The relationship between Trade Liberalization, Growth and Balance of Payments in Sub-Saharan Africa: Insights from Dynamic Panel Data Analysis

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Abstract
The general objective of this paper is to analyze the relationship between trade liberalization, growth, and the balance of payment in Sub-Saharan Africa. The paper covers a total of 37 sub-Saharan African countries for a period of 24 years, spanning from 1996 to 2019. The formal regression analysis makes use of generalized moment methods (GMM). We also allow control variables in sets of regressions, such as terms of trade, gross fixed capital formation, inflation, labor force, government debt, foreign direct investment, and real effect exchange rate. First, we examine the impact of trade liberalization, measured by trade-to-GDP ratio and tariffs, on economic growth (real GDP). Next, we analyze the impact of growth on trade balance and current account balance to examine whether higher economic growth due to trade liberalization leads to an effect on the balance of trade. Results in the growth model suggest that the trade-to-GDP ratio has a positive and significant effect on economic growth while tariffs exert no effect on growth. Empirical results show that in the balance of trade and current account balance models, economic growth, trade-to-GDP ratio, and tariffs exert a positive and significant impact on both the balance of trade and current account. The results imply that sub-Saharan governments and policymakers should pursue policies that will promote trade openness.

Key words: Liberalization; Growth; Balance of Payments; Sub-Sahara Africa
Classification: F32, F14, 024, C21, C23

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1. Introduction

Trade liberalization has been an important policy debate in developmental literature since the early 1970s. The center of this debate has placed particular emphasis on the role of openness in economic growth and productivity as part of its development strategy. As seen in many countries, the principal motive of governments, especially in recent years, has been to obtain high and sustainable economic growth to prevail in a challenging world of trade relations (Manni & Afzal, 2012). In attaining this principled goal, countries have embarked themselves on popular economic policies that allow the reduction and removal of barriers to trade, such as tariffs, quotas, and import/export controls, to name but a few. Among many policies, countries, including Sub-Saharan Africa, have decided to opt for trade liberalization of their economies (Hearth, 2010). In fact, trade can affect economic growth through the promotion of better resource allocation, facilitation of the use of knowledge, technological development, and competition in domestic and international markets for goods. Similarly, according to Andersen & Babula (2009), international trade can affect economic growth through an increase in the market size for new types of products.

The rationale for trade liberalization reforms is dismal economic performance, which fundamentally reflects domestic policy inadequacies, and it is precisely these policy inadequacies that need to be re-examined and addressed. In order to realize economic recovery, liberalization of internal and external trade and greater reliance on market forces have been accorded high priority in the policy agenda. These policies have primarily been designed to restore equilibrium, especially in the balance of payments and by boosting productivity and exports in both the manufacturing and agricultural sectors.

Over the last three decades or so, developing countries in Sub-Saharan Africa have adopted a series of trade liberalization measures. Trade liberalization has, among other things, entailed a substantial reduction in the role of the government in production and marketing; the abolition of controlled prices; the removal of export taxes; the relaxation of foreign exchange and import controls; and bolstering the participation of the private sector in the economy (Kazungu, 2009).

Unquestionably, these reforms also arose as a response to the protracted economic crisis that hit many African countries in the 1980s. The severity of the crisis was pronounced in slow and negative growth, a drastic fall in the share of Sub-Saharan African exports in the world trade, a decline in manufacturing output, and an unfavorable trade balance. Thus, the role of trade and trade policy reforms in Sub-Saharan Africa not only remains questionable but also poses serious questions about development strategy. To this extent, some studies argue that the relationship between trade liberalization, growth, and the balance of payment has failed due to a combination of internal and external problems. But other studies have confirmed that trade liberalization has achieved the biggest outcomes in Sub-

Saharan African history. According to Manni & Afzal (2012), trade liberalization policies open up the opportunity for countries' economies to enhance growth and foster overall development. Moreover, as noted by Thirlwall (2000), generalized trade liberalization in the form of unilateral tariff reductions or the reduction of non-tariff barriers to trade improves growth performance. However, according to Salinas & Aksoy (2006), there is no conclusive evidence about the economic impact of trade liberalization on the economic growth of countries. Yet, Herath (2010) produces mixed results in terms of the relationship between trade liberalization and economic growth.

Trade liberalization has been plagued by policy interruptions and reversals. To this end, there is a need for this paper to examine the relationship between trade liberalization, economic growth, and the balance of payment in Sub-Saharan Africa. The paper, therefore, aims to fill the knowledge gap on the relationship between international trade, economic growth, and the balance of payment in Sub-Saharan Africa by using secondary data spanning from 1996 to 2019. Findings from the paper may help policymakers with the formulation and reform of trade liberalization policies.

