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Growth effect of trade and investment in Sub-Saharan Africa countries: Empirical insight from panel corrected standard error (PCSE) technique

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Abstract: The pre-eminence of trade and investment in the economic prosperity of developed and developing countries cannot be overemphasized. Many studies have shown a strong positive impact of trade on economic growth across developed and the emerging market. However, very little is known about the simultaneous effect of trade and investment on growth in SSA when institutional control variables are introduced in the model. Therefore, this study examines the role of trade and investment in the growth process in the SSA using trade openness (% GDP), export (% of GDP) and import (% of GDP) as a measure of trade. We embrace an ideographic perspective that allows methodology and design that are sensitive to the nature of the study by deploying panel corrected standard error (PCSE). In this paper, we draw on 35 countries within the SSA. The research outcomes reveal that trade domestic investment and import affect growth in the region positively while export affects growth negatively. A possible reason for this is the nature of export of sub-Saharan African economies which are mostly affected by price volatility in the

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PUBLIC INTEREST STATEMENT

The relevance of trade and investment in the economic prosperity of any nation cannot be neglected. The research has looked at whether trade and investment have aided or discouraged growth in the sub-Saharan Africa (SSA) economies. We embarked on this study because very few studies in the past evaluated the simultaneous effects of both trade and investment on economic growth. It is equally of importance to state that our conceptual model factored in institutional control variables (government effectiveness, rule of law and regulatory quality) which may equally affect the relationship between the dependent and independent variables. The study result revealed that trade openness and import positively impact growth while export negatively impacts growth in the SSA. The outcome of the study further revealed that investment affects growth positively in the region.

global market among other factors such as low prices, vagaries of weather, etc.. We discuss the policy implication of the study.

Subjects: Development Studies; Economics and Development; Economics; Political Economy; Finance;

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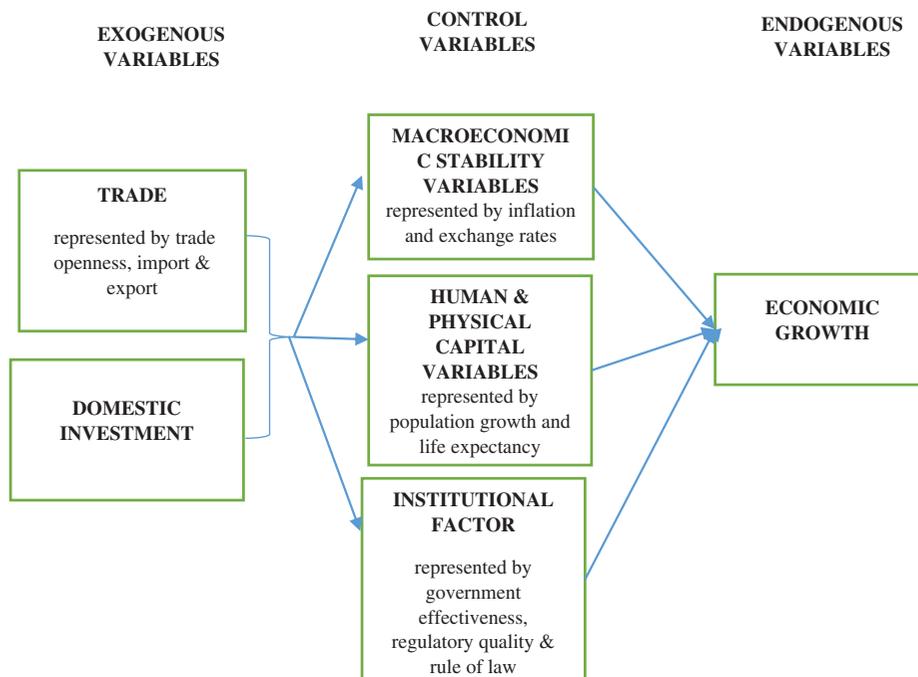
JEL classification: F1; F10; F11; F14; F43

