

Trade Openness, Inflation and GDP Growth: Panel Data Evidence from Nine (9) West Africa Countries

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Abstract

The underlying purpose of this study is to determine the effects of Trade openness and inflation on the GDP growth for nine West-African Countries for the period from 1998 to 2017. The data used in this study are secondary data sources derived from the World Development Indicators (WDI) of the World Bank over the period 1998-2017. This study employed pooled Ordinary Least Squares (OLS), Fixed Effects and Random effects test with panel data in arriving at the results. This study has Trade Openness (OPEN), Inflation (INFLA), Real Exchange Rate (REER) and Investment (INVEST) as independent variables and GDP growth rate as a dependent variable. The results show that inflation has a negative and significant impact on GDP growth in using pooled OLS and Random whiles having an insignificant impact on GDP with the fixed effect test. Trade Openness has a significant negative impact on GDP using the pooled OLS and an insignificant impact using the fixed and Random effects tests. Real Exchange rate showed a positive significant impact in all the tests whiles investment showed an insignificant impact in all the tests.

Keywords

Trade Openness, Inflation, Economic Growth, West Africa

1. Introduction

In recent times, trade between nations and economic integration has become a subject of interest to many. This has initiated arguments at various levels of the impact of trade openness and inflation on economic growth. Various economies, both the developed and the developing, have since recognized the significant

impact potential of these economic indicators. Many nations are adopting strategies to harness the positive attributes of trade openness and inflation for economic growth. Trade openness improves the transmittance of new technologies, managerial skills and creates employments. Second, trade promotes the establishment of economies of scale and exploitation of comparative advantages, supports knowledge transfers, and increases the range of products available for consumers [1]. In addition, trade pushes the reallocation of resources in the direction of productive firms, leads to their expansion, and outcompetes unproductive firms from the market. Increased competitiveness causes firms to optimize production, which drives productivity within the firm. However, Feldkircher and Siklos [2] argued that trading of goods and services is also a critical driver of the international that influences inflation.

Inflation has remained a critical issue for governments and policy makers for a long time since it creates an uncomfortable situation for an economy; having detrimental effects on economic growth. The ultimate aim of many economies in implementing economic policies is to have a high and stable economic growth with low and manageable inflation. A general rise in the prices of goods and services occurs due to demand and supply imbalances.

In the past decade, different studies have provided empirical evidence in investigating the relevance and importance of trade openness and inflation on economic growth since understanding this is crucial in the design of optimal monetary and economic policies. Previous literature pertaining to trade openness, inflation and economic growth seems to give a negative correlation between trade openness and inflation. Rodrik [3] in investigating trade policy reforms in developing countries reports that trade openness may bring macroeconomic instability by increasing inflation, depreciating exchange rates and inviting balance of payment deficits that can lead to chaos. Also, Romer [4] in his findings concluded that trade openness and inflation are negatively and significantly related. He attributed this to the changing inconsistency of discretionary monetary policies. In furtherance, Andriamananjara *et al.*, [5] report that a high degree of trade openness may increase inflation.

This paper seeks to explore, analyze and extend the body of literature; the impact of trade Openness and Inflation in the economic growth process in Africa especially sub-Saharan Africa. We seek to make academic contributions to literature by tracing the relationship between trade openness, inflation and economic growth in the context of 9 Sub-Saharan African Countries with panel data from 1998 to 2017. Also, we include investment and real exchange rate as control variables. By incorporating Investment and Real Exchange Rate, we do not only attempt to test the potential importance of trade openness but also the hypothesis that openness promotes economic growth.

The rest of the paper is structured as follows. In Section 2 a short review of the literature on the relationship between trade openness and economic growth on one hand and between inflation and economic growth on the other. In Section 3 the methodology used is discussed. The empirical evidence is presented in Sec-

tion 4 while concluding remarks are presented in Section 5.

