different regions of the world.

The above empirical evidence shows that since the Solow model postulates that savings does not drive growth (via investment), lots of research have been done in both developed and developing countries. Unfortunately, the evidences are mixed-positive, negative and no association between saving and investment. This study adds to the literature by examining the savings effect on investment in East African countries. It also bridges the gap as to whether savings impacts investment among these countries due to the recent reduction in trade barriers and other regional integration policies (Table 2).

DATA AND METHODOLOGY

This study uses Co-integration and Error Correction Models to test the causal relationship between domestic saving rates and investment rates in the East African Community member countries. Although these methodologies are often applied to multivariate models, this study applied them to Feldstein and Horioka (1980)'s reduced form bivariate model to examine the long-run relationship between domestic saving and investment (both as percent of GDP). The model takes the following form:

$$\left(\frac{I}{Y}\right)_i = \alpha + \beta \left(\frac{S}{Y}\right)_i \quad (1)$$

An econometric expression of Equation 1 then becomes:

$$\left(\frac{I}{Y}\right)_i = \alpha + \beta \left(\frac{S}{Y}\right)_i + \varepsilon_i \quad (2)$$

where $(\frac{I}{Y})$ is the average share of investment (I) in GDP (Y), $(\frac{S}{Y})$ is the average share of savings (s) in GDP, α denotes the constant and β is the elasticity of investment rate with respect to savings rate, measuring the long run adjustment, ε is the error term and i are indices for member countries of the EAC that is, East Africa, Burundi, Kenya, Rwanda, Tanzania and Uganda.

There are two major steps in testing co-integration between the two economic variables, saving rates as percent of GDP and investment rates as a percent of GDP. The first stage involves testing stationarity of the variables, using unit root tests. This is accomplished using the Augmented Dickey Fuller (ADF) test. The test is based on the regression equation with the inclusion of a constant and a trend of the form:

$$\Delta X_t = \beta_0 + \mu t + \theta_1 X_{t-1} + +\beta \sum_{j=1}^{\sigma} \beta_j \Delta X_{t-j} + \varepsilon_t \quad (3)$$

Where $\Delta X_t = X_t - X_{t-1}$, X denotes the variable under consideration σ is the number of lags in the dependent variable, chosen so as to induce a white noise term and ε_t is the stochastic error term. If $|\theta| = 1$, the given variable has a unit root and thus it is non stationarity, and if $|\theta| < 1$, then it is stationary. ADF test is preferable to other unit root test due to the stability of its critical values as well as its power over different sampling experiments (Engle and Granger, 1987).

The second stage involves the direct testing of the stationarity of error processes of two co-integration regressions estimated in previous step. Clearly, the residuals from the co-integrating regression can be considered stationary. Thereafter, to allow a gradual adjustment of investment rates to new saving rates we consider the Equation 2 as the long run relationship around which short term dynamics adjust. Correspondingly, this co-integration is linked to the short run dynamics adjustment, Error Correction Model of Equation 4:

$$\Delta\left(\frac{I}{Y}\right)_I = \pi_1 + \pi_2 \Delta\left(\frac{I}{Y}\right)_{t-1} + \pi_3 \left(\left(\frac{I}{Y}\right)_{t-1} - \theta\left(\frac{S}{Y}\right)_{t-1} - \gamma\right) + \mu_t \quad (4)$$

Where Δ denotes the first difference operator, π_1 is constant, π_2 is the measure of short run impact multiplier, π_3 indicates the speed of adjustment of $\left(\frac{I}{Y}\right)$ toward the long run equilibrium relationship described by Equation 2 and μ_t is the white noise error term. $\left(\frac{I}{Y}\right)_{t-1} - \theta\left(\frac{S}{Y}\right)_{t-1} - \gamma$ represents the error correction term lagged by one period, and is the residual, ε obtained from Equation 2. A high value for π_3 reveals a faster economic response in order to restore equilibrium after short run disturbances, and θ is the long run adjustment and is expected to be negative.

According to Granger (1986), the error-correction models produce better short-run forecasts and provide the short-run dynamics necessary to obtain long-run equilibrium. A cross country correlation analysis is also carried out. Due to unavailability of annual data on investment and domestic saving for Tanzania prior to 1990, the study period covers 1990-2015, compiled from the World Bank and Africa Development Bank databases (Appendix Table 4). The sample of countries consists of Burundi, Kenya, Rwanda, Tanzania and Uganda, all part of the East African Community.

RESULTS AND DISCUSSION

This section presents and discusses both the descriptive and empirical analysis results of the study. Descriptive statistics were mainly tables and figures while the unit root test, co-integration test and Error Correction Model results were discussed in the empirical subsection.

Descriptive statistics

Figure 1 reveals that from 2008 to 2017, the GDP per capita growth in the EAC countries, except Burundi have seem impressive growth. This massive economic development in per capita terms was mainly by normalcy in agricultural activities due to favourable weather conditions and stable external environment. However, since 2015 Burundi entered economic recession as political instability roam over the country. If peace is restored in Burundi, and weather remains favourable since agriculture is rainfed, the EAC will possibly achieve economic convergence in the not too distant future.

As a result of the tremendous rise in the households' disposable income in the region recently, the countries

Table 2. Summary of empirical studies on saving and investment.

S/N	Author(s)	Sample size	Research method	Findings
1	Feldstein and Horioka (1980)	21 Industrialised countries 1960-1974	Ordinary Least Squares Method	Saving and investment rates are strongly correlated
2	Attanasio et al. (2000)	123 Countries 1961-1994	OLS, Granger Causality and Impulse Response functions	Lags of saving rates are positively related to investment rates and investment rates granger cause growth rates negatively and vice-versa
3	Lu and McDonald (2006)	Asian Countries (China, Japan and Asia Tigers)	Ordinary Least Squares Method	Using Ramsey Model, savings was directly correlated to economic growth as current generation forgo current consumption at equilibrium to improve economic growth
4	Verma (2007)	India 1950/51-2003/4	Auto Regressive Distributed Lagged (ARDL) bonds test and OLS	Findings corroborate Carroll-Weil hypothesis that saving drives investment both in the short run and long run but no evidence that investment drives economic growth in India
5	Weale (2008)	United Kingdom 1960-2007	Ordinary Least Squares Method	Balance of payments deficit is proportional in size to the IS gap. To promote saving and reduce this gap, she proposes imposition of taxes on consumer credit, mortgages and subsidy of saving
6	Kudaisi (2013)	West Africa 1980-2006	Generalised Least Squares Method	Financial market has positive effect on savings and the real interest rate and terms of trade have insignificant impact on saving in West Africa
7	Adom and Elbahnasawy (2014)	Five developing countries (Egypt, Cote d'Ivoire, Ghana, Kenya, Nigeria) 1980-2012	Calibrated Ramsey Model and Stimulation	Positive impact of reduction in SI gaps on output expansion and the findings point out that these gaps are associated with relatively lower growth rates of actual output compared to simulated output, with the notable, but limited, exception of Nigeria until 2019. Thus, there is need for appropriate policies to address both structural and non- structural factors that limit the ability of these developing countries to effectively bolster households' deposits.
8	Hundie (2014)	Ethiopia 1969/70-2010/11	ARDL and TYDL Granger Causality tests	Bi-directional causality between gross domestic savings and economic growth as well as between GDS and gross domestic investment. Thus, to attain high and sustained growth, increased savings and investment are required due to its due effect.
9	Ogbokor (2014)	Namibia 1991-2012	ADF, Error Correction Model and OLS	The results suggest that inflation and income have positive impact on savings, whilst population growth rate has negative effects on savings. Further, deposit rate and financial deepening have no significant effect on savings and the need to achieve a higher rate of savings in Namibia by improving upon income levels cannot be overstretched.
10	Jagadeesh (2015)	Botswana 1980-2013	ARDL and OLS	There is significant relationship between saving and economic growth in accordance with Harrod-Domar growth model

have recorded relative improvement in domestic savings. Figure 2 shows that across the EAC, Tanzania and Uganda have the highest domestic savings as a percent of the GDP. In 2016, 23 and 15% of all households' earnings in Tanzania and Uganda were saved respectively. On the other hand, Burundians were on average in debts as their savings to GDP ratio stood at -8.8%. In addition, Rwanda and Kenyan had very low savings rate. This implies that Burundians, Rwandans and Kenyans are the highest spenders or consumers in the region while Tanzanians and