1. Introduction

Both trade and investment have been widely acknowledged as catalytic agents in the growth process of developing countries and developed countries. For instance, much of the prolific studies on international trade, both theoretical and empirical have a general consensus that trade has become one of the major economic growth strategies used by nations more especially the sub-Saharan Africa (SSA) to ensure surplus production, enlarge potential markets, superior innovation, and efficient competition (Ali & Xialing, 2017; Emeka, Frederick, & Peter, 2012; Were, 2015). On the other hand, Mohsen (2015) pointed out that globally inclined countries have not only seen the need to improve their investment goals but also the need to create an attractive investment climate as these lead to a better source of output, employment creativities, higher income and economic growth in the country.

Upon the recognition that trade and investment are seen as the strategic engines through which the general economic growth of any country can be achieved, there is relatively fewer evidence on the connections among trade, investment and economic growth (Chaudhary & Qaisrani, 2002). Much of the prolific empirical studies have focused on the nexus between trade and growth (Geda & Seid, 2015; Goff & Singh, 2014; Were, 2015; Zahonogo, 2014) while the few formal research studies on trade, investment, and economic growth have focused on a single country study (Champa, Mohammed, & Debasish, 2017; Ali & Xialing, 2017; Paul & Milanzi, 2016). Although, the empirical analyses of these studies as mentioned above have shown that there is a significant correlation between trade, investment and economic growth at the individual country level.

Figure 1. Conceptual framework of the growth effect of trade and investment in SSA for the current study.



Meanwhile, the extant literature on the link among trade, investment, and economic growth is still inconclusive partly because the proxies and methodologies used to show the nexus among these threshold variables (i.e. trade, investment and growth) at individual specific country level may not be at best to generalise the multidimensional effects at cross-country level, thus the main concern of this study. According to Kenen and Voivodas (1972) and MacBean (1976), the impacts of trade may differ from country to country; given their volume of trade and dependency on the foreign sector, same also in the case of domestic investment as pointed out by Chaudhary and Qaisrani (2002).

Considering the fact that findings and results of earlier empirical studies in an attempt to explain and understand the multidimensional effects of trade, investment and growth remain inconsistent owing to factors such as the use of small samples size, nature of the methodologies and data used. The above premise, therefore, underscores the relevance of this study. In this study, we, however, re-examine the role of trade and investment in the growth process by empirically investigating the growth effect of trade and investment in sub-Saharan African countries using a panel corrected standard error (PCSE) technique. The empirical evidence is based on a sample size of 35 sub-Saharan African economies using annual data covering the periods 2000 to 2016. We employ the neoclassical augmented growth model developed by Mankiw, Romer, and Weil (1992) in the specification of the study model. The primary motivation underpinning the specification of the model is the inclusion of human capital which enhances growth and productivity of labour and also the study objectives which the study aims to achieve.

The remaining section of the paper is sub-divided as follows. Part two reviews the empirical literature connecting trade, investment, and growth while part three presents the empirical model and issues of the study. Part four present and discuss the empirical result. Part five presents the conclusion and policy insights from the research while the last part shows the limitation of the study and area of further study.

2. Empirical review of literature

Extant empirical studies on how trade influence economic growth abounds in the literature. Most of these studies have reported a positive and statistically significant relationship between trade and growth, as well as investment and growth. However, the degrees of causality vary significantly across countries, regional blocks, and continents. Although some scholars raised concerns over the dataset and statistical methods employed in establishing causality. Frankel and Romer (1999) study concluded that trade has a significant and positive effect on income and the effect of trade on income is like a one percent increase in trade increasing income per person from one to two percent. Hence, they concluded that the effect of trade on income is overwhelming.