2. Literature review
2.1.Theoretical literature review
Trade liberalization is a controversial topic. Critics of trade liberalism argue that the policy can be costly because cheap goods will flood the nation's domestic market. Critics also propose that products can be cheaper and safer than competing with home-made products that can be safely reached by quality inspection. Proponents of trade liberalization, however, claim that it ultimately reduces consumer costs, increases efficiency, and promotes economic growth. Free trade promotes trade, which allows countries to sell goods without legal restrictions or their associated costs. This reduced law reduces costs for countries that do business with other nations and may, ultimately, result in lower consumer prices because imports are lower in fees and competition may increase. This competition may also stimulate countries to transfer resources to industries that may have a competitive advantage. However, free trade can adversely affect some businesses within the country due to high competition from outside producers and may result in limited local support for those industries. There may also be financial and social risks if goods or raw materials come from countries with low environmental standards. Trade liberalization can be a threat to developing economies because they are forced to compete in the same market as powerful economies. This challenge can discourage the domestic industry.

Theories related to trade relations and the economic growth of many countries owe their origins to the Ricardian comparative advantage theory and the Hecksher-Ohlin Factor Endowment theory. According to this theory, two countries would trade profitably if they sold the products they produced at the

lowest possible cost. With free trade and the abolition of trade, international trade will be enhanced by the efficient use of resources given the status of technology. Meanwhile, the Heckscher-Ohlin (H-O) theory argues that trade between countries depends on a multitude of factors. There will be a great deal of mutual respect if business countries have significant technological differences and capabilities. Small business is expected among countries with similar capabilities. This theory explains what we call the "North-South" business model. However, the royal findings from the USA and Wassily Leontief abandoned the theory and criticized the H-O theory, which led to the Leontief Paradox problem.

By and large, the free trade model suggests that all countries gain from trade and world productivity increases. Countries will specialize in products that maximize their resources, and given the same technology and products around the world, the price of resources will be the same in all business countries. Enabling the country to move beyond the production of trade borders is thought to stimulate growth by acquiring capital and consumer goods from other parts of the world. International trade, therefore, stimulates economic growth. However, it is not obvious that all resources have the same quality or are fully supported within and outside the business world. Neither the production technology is performing nor are the markets constantly competing to seek cost reductions and maximize profits.

Thirlwall (1979) developed a post-Keynesian long-run growth model, which gives a central role to demand, using Harrod's (1933) foreign trade multiplier. Thirlwall (2013) argues that for most countries, demand constraints operate long before supply constraints take effect. The original Thirlwall (1979) model to estimate the balance of payments constrained growth rate starts with the balance of payments equilibrium condition,

$$P_d X = P_f ME \tag{1}$$

where P_d = the price of exports in the domestic curreny.

         X = the volume of exports

         P_f = the price of imports in foreign currency

         M = the voulume of imports

         E = the exchange rate measured as the domestic price of foreign currency

The Thirlwall's (1979) balance of payments constrained growth model predicts that a country's long-run growth of GDP can be approximated by the ratio of the growth of real exports to the income elasticity of demand for imports, assuming negligible effects from real exchange rate movements. The original model described above was extended to include capital flows and terms of trade (Thirlwall & Hussain, 1982). The extension is particularly relevant for developing countries, where capital flows, changes in the terms of trade and the real exchange rate have been very important. Due to the tendency of the Thirlwall & Hussain

(1982) model to over predict the rate of growth, the model was extended by Elliott & Rhodd (1999) to include interest rate payments because demand financed by capital flows generally carries with it debt accumulation and servicing (Sumra, 2016).

2.2.Empirical literature review

A number of studies have examined the relationship between trade liberalization, the balance of payments, and economic growth using time series and panel data. For example, Sachs & Warner (1995) studied the relationship between openness and growth as well as policy variables, namely, tax and non-tariff measures, black market exchange rate, import and export monopoly, and import and export monopoly. Their results show that the index of openness is strongly and positively related to growth. Similarly, Greenway *et al.* (1998; 2002) show that, ultimately, liberalization increases growth by 2 percent, and that the open economy is about 50 percent richer in terms of GDP than closed economies. However, it should be understood that, according to Greenway *et al.* (1998; 2002), trade liberalization negatively affects economic growth in the initial stages before having a positive impact.

Wacziarg & Welch (2003) while simulating the work of Sachs and Warner, similarly to Greenway *et al.* (1998; 2002), but through updated data, show that trade liberalism has a strong and powerful effect on growth. In the same vein, Herath (2010) examined the impact of free trade on economic growth and the balance of trade in Sri Lanka before and after free trade. Using the Chow archive analysis and test, the results of the study confirmed the positive relationship between trade liberalization and economic growth. Furthermore, results of the Chow experiment confirmed a shift in economic growth before and after the country's free trade. According to Khan (2011), trade liberalization can have a positive and beneficial effect on economic growth if supported by proper planning and strong economic policies. Trade liberalization should integrate and intensify efforts by domestic and foreign institutions directed towards export-oriented industries and services and improve market access.