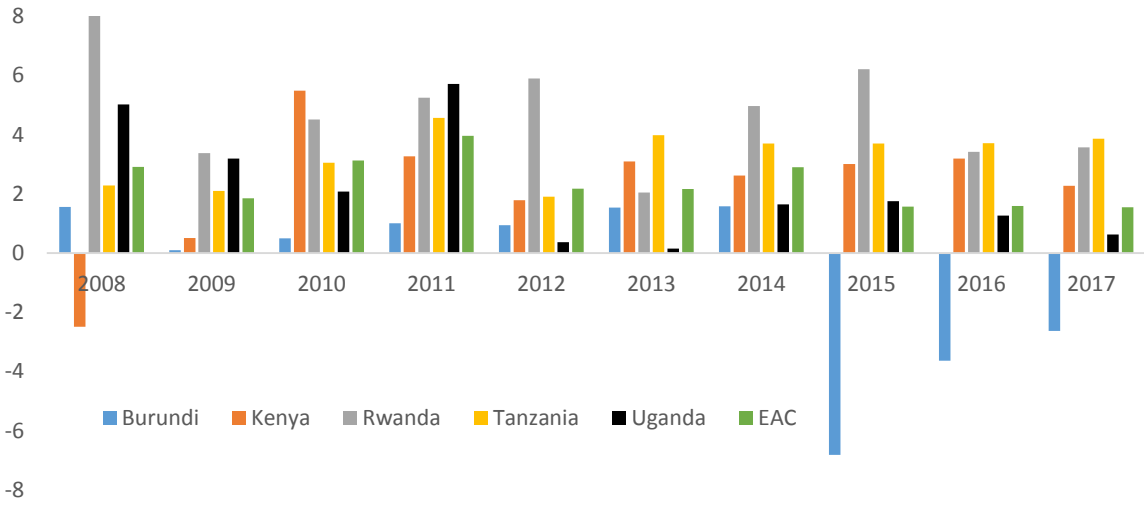


Figure 1. EAC GDP per capita growth (annual %).
Source: World Economic Indicators (2019).

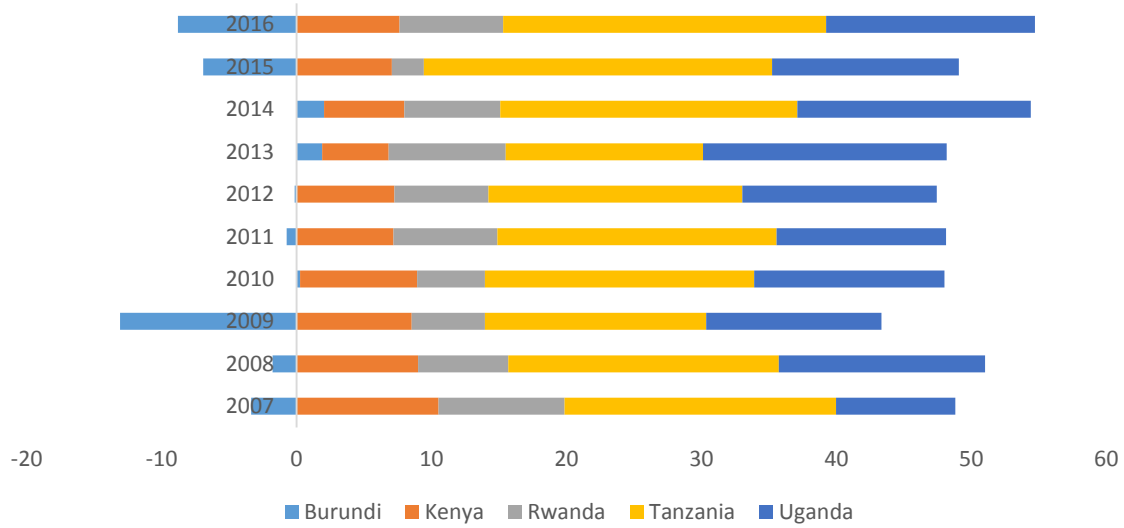


Figure 2. 2007-2016 Gross Domestic Savings as a percent of GDP in EAC.
Source: World Economic Indicators (2019).

Ugandans are the highest investors (since in classical economic theory savings equals investment). The decreasing growth in the savings in Rwanda and Kenya despite drastic increase in their household incomes could be attributed to higher cost of living and openness relative to other countries.

Over the same ten years 2007-2016, EAC relative to other African economic communities recorded an abysmal performance in terms of capital formation mainly as a result of its low domestic savings mobilisation. Expectedly, Figure 3 shows that Tanzania and Uganda, with the highest domestic resources also had the highest gross capital formation on average. However, compared to Kenya, Burundi and Rwanda outperformed despite their lower domestic wealth, implying that foreign grants and aids resources received by these two countries were judiciously employed in fixed capital investment.

However, the community continues to face severe challenges in accessing finance for both public and private sector development investment. These problems range from the small and relatively undeveloped financial system, high transaction and logistic costs to high dependence on the public sector as key driver of economic growth. For instance, despite the region acutely in need of finance to meet its developmental needs, Figure 4 shows that borrowing cost remains very high in member countries. During 2014 and 2016, the real interest rates rose in both Burundi and Uganda, fell

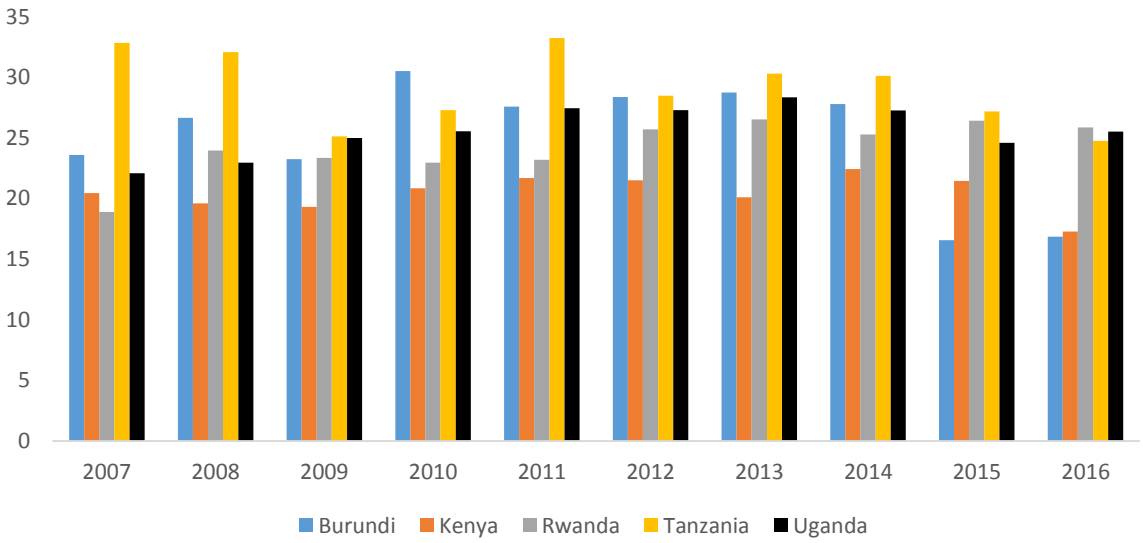


Figure 3. Gross capital formation (% of GDP) in the EAC.
Source: World Development Indicators (2019).