In the overview of the previous cross-country empirical investigations in the 1980s and 1990s carried out by Harrison (1996), Giles and Williams (2000), and Lewer & Berg, (2003), they found that the relationship between trade and economic growth was statistically significant. Their findings were consistent across many empirical investigations in terms of the size of the relationship, which on the average, showed that one percent increase in trade (export) was associated with a one-fifth percent point increase in the gross national product (GNP). This consistency was robust across all the samples and inferential statistical methods deployed. Many studies in the 1990s were unequivocal in the direction of causation between trade and growth (Fosu, 1996; Frankel & Romer, 1999; Greenaway, 1998; Sachs, Warner, Åslund, & Fischer, 1995). Fosu's (1990) study revealed that export positively impacted economic growth using a sample of 28 developing countries in SSA.

The empirical inquiry of Onafowora and Owoye (1998) opined that export affects growth positively using a sample of 12 Sub-Saharan Africa (SSA) countries. Sachs et al. (1995) using the speed of integration measure to proxy trade, found that the fast people to integrate are the East Asian exporting economies while the weak integrators were mostly the low-income countries of

SSA and some middle-income countries of Latin America. Some other studies suggested that trade grows considerably faster after the implementation of trade liberalization (Falvey, Foster, & Greenaway, 2012, Salinas, Gueye, & Korbut, 2014; Wacziarg & Welch, 2008). Despite the response of trade reforms, however, not all reforms have been successful (Singh, 2010).

Recent studies have operationalized trade in the context of trade openness rather than the narrow perspective of trade as export activities (Winters & Masters, 2013). Trade openness gives trade a much wider definition, which includes export and import activities of a nation, unlike previous studies where trade was operationalized as export activities. Literature has shown that trade (export and import) has positively impacted growth and important for economic progress (Rodrik, 1999). Defining trade from the openness perspective (Savvides, 1995), research findings showed that trade significantly accounts for growth in Africa. Yanikkaya (2003) reported a significant positive association between trade and growth when trade was proxy by constructs as technology transfer, economic of scales, and comparative advantage. On a flip side, trade barriers including excise duties, import duties, and taxes on international trade demonstrated a positive association with the growth. Although, Yanikkaya (2003) conceded to the inherent limitations in measuring trade barriers. In a study, considering the effect of trade openness on growth and real income, a negative impact was experienced by developing countries while developed countries recorded a significant positive association (Kim, 2011).

Despite the scholarly contributions to the trade–growth relationship, very little is heard on the combined effect of trade and investment on growth. This obvious gap inevitably snowballs to a knowledge gap requiring scientific enquiry.

3. Model and econometric issues

The study utilizes the neoclassical augmented growth model which was developed by Mankiw et al. (1992) in a bid to estimate the growth effect of trade and investment. The main motivation underpinning the choice of the model is the inclusion of human capital which enhances growth and productivity of labour and also the aim of the study which is to investigate the growth effect of trade and investment. In line with previous empirical studies, the study adopts three measures of trade that is Trade Openness (%GDP); Export (%GDP) and Import (%GDP). Following similar studies and taking into account the heterogeneity of the coefficient, variables of interest (Trade and Investment) and control variables, the study model is expressed by adopting a standard growth regression as:

$$Y_{it} = \alpha_i + \beta Trade_{it} + \delta INV_{it} + \theta Z_{it} + \varepsilon_{it}$$

where Y_{it} is GDP per capita for country i at time t , α_i shows the country-specific effect. $Trade_{it}$ is trade measures. The trade measures are Trade Openness (%GDP); Export (%GDP) and Import (%GDP). INV_{it} is gross domestic investment (%GDP) for country i at time t , Z is the vector of control variables (life expectancy at birth (LE), population growth (POPGR), real exchange rate (REXR), inflation (INF), government effectiveness (GE), regulatory quality (RQ), and rule of law (RL)). The life expectancy at birth and population growth was included in the model to capture the impact of human capital while real exchange rate and inflation were used as a substitute for macroeconomic stability. In addition, government effectiveness, regulatory quality, and rule of law were included in the model to account for the institutional variables. The ε_{it} is the error term while β , δ and θ are the parameter coefficients to be estimated in the study.