2. Literature Review

Enormous empirical studies have been conducted in investigating how FDI and trade openness affect economic growth. Asamoah, Mensah, & Bondzie, [6] use a structural equation modelling methodology for 34 sub-Saharan African countries from 1996-2016 in finding a decreasing effect of FDI on economic growth. Frankel and Romer [7] concluded that exogenous cross-country variations in international trade are positively correlated with GDP across countries. Rodriguez and Rodrik [8] however doubts highly cited papers that argue that international trade is associated with higher growth rates of total factor productivity or GDP per capita. To demystify the causal effects of FDI and trade openness on economic growth, we establish the relationship between these variables from literature.

2.1. GDP Growth

Also known as economic growth is defined as a rise in economic goods and services production relative from a time period to another and normally measured in terms of gross domestic product of an economy. The importance of economic growth cannot be under-estimated. Economic growth is evidence that an economy is increasing efficiency in the use of its scarce resources. Bhagwati [9] noted that economic growth improves technological advancement, and skills formation.

Various studies have used different variables and approaches in finding the determinants of GDP growth. Nketiah *et al.* [10] estimated Foreign Direct Investment on Trade Openness on Economic Growth: Evidence from Ghana from 1975 to 2017. The analysis was based on time series which indicated that trade openness is a main factor affecting Economic growth. The study also found inflation had no significant impact on economic growth. Adhikary [11] used FDI, Trade openness and capital formation with the co-integration analysis to assess economic growth In Bangladesh. He established that FDI and Capital formation can influence GDP growth rate. Similarly, Seyoum *et al.*, [12] used FDI and Trade Openness panel data from 25 sub-Saharan African countries to examine its impact on economic growth (GDP growth) and found a bi-directional causal relationship

2.2. Trade Openness

Researchers across disciplines are faced with the challenge of measurement issues for analytical studies, although the severity varies. There is a general problem of finding reliable and systematic data on trade policies across countries especially the developing ones [13]. In this study, we simply use the most used definition and widely accepted definition of trade openness as the sum of exports and imports (trade volumes) of a country expressed as a percentage of GDP [14]

[15].

WTO [16] points out that trade openness can be beneficial in various ways; one of the favorable ways is a better utilization of countries' resources due to better production conditions thus achieving comparative advantage and another one is exploiting the economics of scale that would increase level of income and efficiency of resource allocation.

The benefits of trade openness include an increase in development, reallocation of employment to new activities that need more human capital and enhancement of knowledge flow between countries. However, trade openness can lead to a decrease in government revenue in developing countries. Therefore, policies, and measures aimed at fostering macroeconomic stability and a favorable investment climate, must accompany trade openness [17]. Yasmin, Jehan and Chaudhary [18] found that trade openness contributes to long-run economic growth, with effects varying according to the level of economic development. WTO [16] also states that trade openness would have a positive long-term impact on growth provided it would lead to an increase in investment's rate or stimulus for technology spread and growth. However, Herzer [19] found that the impact of trade openness is positive for developed countries and negative for developing ones. An income threshold exists above which greater trade openness has beneficial effects on economic growth and below which increased trade has detrimental consequences [20] [21] [22] for an economy.

Prior study mostly identifies the importance of trade openness in determining a country's weakness to sudden stops. Nusair [23] asserted that more open economies, defining them as countries with a larger supply of tradable goods, are less prone to sudden stops in capital flows. The currency crises literature also stresses the significance of trade openness. However, Milesi-Ferretti and Razin [24] found a higher degree of openness to trade declines the probability of a country experiencing an exchange rate crisis. Moreover, they demonstrate how more open economies tend to grow faster in the outcome of a currency crisis. Similar findings are discussed in Glick and Hutchison [25], that greater trade integration reduces a country's likelihood of experiencing a currency crisis. They claim that a greater openness ratio declines the likelihood of sharp reversals of capital flows, as the country is more able to service its external obligation. Ideally, the more opened an economy the higher the rate at which the real exchange rate will depreciate. The implication is that, trade openness is expected to have a negative sign. Grossman and Helpman [26] outlined that an economy stands to benefit from trade openness; technological transfer and productivity improvement on one side, and a boost for economic growth through improvement in domestic investment on the other side.