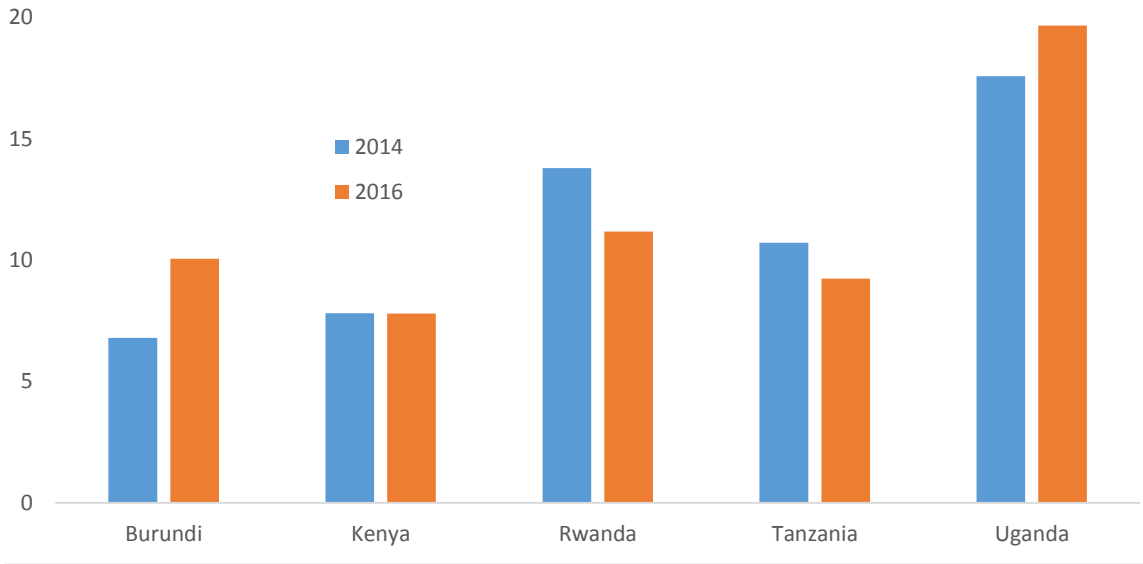


Figure 4. Borrowing cost of capital in the EAC Countries.
Source: World Development Indicators (2019).

slightly in Rwanda and Tanzania but it remains relatively the same in Kenya. However, capital remains still cheaper in Kenya than the rest of the other partner states. In fact, in 2016 alone borrowing cost was on average 20% in Uganda, while it was barely 8% in Kenya. This high cost of borrowing could crowd out investment funds in some countries in favor of others and adversely impact on entrepreneurship and economic transformation in the region. The major source of this high cost is the high demand by the public sector for commercial banks loans to finance their programmes, in face of high risk in the private sector, especially the agricultural sector. The community thus needs to review policies governing financial institutions, public sector's borrowing strategies, and attempt to de-risk the private sector.

Empirical evidence

A cross country correlation analysis between savings and investment for the period 1990 to 2015 for the EAC and

Table 3. Cross Correlation Analysis of Savings and Investment

	iBD	iKY	iRW	iTZ	iUG	iEAC	sBD	sKY	sRW	sTZ	sUG	sEAC
iBD	1											
iKY	0.22	1										
iRW	-0.12	0.56*	1									
iTZ	-0.07	0.31	0.33	1								
iUG	0.08	-0.07	0.09	-0.09	1							
iEAC	0.32***	0.41**	0.47*	0.44**	0.74*	1						
sBD	-0.04	0.27	0.1	0.50*	0.03	0.29	1					
sKY	-0.14	-0.33***	-0.46**	-0.49*	-0.45**	-0.74*	-0.43**	1				
sRW	-0.09	0.38**	0.58*	0.33***	-0.01	0.29	0.32	-0.47*	1			
sTZ	-0.08	0.50*	0.72*	0.51*	0.40**	0.72*	0.16	-0.75*	0.49*	1		
sUG	-0.03	0.35***	0.58*	0.67*	0.31	0.68*	0.49*	-0.82*	0.39**	0.80*	1	
sEAC	-0.14	0.51*	0.71*	0.59*	0.12	0.53*	0.52*	-0.65*	0.86*	0.76*	0.74*	1

*, ** and *** means 1, 5 and 10% significance level
Source: Author's estimations (2019).

Table 4. Summary of the ADF unit roots.

	Burundi	Kenya	Rwanda	Tanzania	Uganda
Saving	-4.6714 (0.0052)	-5.6804 (0.0010)	-4.6013 (0.0060)	-4.6230 (0.0061)*	-3.7966 (0.0339)
Investment	-5.0961 (0.0020)	-5.9926 (0.0003)	-6.3246 (0.0001)*	-7.7892 (0.0000)*	-3.0906 (0.0403)

*Means at I (1).
Source: Author's estimations, (2019).

the individual countries was performed (Appendix Figure 1). Table 3 presents the results of the correlation analysis. The analysis shows that although investment in the EAC is strongly positive and significantly related with investment in the individual countries, it is more correlated with investment in Uganda and weakly related to investment in Burundi. The analysis also reveals that EAC total savings is positively associated with all individual countries' savings rates, except with Kenya savings rate. At individual countries level, apart from Kenya, all countries' savings and investment rates are positively correlated. On the other hand, savings rates in Kenya, the largest economy in the EAC, is statistically significant and negatively associated with all other countries' investment and the overall EAC investment level, implying that most of the domestic savings in Kenya are invested in other EAC member states, instead of in Kenya itself. This is evident in the region as Kenya businesses, especially commercial banks dominate the region's financial system. However, the results show that Burundi is not benefiting significantly from the savings and investment in other countries, due to its political instability and less openness to trade.

The consequences are that intra EAC trade continues to be pulled by Kenya, Uganda and Tanzania with Rwanda and Burundi continuing to record massive trade deficit. According to the EAC trade statistics, between 2006 and 2015, trade surpluses stood at USD 993.8 million, USD 143.5 million, and USD 60 million for Kenya, Tanzania and Uganda respectively. For the same period however, Rwanda and Burundi recorded massive trade balance deficit of USD 139.2 million and USD 375.6 million respectively. This shows that Kenya investments dominate all countries in the East African Community.

At this point, we now conduct unit root tests on savings and investment variables for all countries in the EAC before carrying out the cointegration and Error Correction Models tests. Table 4 shows the results of unit root tests obtained using the Augmented Dickey Fuller Test (ADF). The results show that all the data series were stationary at levels (that is at I (0)) except Tanzania investment and savings series and Rwanda investment rates. For these series, they were stationary at first differences (that is at I (1)). In other words, all the ADF tests rejected the null hypothesis of unit root in favor of the alternative in the level with trend and intercept apart from Tanzania variables and Rwanda's investment rates, in which the latter variables are stationary at first differences.

Next, we test cointegration between savings rates and investment rates in member states of the EAC using the

Table 5. Summarised co-integration results using engle granger tests.

Variable	Engle-Granger t-statistic		Engle-Granger z-statistic		Co-integrated
	Value	Prob.*	Value	Prob.*	
Burundi SAV and INV	-5.2346	0.0014	-26.649	0.0009	YES
Kenya SAV and INV	-5.3364	0.0011	-27.933	0.0004	YES
Rwanda SAV and INV	-3.4321	0.0677	-16.386	0.0506	NO
Tanzania SAV and INV	-2.4735	0.3176	-10.605	0.2475	NO
Uganda SAV and INV	-3.0423	0.1355	-13.453	0.1198	NO

*Denotes MacKinnon (1996) p-values.
Source: Authors' estimations (2019).

Table 6. Regression results using fully modified ols least squares method.

Variable	Constant	Coefficient (Savings)	R-Squared
East Africa Investment	19.10 (4.506)	0.43 (0.134)	0.287
Burundi Investment	1.614 (1.414)	0.014 (0.163)	0.0018
Kenya Investment	4.633 (0.936)	-0.21 (0.082)	0.097
Rwanda Investment	4.091 (0.662)	0.235 (0.058)	0.285
Tanzania Investment	0.79 (3.066)	0.486 (0.218)	0.25
Uganda Investment	13.97 (0.319)	0.52 (0.611)	0.018

Source: Authors' estimations (2019).