The above model is estimated using the panel corrected standard error (PCSE) technique. The technique is employed because it provides an estimate that is free from autocorrelation, accurate standard error estimate, and it is less sensitive to outlier estimates. Furthermore, the panel corrected standard error (PCSE) technique is used when working with dynamic heterogeneous panel data (Bailey & Katz, 2011; Eboiyehi, 2017; Reed & Webb, 2010).

4. Data and variable definition

Annual data covering the period 2000 to 2016 for 35 sub-Saharan African economies were employed in the study. The covering period and selection of countries in the study were based on the availability of data. The dependent variable used in the study is GDP per capita (PCY) while the independent variables are trade and investment as a percentage of GDP (INV). The study employs three measures of trade: Trade Openness (%GDP); Export (%GDP) and Import (%GDP) in line with previous studies. A set of control variables usually employed in the growth equation were also included in the study model. Table 1 shows the variables, definition, and sources of all the variables used in the study.

5. Empirical result and discussion

Prior to investigating the growth effect of trade and investment and growth, the stationarity properties of the variables were first examined as a preliminary test. As shown in Table 2, the research outcome revealed that at first difference, all the variables became stationary. This implies that the variables have no unit root. Hence, the null hypothesis of the existence of a unit root test is rejected.

We also conducted the cointegration test using Kao (1999) in a bid to investigate whether the variables are cointegrated. The result as revealed in Table 3 showed that the variables are cointegrated. This implies that the variables have a long-run relationship.

The PCSE estimation result for the effect of trade and investment on growth is summarized in Tables 4–6, respectively. The PCSE estimation result in Table 4 revealed that trade openness as a share of GDP affects growth in the region positively. This implies that trade openness as a share of GDP has significantly influenced the growth of sub-Saharan Africa economy which is consistent with previous empirical studies. The result also revealed that domestic investment affects growth in the region positively. This implies that domestic investment has significantly contributed to the growth of the sub-Saharan African economy which is consistent with previous empirical studies.

In Table 5, the PCSE estimate revealed that export has a negative and insignificant relationship with growth. This implies that export as a share of GDP has not contributed immensely to the growth in the region. The reason for this is the nature of export of sub-Saharan Africa countries which are mostly primary commodities that are subject to price volatility and fetch low prices in the global market. Also, weak institution, inadequate infrastructures, pest and vagaries of weather has contributed to the low competitiveness of export of sub-Saharan African economies (Were, 2015). The outcome of the PCSE regression also showed that domestic investment has a positive effect on growth in sub-Saharan African countries. This suggests that domestic investment has been a catalyst for growth in the region.

In Table 6, the PCSE regression estimate showed that import as a share of GDP affects growth in the region positively. This suggests that import as a share of GDP has contributed immensely to the growth in the region. The result also indicates that domestic investment affects growth positively in the region. This implies that in sub-Saharan African economy domestic investment has immensely contributed to the growth in the region.

In addition, across the PCSE estimates in Tables 4–6 the effect of exchange rate on growth in the region is positive while the effect of inflation on growth is negative which indicates the significance of a stable macroeconomic environment for growth in the region. Furthermore, the PCSE regression estimates on population growth and life expectancy at birth as presented in tables 4–6 showed that population growth affects growth in the region positively. This implies that sub-Saharan African economies stand to benefit from the positive growth in population. The life expectancy at birth indicates a negative and significant effect on growth which is an indication of the economic burden of the ageing population (Were, 2015). The PCSE regression estimates presented in tables 4–6 also indicates that the institutional control variables such as government effectiveness and rule of law have a positive effect on growth while the regulatory quality has