From the empirical point, Fosu [27] in investigating export and economic growth correlation among African economies, argues that export increase improved economic growth in African countries based on an augmented production function. Also, Asafu-Adjaye and Chakraborty [28] proved a co-integrating relationship between real output, exports and imports in indirect causal links

with real economic growth. Baharumshah and Rashid [29] in examining long-run relationship between exports, imports and GDP in Malaysia, gave empirical assertion that foreign technology imports can predict economic growth. Mamun and Nath [30] confirmed a unidirectional long-run causality from exports to economic growth in studying Bangladesh over the period 1976-2003.

It is an undisputed claim that inflation can create costs to economic, social, political and other sectors in any economy [31]. An economy with higher rate of inflation is likely to have negative effects in the form of wastage of substantial resources due to inefficiencies and destruction of the basis for rational economic decisions and policies [32]. Most empirical investigations between openness and inflation have corroborated with Romer's [4] hypothesis. Romer's [4] hypothesize that inflation and openness are negatively and significantly correlated. In Pakistan, Mukhtar [33] used multivariate co-integration and Vector Error Correction Model (VECM) in investigating the validity of Romer's hypothesis, within the period 1960-2007. The results indicated a negative long-run relationship between trade openness and inflation in Pakistan, which confirms the existence of Romer's hypothesis. Ramzam *et al.* [34] that trade openness can impact inflation due to various structures and country specific factors. However, Munir & Kiani [35] and Thomas [36] invalidated the Romer [4] hypothesis in Pakistan and in the Caribbean's. Munir & Kiani [35] investigation showed a significant and positive relationship between inflation and trade openness. Thomas [37], using a modern panel data approach, showed that trade openness positively influences inflation. There is no unique agreement on the interaction between higher trade openness and inflation. Lin, Mei, Wang and Yao [38] investigated the effect of trade openness on inflation with panel data from Sub-Saharan African countries. Their research observed and indicated the presence of a robust and strong inverse relationship between inflation and trade openness in Sub-Sahara Africa

2.3. Inflation

Inflation is the persistent rise in the general level of prices of goods and services, as measured against some baseline of purchasing power in an economy. Inflation measures how much more expensive a set of goods and services has become over a certain period, usually a year in an economy [39]. Persistent price increases of goods and services have a possible impact and effect on the purchasing power on an economic currency or unit of account within an economy. This impact and effects can be positive or negative [40].

From the pessimist point of view, general price increase causes an upsurge in the opportunity cost of holding money, goods and services scarcity. Inflation may call for the demand for increase in wages by employees who anticipate an increase in commodity prices will lead to depreciation in income thus, affecting welfare [41] [42]. Inflation can also cause "bracket creep" in income tax rate schedules, increasing inequality [43].

However, inflation can also decrease inequality by eroding the real value of debt service (the savings redistribution channel) [44]. These channels imply that rich and poor households may have different preferences over inflation. Inflation reduces the real burden of public and private debt, reduces unemployment due to nominal wage rigidity and provides monetary authorities with a tool to stabilize the economy, since interest rates are nominally kept above zero [45]. Inflation also reduces capital accumulation by lowering the real interest rate and saving rates [46]. Svensson [47] argued that rather than a zero or negative inflation, a minimal inflation is preferable since it can reduce the impact of economic recession by enabling the labour market to adjust more quickly in a downturn which in turn reduces the risk of liquidity trap.

Empirical studies evidence has been provided with regards to the influencers of inflation. Almoussor [48], Arratibel *et al.* [49] asserted that inflation is driven by international price shocks, exchange rate depreciation, domestic demand shocks, and monetary innovations. A higher degree of trade openness also exacerbates the cost of inflation through exchange rate volatility and export competitiveness [46].

High inequality may increase distributional conflict, which can lead to fiscal stalemates and reliance on monetary finance or delay macroeconomic stabilization programs [50]. Political pressure to generate inflation may rise with imbalance, especially in democracies, but a more independent central bank can resist such pressure. Researchers used various approaches to investigate the dynamics of inflation and economic growth.