Engle- Granger Causality test. The essence of the co-integration analysis is to determine if there is a long-run relationship between the two variables, and if so, the number of co-integrating vectors. In general, economic variables (often non-stationary variables) are said to be co-integrated if a linear combination of these variables is stationary (that is, X and Y variables are IΣ1(0)).

The Engle granger co-integration test between the saving rates and investment rates results is presented in Table 5. The results show that only saving rates and investment rates of Burundi and Kenya are co-integrated. All the other countries in the EAC have non co-integrated saving and investment rates because their p- values are greater than 0.05 (5% significance level). Therefore, there is no long run relationship between saving rates and investment rates in all countries in the EAC, except Burundi and Kenya. This has an adverse implication on the policy of encouraging domestic savings in hope of encouraging investment in these countries.

Furthermore, a co-integrating regression was estimated in order to examine the long run impact of savings rates on investment levels in the EAC. Table 6 presents the regression results, with standard errors in parentheses. The results reveal that with the exception of Kenya, all the other countries have positive long term impact of savings on investment. These results are supported by the findings from the cross country correlations, where savings and investment were positively correlated in all member countries, apart from Kenya (Appendix Table 1). However, the sole impact of savings on investment levels is very weak. For instance, in the EAC the R-squared of 0.287 implies that only 28.7% of changes in investment are attributable to changes in saving rates and it points to the possibility of high capital mobility from the region to other regions. Thus, the bulk of the changes are caused by other factors such as foreign direct investment, infrastructure and political stability etc (Appendix Table 2).

In consonance with the correlation analysis, the results further reveal that across individual countries, Uganda has the higher saving-investment impact while Burundi has the lowest impact in the region. In Rwanda, saving contributes only 24% of changes in investment. However, there was significant positive relationship between them and the R^2 almost like that of the entire region. This may be partly due to political stability, peace, security of lives and property, conducive economic environment including government investment policies and its high portfolio and foreign direct investment. The result thus corroborates the findings of Helliwell (1998) of weaker saving-investment correlation across regions than across countries due to capital mobility but contradicts the findings of Feldstein and Horioka (1980) who found a one to one relation between savings and investment.

Finally, an Error Correction Model Estimations was done for those countries whose savings and investment are co-integrated (Appendix Table 3). If savings and investment are not co-integrated (that is not moving together in the long run), it is very unlikely that they would

Table 7. Error correction models.

	Burundi		Kenya	
	Coefficients	**Standard errors**	**Coefficient**	**Standard errors**
D(COUNTRYXSAV)	-0.09	0.14	-0.03	0.18
Correction Factor (E(-1)	-1.07	0.22	-1.13	0.23
R-squared	0.54		0.55	
F-statistic	12.64		12.46	

Source: Authors' estimations (2019).

move in the same direction together in the short run either. As such, the empirical results of the estimated error correction model presented in Table 7 report only for Burundi and Kenya. The high F-statistics for both countries show the models are well specified and this could be justified further by their high short term predictive power since the R-squared of the models reveals that 54 and 55% of changes in investment is accounted by changes in domestic savings alone in these countries. The policy implication is that the domestic saving rates significantly drive economic growth via investment in both Burundi and Kenya.

The empirical results further depict that in the short run any shocks on investment levels as a result of changes in domestic savings will be restored to equilibrium within the next fiscal year only, since the correction factors are -1.07 and -1.13 in Burundi and Kenya respectively (approximately 100%). The adjustment factor should be negative and significant or else the economic shocks will not be dissipated but rather keep compounding year in year out in both countries. The results further imply that in Burundi and Kenya if there is a fluctuation in domestic saving rates among citizens it will take just a year to normalize the investment rates. Despite this faster adjustment rates, these countries are among the countries with the lowest domestic savings rates in the EAC. In particular Burundi continues to face increasing threats to its plans to improve domestic savings and investment as one third of its economy has shrunk since 2015 due to heightened political tensions.

CONCLUSION AND RECOMMENDATIONS

The empirical evidence on the nexus of saving-investment analysis is mixed. In addition, while there is a wide range of research in other parts of the world on this important topic, such research is few in Sub-Sahara Africa. In fact, to the author's best knowledge this is the first research conducted on the nexus of savings and investment using Co-integration and Error Correction Models in the EAC. These methods are superior and preferable to the traditional Ordinary Least Regression in that they are less prone to its restrictive assumptions. Some research confirms the Solow model that the rich and poorer economies can always converge to balanced growth paths because (rational) investors could choose to invest in poor countries with often higher return on capital in the absence of barriers to trade. With respect to this, one of the measures taken by various governments around the world is regional economic integration, whereby higher savings in other countries within the same region or bloc could be invested in needy countries with higher marginal return on capital, without fear of capital mobility restrictions and other trade barriers often imposed by sovereign states. With the EAC pursuing a monetary unification by 2024, and already implemented two regional integration road marks such as the custom union and the common market area, this study is apt and timely in investigating the relationship between savings and investment in the EAC partner states.

The findings revealed that amongst all the regions in Africa, East Africa has the lowest saving rates. The cross country correlation analysis shows that savings and investment are statistically positively correlated with investment levels in all the member states, except in Kenya. The negative association of Kenyan domestic savings with the rest of the other countries is evident in the presence of high Kenyan investment across the region, especially in wholesale and commercial banks. Further, although all the variables were stationary, only Burundi and Kenya domestic saving rates, and investment rates were co-integrated. The Error correction models show the level of domestic savings impact greatly on investment in the short run and that it takes only one fiscal year for the savings and investment to stabilize at equilibrium in the face of external shocks. Nonetheless, the co-integrating regression results show there is weaker impact of savings on investment in the EAC due to flexible capital mobility and harmonized government policies.

To sum up, these results conform to the traditional Solow economic growth theory, in which that capital accumulation (through saving) is not the main driver of long run economic growth (investment) but rather some exogenous technological progress factors. The study supports the EAC partner states' regional economic integration, especially its monetary unification prospects, in removing significant barriers to capital mobility, exorbitant and multiple taxes on rate of returns and

capital income, lower discount rates to encourage higher savings, strong workers' unions, increased labour productivity so as to encourage households' savings and investment. But for EAC to have strong and sustainable economic growth in the long run, this study recommends that the community focuses on impressively improving the Solow residuals ($1-R^2$) of abstract knowledge (basic and applied research), education and skills of the labor force, number of years of schooling, learning by doing (thereby improving innovation), the strength of property rights (collateral reduces risk and makes finance accessible), the quality of infrastructure (to reduce transaction costs), and cultural attitudes towards entrepreneurship and work.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

REFERENCES

Adom AD, Elbahnasawy NG (2014). Saving-investment Gap and economic growth in developing countries: Simulated evidence from selected countries in Africa. British Journal of Economics, Management and Trade 4(10):1585-1598.

Attanasio OP, Picci L, Scorcu AE (2000). Saving, growth, and investment: a macroeconomic analysis using a panel of countries. Review of Economics and Statistics 82(2):182-211.

Engle RF, Granger CW (1987). Co-integration and error correction: representation, estimation, and testing. Econometrica: Journal of the Econometric Society 55(2):251-276.

Feldstein M, Horioka C (1980). Domestic Saving and International Capital Flows. Economic Journal 90(3):314-329.

Granger CJ (1986). Developments in the study of cointegrated economic variables. Oxford Bulletin of Economics and Statistics 48(3):213-228.

Helliwell JF (1998). How much do National Borders Matter? Washington, DC: Brookings Institution. Mimeo, August.

Hundie SK (2014). Savings, investment and economic growth in Ethiopia: Evidence from ARDL approach to co-integration and TYDL Granger-causality tests. Journal of Economics and International Finance 6(10):232-248.

Jagadeesh D (2015). The impact of savings in economic growth: an empirical study based on Botswana. International Journal of Research in Business Studies and Management 2(9):10-21.