Table 1. Variable, definition and source

Variable	Definition	Justification	Source
Dependent variable			
GDP per Capita (PCY)	GDP per capita is gross domestic product divided by midyear population	Were (2015), Zahanogo (2016), Iyoha and Okim (2017)	World Development Indicator
Independent variables			
Gross Domestic Investment as a percentage of GDP (INV)	Gross domestic investment consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories.	Were (2015); Zahanogo (2016); Iyoha and Okim (2017)	World Development Indicator
Trade measures:			
Trade Openness as a percentage of GDP (TO)	Sum of exports and imports of goods and services as a share of GDP	Rodrik (1999); Kim (2011); Were (2015); Zahanogo (2016); Semancikova (2016)	World Development Indicator
Exports of goods and services as a percentage of GDP (Export)	Exports of goods and services shows the value of all goods and other market services provided to the rest of the world.	Onafowora and Owoye (1998); Were (2015); Zahanogo (2016); Iyoha and Okim (2017)	World Development Indicator
Imports of goods and services as a percentage of GDP (Import)	Imports of goods and services represent the value of all goods and other market services received from the rest of the world.	Frankel and Romer (1999); Were (2015),	World Development Indicator
Macroeconomic stability variables			
Inflation (INF)	Annual percentage change of consumer price index	Were (2015); Zahanogo (2016); Iyoha and Okim (2017)	World Development Indicator
REXR	Real effective exchange rate is the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs.	Mustafa, Nishat, and Kemal (2004); Onafowora and Owoye (2008); Adaramola (2016); Iyoha and Okim (2017);	World Development Indicator
Human and physical capital variable			
POPGR	Population growth rate	Were (2015); Zahanogo (2016); Iyoha and Okim (2017)	World Development Indicator
Life expectancy at birth (LE)	Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.	Were (2015)	World Development Indicator
Institutional Variable			
Government effectiveness (GE)	Refers to the quality of bureaucracy and institutional effectiveness. It also refers to the quality of policy formulation and implementation.	Ozpolat, Guven, Ozsoy, and Bahar (2016); Alam et al., (2017)	Economist Intelligence Unit

(Continued)

Variable	Definition	Justification	Source
Dependent variable			
Regulatory quality (RQ)	This refers to the formulation and implementation of policies and regulation that allows and enhance the development of the private sector.	Chong and Calderon (2000); Chang (2010); Ozpolat et al. (2016)	Economist Intelligence Unit
Rule of law (RL)	This refers to law and order, property right, efficiency of the judicial system and quality of contract enforcement.	Ozpolat et al. (2016)	Economist Intelligence Unit

Source: Authors

Table 2. Panel stationarity test

Variable	First Difference			
	LLC	IPS	ADF	PP
PCY	-32.0971*** (0.0000)	-26.0817*** (0.0000)	454.206*** (0.0000)	636.126*** (0.0000)
INV	-28.4728*** (0.0000)	-11.6726*** (0.0000)	262.673*** (0.0000)	375.797*** (0.0000)
TO	-16.6674*** (0.0000)	-9.03073*** (0.0000)	235.870*** (0.0000)	348.601*** (0.0000)
EXPORT	-30.61*** (0.0000)	-24.814*** (0.0000)	430.660*** (0.0000)	478.839*** (0.0000)
IMPORT	-17.6425*** (0.0000)	-9.67,186*** (0.0000)	245.909*** (0.0000)	344.332*** (0.0000)
INF	-25.9173*** (0.0000)	-19.5827*** (0.0000)	377.353*** (0.0000)	541.306*** (0.0000)
REXR	-12.8267*** (0.0000)	-7.11,183*** (0.0000)	180.602*** (0.0000)	361.671*** (0.0000)
POPGR	-7.33,345*** (0.0000)	-13.4196*** (0.0000)	334.713*** (0.0000)	369.787*** (0.0000)
LE	-9.66,863*** (0.0000)	-4.38,091*** (0.0000)	188.635*** (0.0000)	150.508*** (0.0000)
GE	-6.7126*** (0.0000)	-6.4458*** (0.0000)	99.7812*** (0.0000)	222.757*** (0.0000)
RL	-5.89,242*** (0.0000)	-6.16,999*** (0.0000)	118.074*** (0.0000)	274.951*** (0.0000)
RQ	-7.35,486*** (0.0000)	-6.55,826*** (0.0000)	108.503*** (0.0000)	233.271*** (0.0000)

Note: The ***, **, and * the shows the rejection of the null hypothesis of a unit root at 1%, 5%, and 10% while the values in parentheses show the standard error.

a negative effect on growth due to the nature of policies in the region which are restrictive by nature and this, in turn, have a negative effect on investment expansion and growth.