In another study, Kazungu (2009) studied trade liberalization and the structure of production in Sub-Saharan Africa, using parametric and non-parametric tests to assess the impact of liberalization policies on the growth rate of exports. He also used ordinary least squares (OLS) to test the relationship between diversification and then estimated the impact of liberalization on land production. The results show that despite marked differences in the traditional shipping structure, especially in the late 1990s, the contribution of free trade to promoting export growth is weak. Moreover, despite the fact that the number of food crops during the post-reform period is much higher than before, there is no sign of a gradual increase in time. Furthermore, results show that the impact of trade liberalization on land production is mixed; while in traditional shipping its effect is negative

and significant, it is insignificant in non-traditional shipping. Too, Kim & Lin (2009) show that not all parts of shipping contribute equally to economic growth. This is especially suited to developing countries such as sub-Saharan Africa that are largely dependent on exports of products that are affected by many price differences. Admittedly, the performance of exports depends largely on the exchange rate. Different studies have shown that demand for exports increases when its export prices fall in line with global prices. Its currency depreciation in comparison with other currencies, especially in dollars, makes exports more affordable in the international market (see, for example, Brada *et al.,* 1997; Ndulu & Lipumba, 1990).

The earliest empirical literature on the relationship between trade policy reform and economic performance in the 1970s and 1980s used the ratio of trade dependence and export growth rate as a means of transparency (Balassa, (1978, 1982, and 1985). The problem with these indicators, however, is that they are not linked to trade policies since a country can distort trade and still maintain a high level of trade dependency. Other studies employed tax breaks and excise taxes as potential candidates for trade liberalization (Litle *et al.,* 1970; Balassa, 1971). However, Pritchett & Seth (1994), Krugman (1994), and Rodrik (1995) argue that average tariffs are not a good proxy for transparency because they undermine the true level of protection.To ensure that tariffs are said to be a weak measure of trade policy, especially when tax and excise restrictions are applied simultaneously, Edward (1997) shows that non-tariff barriers also do not distinguish between products with higher or lower levels of barriers. Besides, the theoretical framework in earlier studies has failed to explain the exact mechanism of propagation through which exports lead to growth.

In view of the above circumstances, we conclude that a country-specific analysis of research reveals differences in the export-led growth plan. Moreover, previous studies show that the relationship between trade liberalization and growth is a contentious one empirically. While many studies have found a positive relationship, there are those who have found no relationship or even a negative relationship (see Rodriguez & Rodrik, 1999). Hence, this paper is of paramount because, one, it considers 37 sub-Sahan Africa, and two, it employs current data, ranging from 1996 to 2019.

3. Methodology
As has been reported, this paper covers a total of 37 sub-Saharan African countries for a period of 24 years, spanning from 1996 to 2019. Thus, the paper applies a panel data analysis technique to the analysis. Panel data comprises cross-sectional units, e.g., countries, observed at different points in time. The combination of cross-sectional and time-series data allows for richer econometric model specifications and more accurate conclusions. In addition, dynamic adjustment processes can be analyzed for a broad base of cross-sectional units. In a dynamic

model, past observations of the variable of interest can influence the current value (Kripfganz & Schwarz, 2015).

3.1. Data generation methods, measurements and sources of data

Secondary data for the empirical analysis are extracted from International Monetary Fund (IMF), Worldwide Governance Indicator (WGI), World Economic Outlook (WEO), and the World Bank's World Development Indicators (WDI). Also, data were obtained from publications of the central banks of the specific countries From the empirical literature, studies employed a number of variables, including real gross domestic product (GDP), or per capita growth, as the dependent variable. Apart from real GDP, trade liberalization (trade as percent of GDP), trade balance, and current account, which are used as the key variables in this study, other control variables differ from one study to another, although some variables seem to be common across studies. These variables include inflation (Barro, 1996; Barro & Sala-i-Martin, 1995; Bruno & Easterly, 1995; Sarel, 1996; Nell, 2000; Faria & Carneiro, 2001; Gokal & Hanif, 2004; Munir *et al.*, 2009; Agbema, 2015). The general observation here is that inflation has a significant negative effect on economic growth. Also, money supply tends to affect economic growth (Ibrahim, 2015; Bednarik, 2010; Zapodeanu & Cociuba, 2010; Ogunmuyiwa & Ekone, 2010; Husain, 2006; Ahmed & Suliman, 2011). Other control variables include labor force and exports (Agbema, 2015); gross fixed capital formation, FDI, and the real exchange rate (Epaphra, 2016); corruption, law and order, and openness (Aizeman et al., 2007), population growth, the trade-to-GDP ratio, and human capital as measured by primary school enrollments (Mbah & Sami, 2018).