Kudaisi BS (2013). Savings and its Determinants in West Africa Countries. Journal of Economics and Sustainable Development 4(18):107-120.

Lu L, McDonald IM (2006). Does China save too much?". The Singapore Economic Review 51(3):283-301.

Ogbokor CA (2014). A Time Series Analysis of the Determinants of Savings in Namibia. Journal of Economics and Sustainable Development 5(8):52-63.

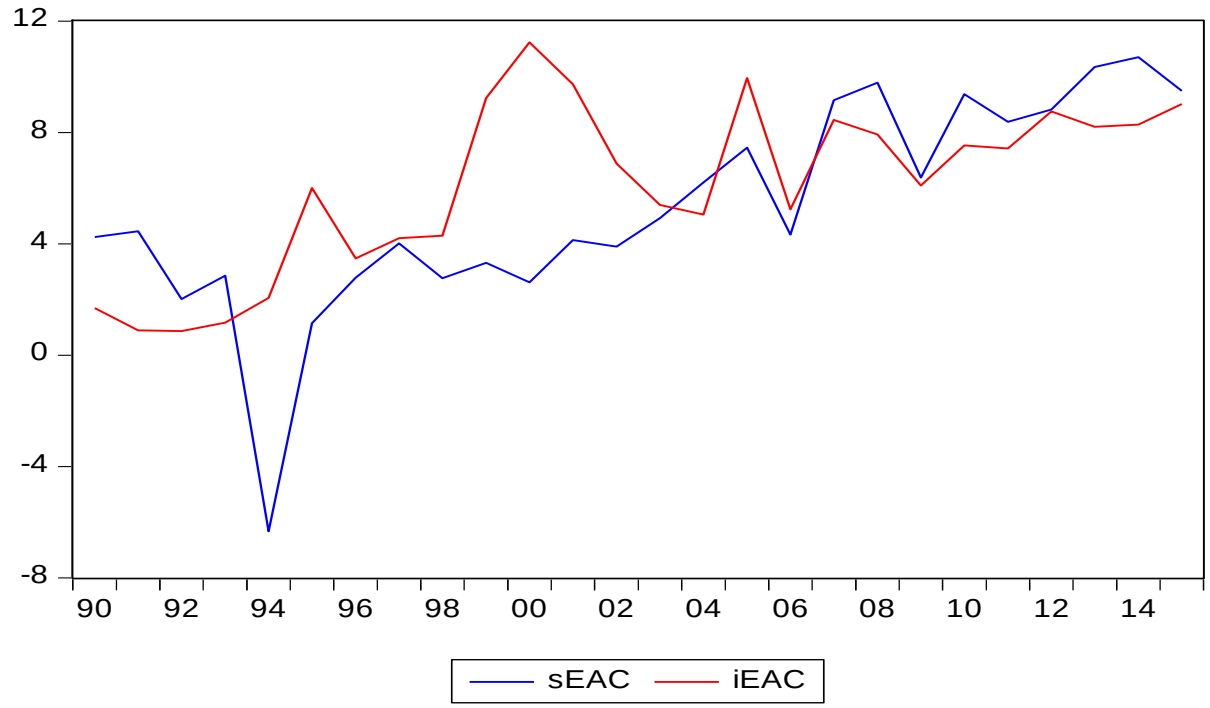
Romer D (2012). Advanced Macroeconomics (4th ed.)", New York: McGraw-Hill.

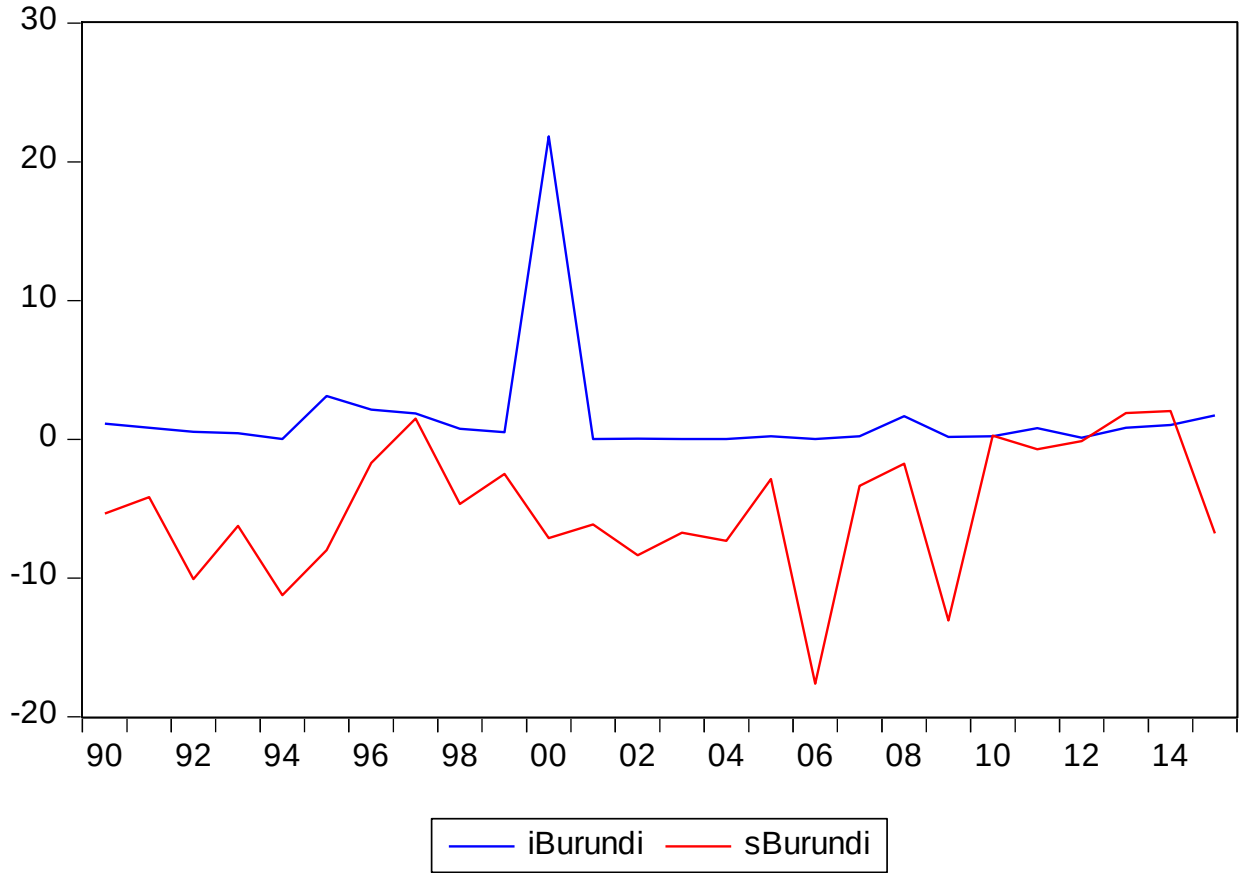
Verma R (2007). Savings, Investment and Growth in India: An Application of the ARDL Bounds Testing Approach. South Asian Economic Journal 8(1):87-98.