Table 3. KAO Residual Cointegration Test

	t-Statistic	Prob.
ADF	-8.094521	0.0000
Residual variance	40.38,641	
HAC variance	20.34,728	

Source: Authors

Table 4. PCSE regression estimate for trade openness (% GDP), investment and growth

Dependent Variable	PCY
TO	0.0087** (0.05)
INV	0.143*** (0.013)
INF	-0.0068 (0.2833)
REXR	0.0002 (0.2566)
POPGR	0.4297*** (0.0058)
LE	-0.1586*** (0.0000)
GE	4.1847*** (0.0006)
RL	1.8718 (0.2493)
RQ	-3.9053*** (0.0013)
Constant	5.7478*** (0.0002)
Durbin Watson	2.0
Number of countries	35
Number of observation	527

Note: *** ** * indicates significance at 1%, 5% and 10% level, respectively.

6. Concluding remarks

The extant studies have unequivocally stated the positive impact of trade on economic growth across developed and the emerging markets. However, very little is known about the impact of trade and investment on growth in the SSA. The study investigated the growth effect of trade and investment in sub-Saharan Africa economies between the periods 2010 to 2016 by employing panel corrected standard error (PCSE) technique. The dependent variables used in the study are growth which is measured as GDP per capita while the independent variables used in the study are trade and investment. In line with previous studies, control variables were also included in the model.

The research outcome revealed that Trade openness (%GDP) and Import (%GDP) affect growth in the region positively while Export (%GDP) affects growth negatively. Possible reason for this is the nature of export of sub-African economies which are mostly affected by price volatility in the global market among other factors such as low prices, vagaries of weather, etc.. The research outcome also revealed that domestic investment affects growth positively in the region which is an

Table 5. PCSE regression estimate for Export (% GDP), Investment and Growth

Dependent Variable	PCY
EXPORT	-0.0028 (0.6034)
INV	0.1502*** (0.0000)
INF	-0.0033 (0.5769)
REXR	0.0007 (0.7277)
POPGR	0.3917*** (0.01)
LE	-0.1615*** (0.0000)
GE	4.1033*** (0.0006)
RL	2.2500 (0.1472)
RQ	-3.9946*** (0.0005)
Constant	6.5739*** (0.0000)
Durbin Watson	1.93
Number of countries	35
Number of observation	527

Note: *** * indicates significance at 1%, 5% and 10% level, respectively.

indication that domestic investment has significantly contributed positively to the growth of SSA economies.

The study recommends that government in the region should create a conducive environment by reducing the cost of doing business and providing infrastructures, granting tax rebate so as to encourage local producers. Furthermore, the region should deploy technology with a view of increasing the value addition of its primary commodities. For the region to unlock its growth and trade potential, the study recommends the need for effective trade integration at the regional and global level.

7. Policy implication

The influences of both trade openness (trade) and capital formation (investment) remain potent factors contributing to aggregate income in SSA. The capital formation build-up is on the increase in SSA through both domestic investment and Foreign Direct Investments (FDI) and encouragement of local manufacturers through various incentive programmes of various governments that could aid the purchase of capital stock for firing the production plants. The positive impact of trade on economic growth is not by serendipity rather trade policies have evolved remarkably since 1960 in SSA. The trade policy formulation and implementation in SSA was a consideration for protectionist policies in a bid to protect the domestic market from foreign competition and encourage domestic industrial development. Between the period 1960–2015, the trade policies such as import substitution, investment incentive policy, nationalization policy, guided privatization, import

Table 6. PCSE regression estimate for Import (% GDP), Investment and Growth

Dependent Variable	PCY
IMPORT	0.016*** (0.0098)
INV	0.1429*** (0.0000)
INF	-0.0053 (0.4085)
REXR	0.00002 (0.3046)
POPGR	0.5055*** (0.001)
LE	-0.1613*** (0.0000)
GE	4.2026*** (0.0007)
RL	2.1797 (0.1824)
RQ	-4.0561*** (0.0009)
Constant	5.68,337*** (0.0003)
Durbin Watson	2.0
Number of countries	35
Number of observation	527

Note: *** ** * indicates significance at 1%, 5% and 10% level, respectively.

prohibition, exchange rate control, deregulation of interest rate, export incentives, and foreign exchange restrictions have been implemented purposely to boost trade.

However, the study results indicate that the major factor contributing to a positive impact of trade on aggregate income is import while export indicated an inverse relationship to aggregate income. An important question is: why export activities of SSA countries have not contributed to the growth in the region. The answer may be that exporting activities are shallow and could be equated with a heavy reliance on exports of one or two primary commodities only (e.g. crops and crude oil). The over-reliance on the primary commodity by the SSA has been identified as a root cause of economic problems that have been afflicting developing countries.

The data have pointed out that in many developing countries primary commodity exports accounted for a very high percentage of total exports. As a consequence, a shortfall in production and/or a decline in commodity prices can plunge the exporting developing countries into economic crisis. According to Prebisch-Singer thesis (see Prebisch, 1950; Singer, 1950) as a result of a continuous decline in the terms of primary commodity trade, the developing countries are increasingly able to import a fewer amount of manufactured goods for a given amount of primary commodities they export. In other words, primary commodities exporters will have to keep increasing the volume of primary commodities exports in order to import the necessary manufactured goods (Todaro, 2000). For several decades, until the 1980s, the

Prebisch-Singer thesis generated considerable interest among the economists and spurred numerous empirical studies on the topic. Therefore, export under this circumstance will negatively impact on aggregate income.

This paper posits that governments of SSA countries must re-strategise by shifting their focus from the export of primary products (including cash crops, mineral, and crude oil) to value-added products. A comprehensive study of the entire value-chain of each product or mineral must be conducted with the expectation of processing primary products into intermediate and final products for export. For instance, crude oil could be processed into about eight or more other finished products, including butane, diesel fuel, premium motor spirit, gasoline, kerosene, liquefied natural gas, liquefied petroleum gas, and propane. It is interesting to note that Nigeria spends at least fifty percent of its total crude oil export value on the importation of refined petroleum. This is like throwing away industrialization, investment and employment opportunity to other countries.

Governments of SSA countries must now create policies that will encourage local conversion of raw materials or primary products to both intermediate and finished products for real economic prosperity and growth. Export-led growth that only geared towards exportation of primary products is counterproductive in the medium to long run. The current asymmetrical shape of trade occasioned by booming importation giving rise to aggregate income is voodoo and not sustainable economic growth. The World Bank (1993) identified Singapore, South Korea, Taiwan, Thailand Hong Kong, Indonesia, Japan, and Malaysia, as eight East Asian nations with vibrant economic growth because of their export-led growth.

Major policy shift has become inevitable. The policies that will encourage local conversion of primary products to intermediate or finished goods before exportation is needed in promoting growth in the region. Therefore, the governments must be prepared to institute a regime of waivers, grant and tax incentives (e.g. pioneer status) that will encourage conversion of all the cash crops, minerals, and metals to at least semi-finished goods rather than primary product before exportation.

8. Limitation of the study and area of further study

The study investigated the growth effect of trade and investment in sub-Saharan Africa economies. Future research should be carried out to compare the growth effect of trade and investment between sub-Saharan Africa countries, Developed countries, and Latin American. Furthermore, the dynamic interaction among growth, trade, and investment can also be investigated at both cross-country level and single country level.

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