The models to examine the relationship between trade liberalization, growth and balance of payments can be specified as

$$\ln rGDP_{it} = \theta_0 + \theta_1 \ln gfcf_{it} + \theta_2 \ln trade_{it} + \theta_3 \pi_{it} + \theta_3 \ln l_{it} + \theta_4 \ln debt_{it} \qquad (2)$$
$$+ \theta_5 \ln tot_{it} + \theta_6 \ln tariff_{it} + \theta_7 fdi_{it} + \theta_8 \ln reer_{it} + u_{it}$$

$$\ln TB_{it} = \gamma_0 + \gamma_1 \ln rGP_{it} + \gamma_2 \ln trade_{it} + \gamma_3 \pi_{it} + \gamma_4 \ln tot_{it} + \gamma_5 \ln tariff_{it} \qquad (3)$$
$$+ \gamma_6 fdi_{it} + \gamma_7 \ln reer_{it} + v_{it}$$

$$\ln CA_{it} = \varphi_0 + \varphi_1 \ln rGDP_{it} + \varphi_2 \ln trade_{it} + \varphi_3 \pi_{it} + \varphi_4 \ln tot_{it} + \varphi_5 \ln tariff_{it} \qquad (4)$$
$$+ \varphi_6 fdi_{it} + \varphi_7 \ln reer_{it} + \varepsilon_{it}$$

Where	$\ln rGDP_t$	=	Log of Real GDP
	$\ln gfcf_t$	=	Log of gross fixed capital formation, percent of GDP
	$\ln trade_t$	=	Log of import plus export, percent of GDP
	π_t	=	Inflation, consumer prices, annual percent

$\ln l_t$	=	Log of labour force
$\ln debt_t$	=	Log of Central Government debt, percent of GDP
$\ln tot_t$	=	Log of terms of trade
$tariff_t$	=	Tariff
fdi_t	=	Inflow of FDI, percent of GDP
$\ln reer_t$	=	Log of real effective exchange rate
$\ln TB_t$	=	Log of balance of trade, percent of GDP
$\ln CA_t$	=	Log of current account balance, percent of GDP

3.2.Dynamic panel data set-up

If there is unobserved unit-specific heterogeneity, it is often hard to disentangle the effects of the observed and the unobserved time-invariant heterogeneity (Kripfganz & Schwarz, 2015). Standard fixed and random effects estimators cannot be used because of multicollinearity problems and, when the time dimension is short, the familiar Nickell (1981) bias in dynamic panel data models. Therefore, it is common practice in empirical work to apply the generalized method of moments (GMM) framework proposed by Holtz-Eakin *et al.* (1990), Arellano & Bond (1991), Arellano & Bover (1995), and Blundell & Bond (1998), amongst others. However, Binder *et al.* (2005) and Bun & Windmeijer (2010) emphasize that GMM estimators might suffer from a weak instrument problem when the autoregressive parameter approaches unity or when the variance of the unobserved unit-specific effects is large. Moreover, the number of instruments can rapidly become large relative to the sample size. The consequences of instrument proliferation, summarized by Roodman (2009), range from biased coefficient and standard error. In order to overcome the problem of the weak instrument in the context of estimating the effects of time-varying regressors, Hsiao *et al.* (2002) propose a transformed likelihood approach that is based on the model in first differences. Thus, in the context of panel data, we deal with unobserved heterogeneity by applying the within transformation by taking first differences if the second dimension of the panel is a proper time series (Baum, 2013). The ability of first differencing to remove unobserved heterogeneity underlies the family of estimators that have been developed for dynamic panel data (DPD) models (Baum, 2013). These models contain one or more lagged dependent variables, allowing for the modeling of a partial adjustment mechanism. In the one-way random-effects model, the v_i error component enters every value of the dependent variable y_{it} by assumption, so that the lagged dependent variable cannot be independent of the composite error process. One solution to this problem involves taking the first differences of the original model.

The first difference transformation removes both the constant term and the individual effect.

Dynamic panel data models have played a pivotal role in analyzing economicphenomena of a dynamic nature. The general functional form of the dynamic panel data model is:

$$y_{it} = \alpha + \lambda y_{i,t-1} + x_{it}\beta + u_{it} \tag{5}$$

$$u_{it} = \eta_i + v_{it} \tag{6}$$

Where $i = 1, 2, \cdots, N$, indexes cross-sectional units and $t = 1, 2, \cdots, T$, indexes time. The scalar y_{it} is the dependent variable of interest, i.e. economic growth, observed at the country level, and the recursive nature of the lagged dependent variable $y_{i,t-1}$ on the right-hand side is the source of dynamics in the model. The vector x_{it}, which is $K_x \times 1$ a dimension, represents time-varying independent variables. The parameters λ ,and β , and denote the carryover effect and marginal effects with regard to x_{it} and w_{it} respectively. The data consist of $(y_{i1}, y_{i2}, \cdots, y_{iT})$, and $(x_{i1}, x_{i2}, \cdots, x_{iT})$ for $i = 1, 2, \cdots, N$, implying a dimension of $N \times T$ observations. All variables are independently and identically distributed across i and $|\lambda| < 1$.

The focus in dynamic panel data analysis is mainly on the case where *N* is large and *T* is small— typical data available in dynamic panel data settings (Chung *et al.*, 2019). The unobservable term u_{it} consists of two components, individual unobserved heterogeneity η_i and an idiosyncratic error v_{it}. the structure of the unobservable term in model (5) raises an endogeneity problem as the time-invariant unobserved heterogeneity component η_i is correlated with the lagged dependent variable $y_{i,t-1}$. This issue can be dealt with in a relatively straightforward manner by taking the first difference of models (2-3) to subtract out η_i. However, the endogeneity problem with regard to the idiosyncratic error term v_{it}, that is, the lagged dependent variable $y_{i,t-1}$ being correlated with the lagged unobservable v_{is} for $s < t$ —remains a concern (Chung *et al.*, 2017). As stated above, the dynamic panel data methods proposed by Anderson & Hsiao (1981, 1982), and further developed by Arellano & Bond (1991), Arellano & Bover (1995), and Blundell & Bond (1998), utilize lagged levels and lagged differences as instruments to deal with this endogeneity issue, but their

instruments are fully valid only under the assumption that the idiosyncratic errors v_{it} are uncorrelated over time.

To eliminate country-specific effects, we take the first differences of (5) as follows:

$$y_{it} - y_{it-1} = \lambda \left(y_{it-1} - y_{it-2} \right) + \left(x_{it} - x_{it-1} \right) + v_{it} - v_{it-1} \tag{7}$$

$$\Delta y_{it} = \lambda \, \Delta y_{i,t-1} + \Delta x_{it} \beta + \Delta v_{it} \tag{8}$$

The construction of the new error term, $\Delta v_{it} = v_{it} - v_{it-1}$ with the lagged dependent variable, $y_{it-1} - y_{it-2}$ corrects the likely endogeneity of the variables (see also Levine *et al.,* 1999 and Alimi, 2015). The GMM panel estimator uses the following moment conditions:

$$E\left[y_{it} - s(v_{it} - v_{it-1}) \right] = 0 \; for \, s \geq 2; t = 3,...,T \tag{9}$$

$$E\left[x_{it} - s(v_{it} - v_{it-1}) \right] = 0 \; for \, s \geq 2; t = 3,...,T \tag{10}$$

$$E\left[z_{it} - s(v_{it} - v_{it-1}) \right] = 0 \; for \, s \geq 2; t = 3,...,T \tag{11}$$

under the assumptions that the error term, v, is not serially correlated and that the regressors, x, z, are weakly exogenous. Intuitively, the GMM takes into consideration the time-series dimension of the data and non-observable country-specific effects. It also takes into account the inclusion of lagged dependent variables among the explanatory variables and the possibility that all explanatory variables are endogenous (Bond *et al*., 2001; Caselli *et al*., 1996). However, statistical shortcomings with this estimator as reported by Alonso-Borrego & Arellano (1996) and Blundell & Bond (1998), is that when the regressors are persistent over time, lagged levels of these variables are weak instruments for the regression equation in differences (Epaphra and Kombe, 2017).

3.3. Diagnostic checking

The assumptions of homoscedasticity, normality, and serial correlation can be tested on the data to ensure they are not violated. Indeed, according to Drukker (2003), serial correlation in linear panel data models, biases the standard error, and causes the result to be less efficient. The idiosyncratic error component v_{it} and the unobserved unit-specific effects η_i are independently distributed across i and satisfy:

$$E\left[v_{it} \right] = E\left[\eta_i \right] = 0 \quad \text{(mean zero)} \tag{12}$$

$$E\left[v_{is} v_{it} \right] = 0 \quad \forall s \neq t \quad \text{(no serial correlation)} \tag{13}$$

$$E\left[\eta_i v_{it} \right] = 0 \; \text{for all } t \quad \text{(orthogonal to individual effects)} \tag{14}$$

$$E\left[y_{i1} v_{it} \right] = 0 \; \text{for all } t \quad \text{(orthogonal to initial condition)} \tag{15}$$

Identification of the (structural) parameters λ ,*and* β hinges on the assumptions about the dependencies between the repressors and the unit-specific effects (Kripfganz & Schwarz, 2015).

4. Findings and discusions
4.1.Descriptive statistics
Descriptive statistics quantify and describe the basic characteristics of a data set. It serves as a starting point for data analysis, allowing the study to organize, simplify, and summarize data that provides useful information on the population of interest. Most notably, however, descriptive statistics do not allow the study to make presumptive conclusions about the population of interest, as this is reserved for inferential statistics.

Table 1 provides a summary of the variables employed in this paper. In all, 37 sub-Saharan African countries were observed, covering the 1996–2019 period. The number of observations ranges from 336 observations for the real exchange rate to 859 observations for real GDP. These larger samples, arguably, tend to provide more precise estimates of the process parameters, such as the mean and standard deviation. The table reports the minimum and maximum values, which in turn identify a possible outlier.

Table 1. Descriptive Data Analysis

Variable	Obs	Mean	Std. Dev.	Min	Max
ln *rGDP*	859	22.853	1.391	20.196	26.896
ln *TB*	853	-10.221	16.990	-161.428	36.362
ln *CA*	690	-5.787	8.890	-65.029	24.694
ln *gfcf*	851	2.892	-4923099	1.228	4.090
ln *trade*	855	4.113	-4434091	3.031	5.741
π	753	8.996	31.884	-8.975	513.907
ln *l*	840	15.008	1.357	11.644	17.908
ln *debt*	849	3.860	-725643	1.735	6.306
tariff	550	12.915	5.100	0.550	40.610
fdi	860	3.780	7.724	-11.636	103.337
ln *reer*	336	4.659	0.257	4.169	6.289

Source: Authors computations and analysis

We assess the spread of the data by comparing the minimum and maximum values. If the minimum value is very low, even when we consider the mean, and if the maximum value is very high, even when we consider the mean, Nonetheless, the differences in observations are expected, taking into account the fact that the data was obtained from different economies in sub-Saharan Africa. Similarly, the standard deviation, which determines how spread out the data is from the mean,

is higher in some observations, such as Treasury bills, inflation, and foreign direct investment, indicating greater spread in the data, but it is lower in variables such as real exchange rate, real GDP, and labor force, suggesting lower spread in the data.

4.2.Real GDP estimation results
Table 2 presents the real GDP estimation results. All variables, with the exception of total terms of trade (tot) and tariff rate (tariff), are found to be statistically significant at 1%, 5%, or 10%. The effect of trade liberalization, measured in terms of trade-to-GDP ratio, is positive and significant at a 5% level, implying that one unit increase in the liberalization index leads to a 1.25 percentage point increase in growth rates on average, other things being equal. Results are in line with the findings of Manni & Afzal (2012); Herath (2010); Khan et al. (2012); Khobai *et al*. (2018); Keho & Wang (2017) and Hozouri (2016). Similarly, as expected, the gross fixed formation-to-GDP ratio, labour force, and the ratio of FDI-to-GDP exert a positive and significant impact on economic growth in sub-Saharan Africa. FDI is believed to be an important factor in economic development, particularly for sub-Saharan African countries facing a large resource gap.

Unsuprisingly, the rate of inflation and government debt-to-GDP seem to have a negative and significant effect on real GDP. When all other factors remain constant, a 1% increase in the rate of inflation, for example, results in a 0.23 percent decrease in real GDP. Likewise, GDP will drop by 2.45 percent if government debt increases by 1 percent in sub-Saharan Africa. The argument for these two variables is that higher inflation, which is associated with volatility, described as macroeconomic instability, tends to create distortions in economic decisions concerning savings and investment, which in turn hinder economic growth. Likewise, high public debt can adversely affect economic growth via heightened long-term interest rates, higher distortionary tax rates, inflation, and a general constraint on countercyclical fiscal policies, which may lead to increased volatility and lower growth rates.

We would expect a positive coefficient on real exchange rate because real depreciation would increase real export, which in turn, leads to an increase in real GDP. Unsurprisingly, the coefficient on real effect exchange rate is negative and statistically significant at 1%. However, the coeffcenient on real effective rate is very small, suggesting   a less significant effect on growth.

Table 2. Real GDP Estimation Results

ln $rGDP$	Coeff	Std. Err.	z	$P > \lvert z \rvert$	[95% Conf. Interval]	
ln $rGDP$ L1.	0.9557***	0.0088	108.9	0.000	0.9385	0.9729
ln $gfcf$	0.0300***	0.0975	3.07	0.002	0.0108	0.0490
ln $trade$	0.0258**	0.0125	2.06	0.039	0.0013	0.0503
π	-0.0023***	0.0004	-3.04	0.000	-0.0018	-0.0004
ln l	0.0360***	0.0066	5.49	0.000	0.0231	0.0489
ln $debt$	-0.0245***	0.0034	-7.12	0.000	-0.0313	-0.0178
ln tot	0.0064	0.0094	0.68	0.494	-0.0120	0.0060
$tariff$	0.0010	0.0007	1.37	0.165	-0.0004	0.0024
fdi	0.0004*	0.0002	1.68	0.094	-0.0001	0.0009
ln $reer$	0.0004***	0.0001	4.40	0.000	0.0002	0.0005
Constant	0.3015**	0.1549	1.95	0.052	-0.0022	0.6051