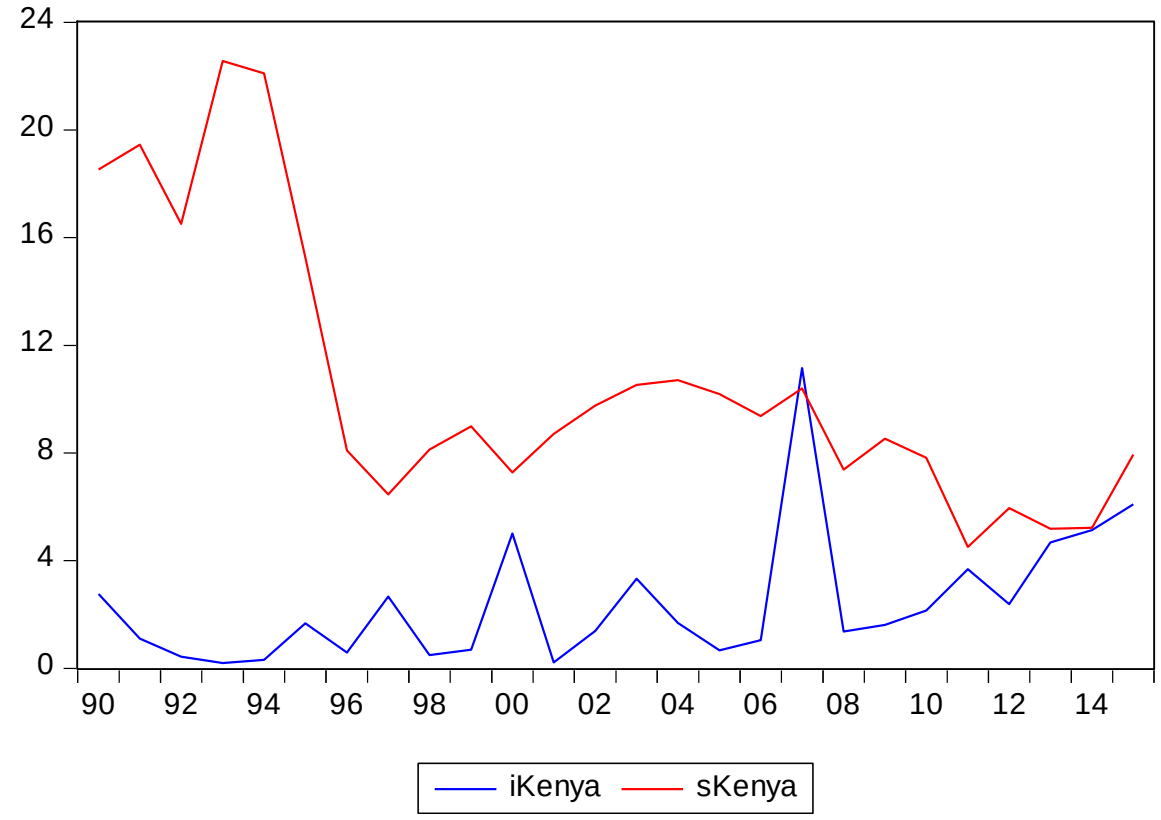
Weale M (2008). Commentary: The Balance of Payments and the Savings Gap. National Institute Economic Review 11(2):203-218.

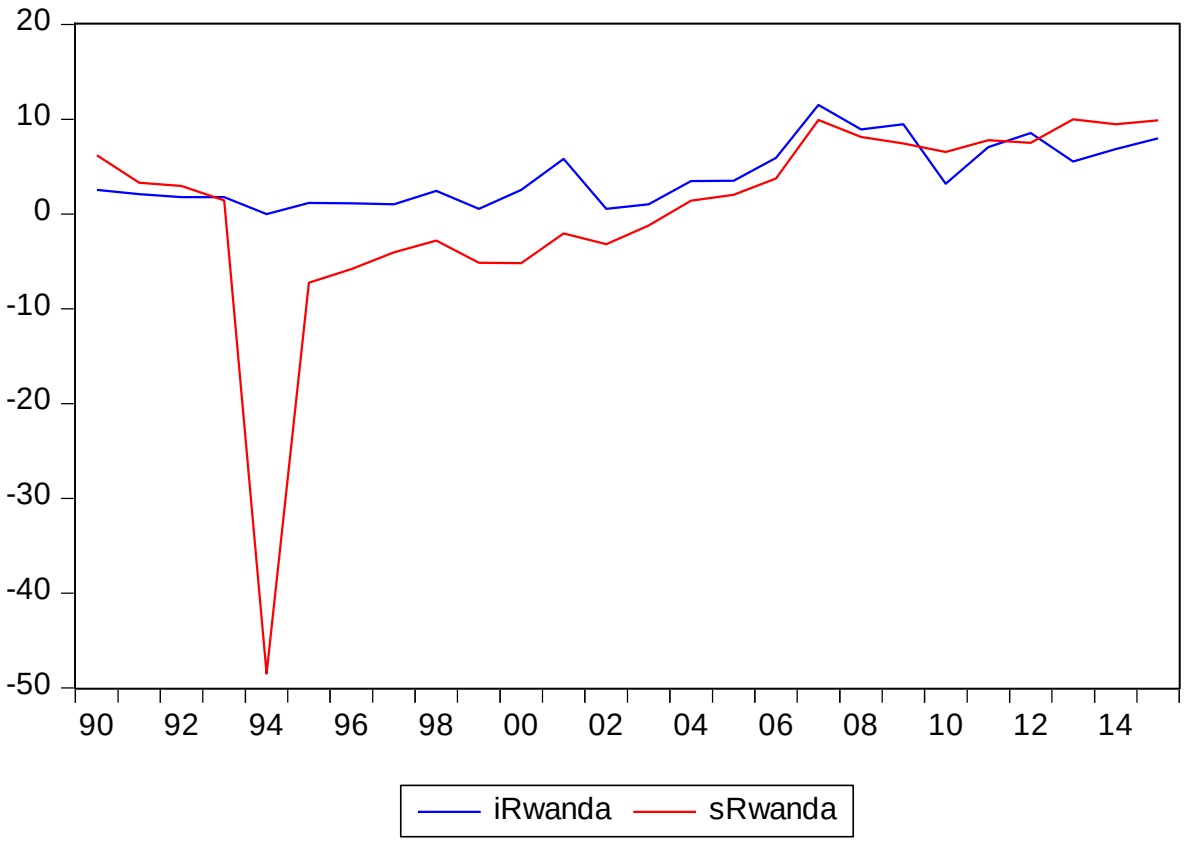
Young A (1995). The Tyranny of Numbers: Confronting the Statistical Reality of the East Asian Growth Experience. Quarterly Journal of Economics 110(3):641-680.