In terms of inflation and economic growth, Umaru *et al.*, [51] concluded that inflation contributed positively to the economic growth in Nigeria using the Granger causality test with data from 1970 to 2010. Tobin [52] had earlier found that inflation advanced economic growth. Malik and Choudhury [53] in assessing the correlation between inflation rate and the rate of economic growth among four South Asian countries found that inflation positively related to economic growth in these four South Asian countries. Khan and Senhadji [54] confirmed this assertion that one-digit inflation has a positive association with economic growth in developing countries. On the other side, a number of studies have found contrary views, a negative linkage with economic growth. With the data of 100 countries, covering the period from 1960 to 1990-Barro [55] discovered that inflation had a negative relationship with real per capita GDP growth. Similarly, Ndorieimpa [56] used a five-year panel data of 47 African countries and also revealed a negative impact of inflation on economic growth. However, in Mukoka [57] there was no correlation between inflation and economic growth in Zimbabwe using data from 1990 to 2017.

3. Data and Methodology

3.1. Data Collection

The data was extracted from the World Development Indicators (WDI) and

World Governance Indicators (WGI) from the World Bank database from the year 1998 to 2017. The data set on the variables, economic growth is proxied by GDP, Investment, Real exchange rate (REER), trade openness (TOP) and inflation (INFLA) is sourced from World Development Indicators [58].

The variables used in the model are measured as follows: we used GDP growth proxied by GDP growth (annual %) as the dependent variable.

The independent variables include Inflation as a share of GDP and trade measured as total trade as a share of GDP, Investment proxied by Gross fixed capital formation (annual % growth) and real effective exchange rate indices (GDP deflator based), annual. The variable trade openness is proxied by export plus import as a percentage of GDP and economic growth is proxied by GDP growth (annual %).

3.2. Descriptive Statistics

In this section, descriptive statistics (*i.e.* means, standard deviations, minimum and maximum values of variables). Consider a hypothetical data set $(x_1, x_2, x_3, \dots, x_n, y)$, and a hypothesized linear regression model for panel data

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \dots + \beta_n x_{in} + \mu_i \quad (1)$$

The study used the foreign direct investment, trade openness and economic growth in Ghana focusing by developing a simple economic growth model for Ghana as below:

$$GDP_{it} = \beta_0 + \beta_1 INFLA_{it} + \beta_2 INVEST_{it} + \beta_3 OPEN_{it} + \beta_4 REER_{it} + \dots + u_{it} \quad (2)$$

where:

GDP = Gross Domestic Product Growth.

INFLA = Inflation.

INVEST = Investment.

OPEN = Trade Openness.

REER = Real Exchange Rate.

3.3. Fixed Effect Model and Random Effects Model

3.3.1. Fixed Effect Model

Following Jugurnath *et al.* [59] which both static panel regression techniques and dynamic panel estimate to analyze empirically the impact of Foreign Direct Investment (FDI) on the economic growth for a panel of 32 Sub-Saharan African countries during the period 2008-2014. Fixed effects (FE) is used whenever you are only interested in analyzing the impact of variables that vary over time. FE explores the relationship between predictor and outcome variables within an entity (country, person, company, etc.). Each entity has its own individual characteristics that may or may not influence the predictor variables (for example, being a male or female could influence the opinion toward certain issue; or the political system of a particular country could have some effect on trade or GDP, or the business practices of a company may influence its stock price). The equa-

tion for the fixed effects model becomes:

$$Y_{it} = \beta_1 X_{it} + a_i + \mu_{it} \quad (3)$$

where

$a_i (i = 1, \dots, n)$ is the unknown intercept for each entity (n entity-specific intercepts).

Y_{it} is the dependent variable (DV) where i = entity and t = time.

X_{it} represents one independent variable (IV).

β_1 is the coefficient for that IV.

μ_{it} is the error term.

The model for the GDP GROWTH:

$$\text{GDP}_{it} = \alpha_i + \beta_1 \text{INFLA}_{it} + \beta_2 \text{INVEST}_{it} + \beta_3 \text{OPEN}_{it} + \beta_3 \text{REER}_{it} + \dots + u_{it} \quad (4)$$

where:

GDP = Gross Domestic Product Growth.

INFLA = Inflation.

INVEST = Investment.

OPEN = Trade Openness.