***Denotes a 1 percent level of significance**Denotes a 5 percent level of significance *Denotes a 10 percent level of significance

4.3. Balance of trade estimation results

In this section, we examine the effect of economic growth and trade liberalization on the balance of trade. This is important because, as trade liberalization increases both exports and imports, the difference between them, the trade balance, may increase or decrease due to tariff reductions. Indeed, it is a common concern among sub-Saharan African countries that trade liberalization could lead to a deterioration of their trade balance. The impact of trade liberalization on the trade balance, therefore, needs to be investigated empirically. Table 2 shows the estimation results when inflation, terms of trade, FDI, and the real exchange rate are included as control variables in the model. We find that economic growth has a positive and significant effect on the trade balance. Holding other factors constant, a 1% increase in real GDP results in a 2.67% average increase in the balance of trade.

Both the trade-to-GDP ratio and the tariff coefficients are negative and statistically significant at the 1% level, as expected. These results suggest that liberalization leads to a deterioration of the trade balance in sub-Saharan Africa, consistent with UNCTAD (1999) for 15 developing countries over the period of 1970–1995 and Santos-Paulino & Thirlwall (2004) for a sample of 22 developing countries over the 1972–1997 period. It is conceivable that liberalisation may lead to faster growth of imports than exports. The faster growth in imports compared to exports could have serious implications for the balance of trade in sub-Saharan Africa. Since a deterioration in the balance of trade means sub-Saharan Africa is importing more than exporting, more currency will be leaving the region.

The terms of trade are expected to have a negative effect on the trade balance due to the fact that an improvement in the terms of trade means that export prices are increasing faster than import prices. Therefore, ceteris paribus, a rise in export prices would cause a decline in the quantity of exports, while relatively cheaper import prices would increase the quantity of imports. Surprisingly, however, the coefficient on terms of trade turns out to be statistically insignificant and with the wrong sign.

Furthermore, empirical results, as shown in Table 2, show that the real effective exchange rate coefficient is positive and statistically significant at the 10% level. Inasmuch as currency depreciation is meant to increase the price of imports and decrease the price of exports, it is expected to decrease the quantity of imports and increase the quantity of exports, leading to a favorable impact on the trade balance. These findings are similar to those of Magee (1973); Rose & Yellen (1989); Bahmani-Oskooee & Alse (1994); Kale (2001), and Akbostanci (2004). These findings are also consistent with the Marshall-Lerner condition. Nevertheless, these results should be taken with caution because a country's trade balance could be improving with one trading partner while at the same time deteriorating with another. As a result, the use of aggregate data may suppress actual bilateral movements.

The results also show that FDI adversely affects the trade balance in sub-Saharan Africa. At the 5% level, the FDI coefficient is negative and statistically significant. By and large, FDI may have negative effects on the trade balance through increased imports. This is particularly the case when multinational firms tend to import high-technology machines as well as intermediate inputs, which increases the host country's imports, consistent with Helpman (1984) and Markusen & Venables (1998). In like matter, inflation tends to exert an adverse effect on the balance of trade in sub-Saharan Africa. Significantly, the inflation coefficient is found to be negative and statistically significant at 5%, implying that prices and costs in Sub-Saharan Africa are rapidly rising, making goods and services produced in the region more expensive than similar goods produced elsewhere, which encourages imports and discourages exports.

Table 3. Trade Balance Estimation Results

ln *TB*	Coeff	Std. Err.	z	$P > \lvert z \rvert$	[95% Conf. Interval]	
ln *TB* L1.	0.4478***	0.0548	8.18	0.000	0.3404	0.5551
ln *rGDP*	2.6729***	0.7174	3.73	0.000	1.2668	4.0789
ln *trade*	-7.9239***	2.1230	-3.73	0.000	-12.085	3.7628
π	-0.1940**	0.0818	-2.37	0.018	-0.3543	-0.0337
ln *tot*	1.0919	1.3733	0.80	0.427	-1.5999	3.7837
fdi	-0.2965**	0.1282	-2.31	0.021	-0.5477	-0.0453
tariff	-0.7517***	0.1840	-4.09	0.000	-0.8911	1.1122
ln *reer*	0.0314*	0.0187	1.68	0.093	0.0181	0.0681
Constant	-10.6097	9.2033	-1.15	0.249	-28.648	7.4286

***Denotes a 1 percent level of significance **Denotes a 5 percent level of significance, *Denotes a 10 percent level of significance: **Source**: Authors' estimates

4.4. Current account balance estimation results

We next test the hypothesis that growth and trade liberalization have effects on the current account balance in sub-Saharan Africa while retaining the control variables applied in the balance of trade model. It should be noted that the current account balance of payments is primarily composed of the balance of trade and investment income and transfer payments. The results of the current account estimation are reported in Tables 4.