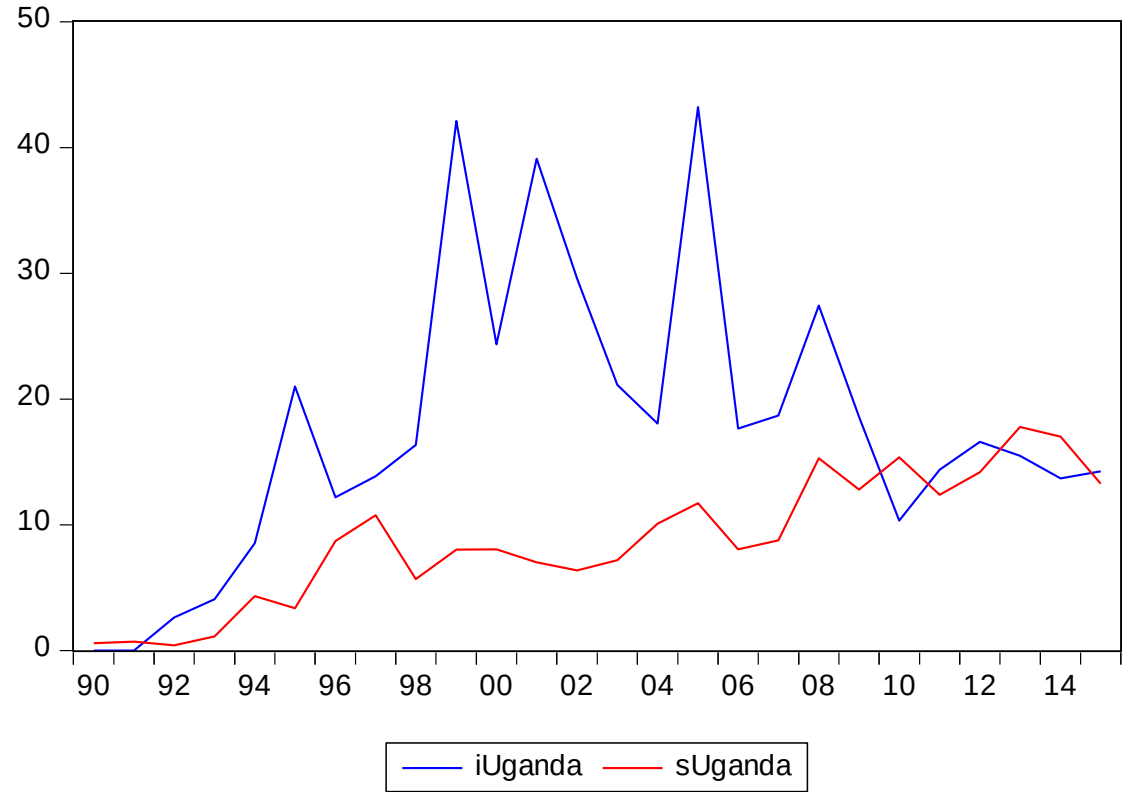
APPENDIX

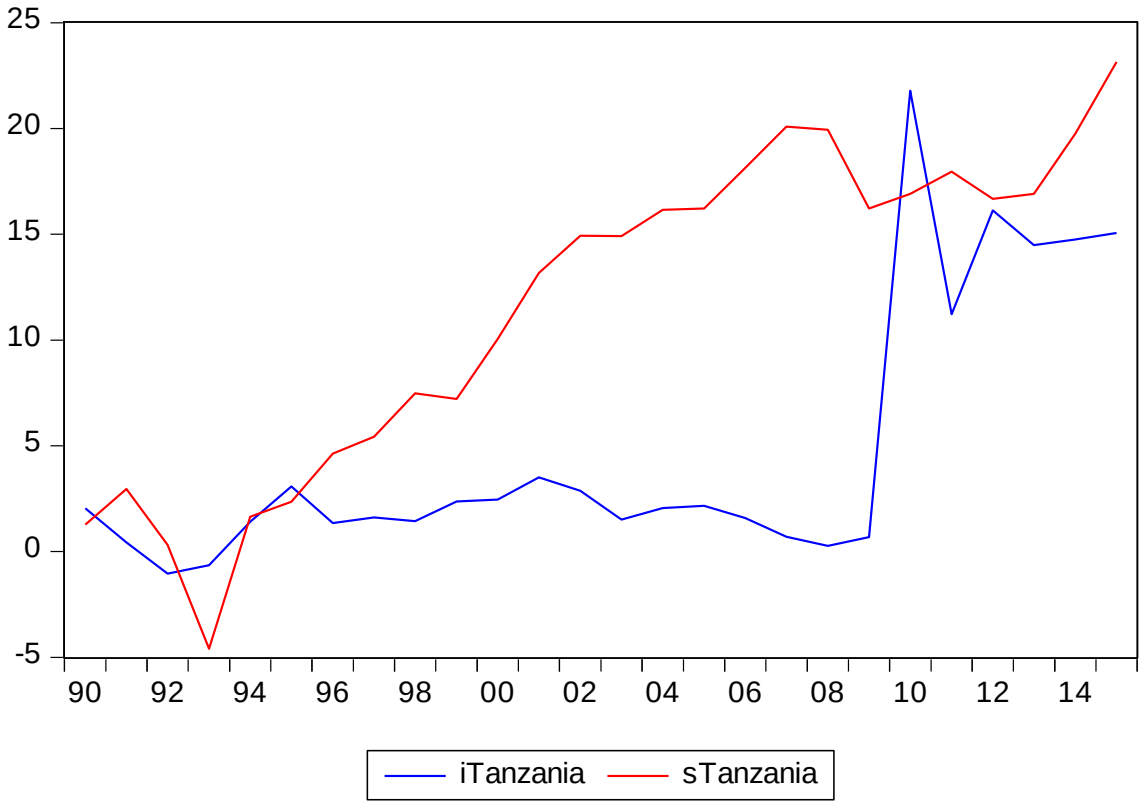

12
8
4
0
-4
-8
90
92
94
96
98
00
02
04
06
08
10
12
14
sEAC
iEAC


30
20
10
0
-10
-20
90
92
94
96
98
00
02
04
06
08
10
12
14
iBurundi
sBurundi


24
20
16
12
8
4
0
90
92
94
96
98
00
02
04
06
08
10
12
14
iKenya
sKenya


20
10
0
-10
-20
-30
-40
-50
90
92
94
96
98
00
02
04
06
08
10
12
14
iRwanda
sRwanda





Appendix Figure 1. Trends in Savings and Investment in Tanzania from 1990 to 2015.

Appendix Table 1. Cross Country Correlations, 1990-2015.

Covariance Analysis: Ordinary
Date: 09/07/18 Time: 14:37
Sample: 1990 2015
Included observations: 26

Correlation t-Statistic	IBURUNDI	IKENYA	IRWANDA	ITANZANIA	IUGANDA	IEAC	SBURUNDI	SKENYA	SRWANDA	STANZANIA	SUGANDA	SEAC
IBURUNDI	1.000000											

IKENYA	0.222714	1.000000										
	1.119182	-----										
IRWANDA	-0.115707	0.561851	1.000000									
	-0.570678	3.327333	-----									
ITANZANIA	-0.071725	0.313900	0.327262	1.000000								
	-0.352287	1.619656	1.696681	-----								
IUGANDA	0.084373	-0.075283	0.087449	-0.089655	1.000000							
	0.414822	-0.369858	0.430058	-0.440996	-----							
IEAC	0.320370	0.416467	0.474463	0.448135	0.742763	1.000000						
	1.656812	2.244140	2.640518	2.455802	5.434625	-----						
SBURUNDI	-0.036446	0.276289	0.104765	0.506091	0.036632	0.294036	1.000000					
	-0.178665	1.408353	0.516084	2.874652	0.179580	1.507101	-----					
SKENYA	-0.138173	-0.331773	-0.463115	-0.494729	-0.454533	-0.736842	-0.431643	1.000000				
	-0.683461	-1.722940	-2.559852	-2.788881	-2.499913	-5.339385	-2.344243	-----				
SRWANDA	-0.089719	0.382796	0.588978	0.337244	-0.011201	0.294682	0.316506	-0.465891	1.000000			
	-0.441312	2.029924	3.570374	1.754963	-0.054876	1.510725	1.634589	-2.579432	-----			
STANZANIA	-0.082495	0.503272	0.723888	0.514212	0.402229	0.728403	0.159456	-0.750018	0.493810	1.000000		
	-0.405525	2.853188	5.140192	2.937182	2.152293	5.208264	0.791296	-5.555226	2.782023	-----		
SUGANDA	-0.030608	0.355662	0.580874	0.675870	0.306427	0.683416	0.496972	-0.820018	0.391507	0.806780	1.000000	
	-0.150016	1.864279	3.495963	4.492514	1.577046	4.586179	2.805656	-7.019034	2.084366	6.689321	-----	
SEAC	-0.143940	0.514733	0.712025	0.592632	0.125493	0.535706	0.529329	-0.648662	0.869538	0.763624	0.741898	1.000000
	-0.712580	2.941234	4.967850	3.604457	0.619688	3.108002	3.056480	-4.175382	8.625504	5.794030	5.420549	-----

Appendix Table 2. Ordinary least squares regression results.