REER = Real Exchange Rate.

3.3.2. Random Effects Model

The rationale behind the random-effects model is that, unlike the fixed effects model, the variation across entities is assumed to be random and uncorrelated with the predictor or independent variables included in the model. In the fixed-effects model, these variables are absorbed by the intercept. The random-effects model is:

$$Y_{it} = \beta_1 X_{it} + a_i + \mu_{it} + \varepsilon_{it} \quad (5)$$

where:

$a_i (i = 1, \dots, n)$ is the unknown intercept for each entity (n entity-specific intercepts).

Y_{it} is the dependent variable (DV) where i = entity and t = time.

X_{it} represents one independent variable (IV).

β_1 is the coefficient for that IV.

μ_{it} is the Between-entity error.

ε_{it} is the within-entity error.

The model for the GDP GROWTH

$$\text{GDP}_{it} = \alpha_i + \beta_1 \text{INFLA}_{it} + \beta_2 \text{INVEST}_{it} + \beta_3 \text{OPEN}_{it} + \beta_3 \text{REER}_{it} + \dots + u_{it} + \varepsilon_{it} \quad (6)$$

where:

GDP = Gross Domestic Product Growth.

INFLA = Inflation.

INVEST = Investment.

OPEN = Trade Openness.

REER = Real Exchange Rate.

4. Results and Analysis

4.1. Descriptive Statistics

The descriptive statistics which includes the means, standard deviations, minimum and maximum values of variables. **Table 1** presents the results of the variables used in the study. The study analysis is retrieved from the World Development Indicators from the World Bank with data from 1998-2017 (*i.e.* 20 years each country). The results show that the average percentage of GDP growth is 876.048, with a maximum percent of 139.315 and a minimum of 3221.678.

Trade openness had a mean value of 66.805 with a minimum value of 20.723 and a maximum of 146.767. Inflation has a mean percentage of 67.885 with a minimum percent of 0.433 and a maximum of 239.837. Investment has a mean percentage of 24.708 with a minimum percent of 4.563 and a maximum of 83.538. Real exchange rate (REER) has a mean percentage of 110.631 with a minimum percent of 70.070 and a maximum of 208.905.

4.2. Pooled OLS Regression Analysis

Table 2 showed the regression coefficients for the model estimating the impact of selected factors on economics growth using Panel data. From the Table, the model shows that foreign direct investment (FDI), Real exchange rate (REER)

Table 1. Descriptive analysis test results.

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
GDPGROWTH	180	876.048	589.005	139.315	3221.678
INFLATION	180	67.885	58.881	0.433	239.837
INVESTMENT	180	24.708	15.824	4.563	83.538
OPEN	180	66.805	22.872	20.723	146.767
REER	180	110.631	19.982	70.069	208.905

Table 2. Pooled OLS Regression test results.

GDPGROWTH	Coefficient	Standard Error	t-statistic	P value (P < 0.05)
C	929.177	245.553	3.78	0.000
INFLATION	-5.477	0.706	-7.76	0.000*
OPEN	-4.412	1.791	-2.46	0.015*
REER	5.133	1.892	2.71	0.007*
INVESTMENT	1.847	2.678	0.69	0.491
Adjusted R-squared			0.2736	
R-squared			0.2898	
F-statistic			17.86	
Prob (F-statistic)			0.0000	
No of observations			180	

and Trade Openness (OPEN) were significant at 5% level in Pooled OLS estimation. Investment has positive coefficient but insignificant at 5% level. This suggests that FDI, REER and OPEN are good explanatory variables for determinants of Economic growth in Ghana. The coefficients on the explanatory variables are negative (except REER and Investment).

4.3. Fixed Effect

Table 3 showed the fixed effect coefficients for the model estimating the impact of selected factors on economic growth using panel. From the Table, the model shows that real exchange rate (REER) was significant at 5% level in fixed effects model estimation. Inflation, trade openness (OPEN) and investment which is insignificant at 5% level in fixed effect model estimation. This suggests that real exchange rate (REER) is a good explanatory variable for determinants of Economic growth (GDP GROWTH). The coefficient on the explanatory variables is negative (except REER and INVESTMENT).

4.4. Random Effect

Table 4 showed the random effect coefficients for the model estimating the impact of selected factors on economic growth using panel data. From the Table,

Table 3. Fixed effect (FE) test results.

GDPGROWTH	Coefficient	Standard Error	t-statistic	P value (P < 0.05)
C	-240.681	332.226	-0.72	0.470
INFLATION	-0.737	2.389	-0.31	0.758
REER	10.055	1.762	5.71	0.000*
OPEN	-0993	2.628	-0.38	0.706
INVESTMENT	4.888	4.507	1.08	0.280
R-squared			0.1747	
Prob > F			0.0000	
Number of observations			180	
Number of groups			9	

Table 4. Random effect (RE) test results.

GDPGROWTH	Coefficient	Standard Error	t-statistic	P value (P < 0.05)
C	108.889	307.134	0.35	0.723
INFLATION	-3.586	4.053	-2.22	0.026*
REER	9.065	1.708	5.31	0.000*
OPEN	-1.152	2.438	-0.47	0.637
INVESTMENT	3.428	4.053	0.85	0.398
R-squared			0.1667	
Prob > chi2			0.0000	
Number of observations			180	
Number of groups			9	

the model shows that the variables inflation (INFLA) & real exchange rate (REER) were significant at 5% level in Random effect estimation. The other variables like investment and OPEN were not significant at 5% level. This suggests that inflation (INFLA) & real exchange rate (REER) are good explanatory variables for determinants of Economic Growth in Ghana. Some of the coefficients on the explanatory variables are negative (except INVESTMENT and REER).

5. Conclusions and Policy Implications

This study used the Pooled Ordinary Least Square (OLS), Fixed Effects and Random Effect tests to examine the nature of the relationship between economic growth (GDP), inflation (INFLA) and trade Openness (OPEN). These were chosen in reference to their numerous merits they offer over the other tests. This covers the period from 1998 to 2017 for nine (9) West Countries namely Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Mauritania, Nigeria, Senegal and Sierra Leone.

The significant value of $\text{Prob} > F = 0.000$ found in all indicates a value less than the value of a predetermined significance level. We can conclude therefore that Inflation (INFLA), Trade Openness (OPEN), Real Exchange Rate (REER) and Investment (INVEST) serving as the independent variables in this paper have significant effects on the dependent variable (GDP growth). Also the adjusted R-squared value found in this research provides a prove that the independent variables: Inflation (INFLA), Trade Openness (OPEN), Real Exchange Rate (REER), Investment, have the capacity to explain the dependent variable.

The results showed a significant relationship between the variables. In analyzing the determinants of economic growth (GDP) using the pooled OLS test, Inflation (INFLA), Trade Openness (OPEN) and Real Exchange Rate (REER) showed a significant relationship with economic growth among these countries with investment not showing any significant impact on GDP growth. The test results showed inflation (INFLA) has a negative significant effect on GDP growth. Trade Openness (OPEN) also showed a similar trait exhibiting a significant negative effect against GDP growth. However, Real Exchange rate (REER) showed a positive significant effect on GDP with Investment amounting to an insignificant effect on GDP growth among these nine countries.

Also, based on the evidence from the fixed effects test, Real Exchange rate (REER) showed a positive significant impact on GDP growth. Inflation (INFLA), Trade openness (OPEN) and Investment (INVEST) had an insignificant bearing on economic growth (GDP).

Using the random effects test, Real Exchange rate and Inflation (INFLA) showed a significant relationship with GDP growth. Real Exchange Rate (REER) demonstrated a significant positive relationship while Inflation (INFLA) showed a negative relationship. Trade Openness (OPEN) and Investment (INVEST) established no significant relationship with GDP growth.

Deducing from the findings, the study revealed that Real Exchange Rate (REER) among these countries had a significant impact on economic growth

(GDP growth) in the various test runs. It is therefore recommended that governments of these countries should implement measures and policies to manage real exchange effects to protect the economy. With regard to inflation, governments of these countries can put in measures to curb and control inflation since a rise in inflation has negative effects on GDP growth.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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