At the 1% level of significance, the coefficient on real GDP growth is robustly positive and significant. Consistent with Calderon (2000), this result suggests that an increase in the real GDP growth rate has the effect of enlarging the current account deficit. A 1% point rise in the GDP growth rate leads to an increase of about 2.77% points in the current account deficit. Similarly, we find a significant relationship between the real exchange rate and the current account deficit that is consistent with the predictions of the Mundell-Fleming model. A depreciation of the domestic currency (that is, a fall in the real effective exchange rate) has the effect of reducing the current account deficit, though by a relatively small amount. Thus, a 1% depreciation of the real exchange rate leads to a current account deficit reduction of 0.03%, *ceteris paribus*. On the other hand, we find a negative and significant relationship between tariffs and current account deficits. Hence, according to our estimation, an increase of 1% in tariffs will reduce the current account deficit by 0.48% points. Surprisingly, the coefficients of trade-to-GDP ratio and terms of trade turn out to be statistically insignificant.

An increase in either FDI or inflation contributes to a decrease in the current account deficit. However, whereas the coefficient on FDI is strongly statistically significant, the one on inflation, which serves as a measure of macroeconomic uncertainty, is only marginally so. According to the estimated coefficients

reported in Table 4, the effect of an increase in the FDI of 1 % point leads to a current account fall of 0.56 percentage points; the corresponding figure for the private rate is 0.11, that is, 5 times smaller. Nonetheless, this is consistent with the notion that macroeconomic uncertainty lowers investment and leads to a lower current account deficit (Gosh & Ostry, 1997).

Table 4. Current Account Estimation Results

ln *CA*	Coeff	Std. Err.	z	$P > |z|$	[95% Conf. Interval]	
ln *CA* L1.	0.3012***	0.0551	5.47	0.000	0.1932	0.4091
ln *rGDP*	2.7658***	0.7425	3.72	0.000	1.3105	4.2210
ln *trade*	1.6734	1.8286	0.92	0.360	-1.9106	5.2573
π	-0.1142	0.0775	-1.47	0.141	-0.2662	0.0377
ln *tot*	1.2926	1.3855	0.93	0.351	-1.4229	4.0080
fdi	-0.5625***	0.1254	-4.49	0.000	-0.8083	-0.3167
tariff	-0.4815***	0.1670	2.89	0.004	0.1544	0.8087
ln *reer*	-0.0218*	0.0180	-1.21	0.227	-0.0571	0.0136
Constant	-5.9608	6.6919	-0.89	0.373	-19.077	7.1551

***Denotes a 1 percent level of significance, **Denotes a 5 percent level of significance, *Denotes a 10 percent level of significance

5. Conclusions

The quantitative analysis undertaken in this paper suggests that greater openness has had a favorable effect on economic growth. Sub-Saharan Africans, therefore, face increasing pressure to liberalize trade. So far, sub-Sahara Africa needs to eliminate barriers to trade to increase trade with the rest of the world. Notably, trade balances and current account deficits in Sub-Saharan African economies have increased as a result of trade liberalization and tariff reduction. The main argument is that though both real exports and imports have increased with greater openness, imports have increased more than exports, which, in turn, deteriorates the trade balance and current account..

The faster growth in imports in relation to exports could have serious implications for the balance of trade and, in itself, could constrain economic growth in some of the developing economies. Hence, sub-Saharan Africa would have difficulty in reaching potential or planned growth in the subsequent periods after trade liberalization. This implies that sub-Saharan Africa should promote more exports, which has a significant impact on both economic growth and the trade balance, as well as the current account.

Since our paper evidences that trade liberalization contributes to economic growth, it is recommended that governments and policymakers pursue policies that will promote trade liberalization in Sub-Saharan Africa. This can be achieved

by establishing multi-lateral and bilateral trade agreements that are favorable and ensuring an environment that will support international trade and appropriate technology transfer.

Because of the fact that trade liberalization promotes growth on one hand and deteriorates trade balances on the other hand, Sub-Saharan Africa should liberalize its trade in such a manner that a balance between exports and imports is achieved. The balance between exports and imports can be maintained through policies such as the maintenance of an appropriate real exchange rate and macroeconomic stability, as well as an institutional environment conducive to the growth of entrepreneurship and productive investment. Moreover, real exchange rates play a vital role in foreign trade and economic growth.

We believe this research can be a positive contribution to trade liberalization policy studies in sub-Saharan African countries and other developing countries. Nevertheless, more effort is needed to assess the impact of trade liberalization on the trade balance, economic growth, and current account balance in sub-Sharan African countries.

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Ethical considerations
This article followed all ethical standards for research without direct contact with human or animal subjects.

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