Dependent Variable: BURUNDIINV
Method: Fully Modified Least Squares (FMOLS)
Date: 03/13/17 Time: 13:52
Sample (adjusted): 1991 2015
Included observations: 25 after adjustments
Cointegrating equation deterministics: C
Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth = 3.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BURUNDISAV	0.014135	0.164863	0.085737	0.9324
C	1.613811	1.141175	1.414166	0.1707

R-squared	-0.001844	Mean dependent var	1.558982
Adjusted R-squared	-0.045402	S.D. dependent var	4.300247
S.E. of regression	4.396783	Sum squared resid	444.6292
Durbin-Watson stat	2.141535	Long-run variance	15.57239

Dependent Variable: KENYAINV
Method: Fully Modified Least Squares (FMOLS)
Date: 03/13/17 Time: 14:03
Sample (adjusted): 1991 2015
Included observations: 25 after adjustments
Cointegrating equation deterministics: C
Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth = 3.0000)

Appendix Table 2. Cont'd

Variable	Coefficient	Std. Error	t-Statistic	Prob.
KENYASAV	-0.210298	0.082180	-2.559003	0.0175
C	4.632617	0.936468	4.946901	0.0001
R-squared	0.096833	Mean dependent var		2.388115
Adjusted R-squared	0.057565	S.D. dependent var		2.503213
S.E. of regression	2.430097	Sum squared resid		135.8235
Durbin-Watson stat	2.109299	Long-run variance		4.076459

Dependent Variable: RWANDAINV
Method: Fully Modified Least Squares (FMOLS)
Date: 03/13/17 Time: 14:07
Sample (adjusted): 1991 2015
Included observations: 25 after adjustments
Cointegrating equation deterministics: C
Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth = 3.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RWANDASAV	0.235444	0.058146	4.049202	0.0005
C	4.091170	0.661962	6.180374	0.0000
R-squared	0.285032	Mean dependent var		4.146768
Adjusted R-squared	0.253946	S.D. dependent var		3.334137
S.E. of regression	2.879841	Sum squared resid		190.7501
Durbin-Watson stat	1.623663	Long-run variance		10.94982

Dependent Variable: TANZANIAINV
Method: Fully Modified Least Squares (FMOLS)
Date: 03/13/17 Time: 14:13
Sample (adjusted): 1991 2015
Included observations: 25 after adjustments
Cointegrating equation deterministics: C
Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth = 3.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TANZANIASAV	0.486385	0.218245	2.228620	0.0359
C	-0.791964	3.065656	-0.258334	0.7984
R-squared	0.252778	Mean dependent var		4.846974
Adjusted R-squared	0.220290	S.D. dependent var		6.435191
S.E. of regression	5.682349	Sum squared resid		742.6490
Durbin-Watson stat	0.846355	Long-run variance		65.06259

Dependent Variable: UGANDAINV
Method: Fully Modified Least Squares (FMOLS)

Appendix Table 2. Cont'd

Date: 03/13/17 Time: 14:15
Sample (adjusted): 1991 2015
Included observations: 25 after adjustments
Cointegrating equation deterministics: C
Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth = 3.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UGANDASAV	0.529623	0.611024	0.866779	0.3950
C	13.97166	6.319464	2.210893	0.0373
R-squared	-0.018736	Mean dependent var		18.52710
Adjusted R-squared	-0.063029	S.D. dependent var		11.08429
S.E. of regression	11.42827	Sum squared resid		3003.921
Durbin-Watson stat	1.018238	Long-run variance		219.9762

Appendix Table 3. Error correction model results.

Dependent Variable: D(BURUNDIINV)
Method: Least Squares
Date: 03/13/17 Time: 14:01
Sample (adjusted): 1992 2015
Included observations: 24 after adjustments

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(BURUNDISAV)	-0.094981	0.140991	-0.673666	0.5079
E(-1)	-1.073219	0.216494	-4.957275	0.0001
C	0.041781	0.928309	0.045008	0.9645
R-squared	0.542704	Mean dependent var		0.036761
Adjusted R-squared	0.499152	S.D. dependent var		6.425159
S.E. of regression	4.547125	Akaike info criterion		5.983336
Sum squared resid	434.2033	Schwarz criterion		6.130593
Log likelihood	-68.80003	Hannan-Quinn criter.		6.022403
F-statistic	12.46105	Durbin-Watson stat		1.992743
Prob(F-statistic)	0.000270			

Dependent Variable: D(KENYAINV)
Method: Least Squares
Date: 03/13/17 Time: 14:06
Sample (adjusted): 1992 2015
Included observations: 24 after adjustments

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(KENYASAV)	-0.029853	0.179451	-0.166358	0.8695
S(-1)	-1.132963	0.226467	-5.002773	0.0001
C	-0.064918	0.505284	-0.128479	0.8990
R-squared	0.546246	Mean dependent var		0.207925
Adjusted R-squared	0.503032	S.D. dependent var		3.432988
S.E. of regression	2.420119	Akaike info criterion		4.721979
Sum squared resid	122.9965	Schwarz criterion		4.869236
Log likelihood	-53.66375	Hannan-Quinn criter.		4.761046
F-statistic	12.64031	Durbin-Watson stat		1.936939
Prob(F-statistic)	0.000249			

Appendix Table 4. Macroeconomic Time Series Data for East Africa Community, 1990-2015.

Years	BV	UV	KV	RV	TV	BS	US	KS	RS	TS
1990	1.12	.00	2.76	2.52	2.04	-5.365178	0.575976	18.52811	6.1950422	1.278450
1991	0.82	.00	1.10	2.10	0.43	-4.178041	0.697929	19.45603	3.2829851	2.958188
1992	0.52	2.63	0.43	1.77	-1.05	-10.0894	0.408965	16.51074	2.9394659	0.320028
1993	0.44	4.07	0.20	1.77	-0.65	-6.23892	1.130992	22.55914	1.4185057	-4.599150
1994	0.01	8.53	0.31	0.00	1.40	-11.2358	4.323537	22.10794	-48.50794	1.638546
1995	3.12	21.00	1.67	1.15	3.08	-7.98850	3.372865	15.25719	-7.261453	2.356828
1996	2.14	12.18	0.58	1.11	1.34	-1.72327	8.709425	8.092988	-5.796891	4.631252
1997	1.87	13.85	2.67	1.01	1.62	1.49241	10.73908	6.456699	-4.063005	5.428324
1998	0.74	16.34	0.49	2.42	1.44	-4.66892	5.681318	8.133912	-2.816672	7.483576
1999	.50	42.10	0.69	0.53	2.36	-2.50329	8.027555	8.994628	-5.154609	7.214713
2000	21.83	24.35	5.01	2.55	2.45	-7.13464	8.037604	7.280151	-5.182551	10.05453
2001	0.02	39.11	0.22	5.80	3.51	-6.13738	7.008241	8.706622	-2.062357	13.17007
2002	0.04	29.58	1.39	0.52	2.87	-8.35356	6.36618	9.761485	-3.197895	14.93043
2003	0.01	21.12	3.33	1.01	1.51	-6.74469	7.171864	10.52341	-1.239291	14.91839
2004	0.02	18.03	1.68	3.46	2.05	-7.32352	10.07936	10.70694	1.3925724	16.15531
2005	0.22	43.21	0.67	3.50	2.16	-2.86909	11.72026	10.18891	2.013888	16.21806
2006	0.01	17.66	1.05	5.90	1.58	-17.6322	8.047911	9.366957	3.729603	18.13499
2007	.20	18.68	11.15	11.51	0.70	-3.35862	8.755775	10.40022	9.9273607	20.08406
2008	1.66	27.43	1.36	8.91	0.27	-1.77049	15.27979	7.382288	8.1204727	19.93571
2009	0.16	18.58	1.61	9.46	0.68	-13.0733	12.79438	8.534276	7.4245939	16.22100
2010	0.21	10.33	2.14	3.20	21.78	0.25744	15.35002	7.821894	6.5302437	16.91245
2011	0.79	14.37	3.68	7.05	11.22	-0.72301	12.37748	4.506046	7.7743109	17.95804
2012	0.11	16.60	2.38	8.55	16.13	-0.14567	14.16493	5.952824	7.4859075	16.67641
2013	0.83	15.49	4.67	5.55	14.48	1.89555	17.76884	5.183262	9.9712171	16.90609
2014	1.01	13.68	5.14	6.83	14.75	2.04193	17.01670	5.218337	9.4717330	19.75654
2015	1.70	14.24	6.09	7.99	15.06	-6.78462	13.27506	7.936885	9.8852150	23.15261

Source: World Bank and Africa Development Bank Databases (2019).

Related Journals: