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A Gravity Model Analysis of the Influencing Factors of Ghana-Nigeria Bilateral Trade in Merchandize Products

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ABSTRACT

Evidently, the quantum of the general and sectoral impacts of growing trends of Ghana- Nigeria bilateral trade has been a phenomenon of mixed feelings. To some analysts the relationship has been positive, to others it is challenging. The purpose of this research therefore, tries to evaluate the influencing factors of Nigeria-Ghana trade in merchandize products through the gravity model of trade from 2008-2019. The results showed that the real exchange rate had a small but significant positive impact on the bilateral trade between Ghana and Nigeria, but more importantly, it had a positive impact on the Nigerian economy. The study again discovered a positive correlation between the size of the economy between Ghana and Nigeria and the flow of bilateral trade. This shows that trade improves as the GDP between these two countries increases or decreases. The market size or population of both countries exhibited a strong positive impact on trade flows and this is consistent with the theoretical foundation.
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Introduction

The relationship between Nigeria and Ghana is a crucial one for the region, this study helps to expand the degree of trade cooperation between both countries, explains the economic growth and development of these two sub-regions. It is most importantly to note that some of the most unresolved issues are the extent to which countries benefit from bilateral trade cooperation, such as the case of Ghana and Nigeria. The study is unique because it is the first to exclusively study and empirically investigate the trend of Nigeria-Ghana bilateral trade relation through the Newtonian gravity model of trade for a period of eleven years.

Falling transport costs, trade liberalization, economic convergence of countries and the increase of intermediate goods trade, are often categorize as the major factors influencing the growth of world trade (Feenstra, 1998). Owed to absolute and comparative advantage, and product differentiating, it's ideal and typical for countries to engage in international trade, not only for the intensification of their consumption basket, but also to expand and strengthen their economic growth through international capital inflows, transfer of technology, skilled labour and competitive domestic markets (Ignatius et al., 2018). It is difficult for an open economy country to produce all the goods and services needed by its population at a competitive price. The absolute and comparative advantages theories showed us the importance of exchange between countries. Makki and Somwaru (2004) explain that trade facilitates more efficient production of goods and services by shifting production to countries that have comparative advantage in producing them.

International trade allows countries to use their resources efficiently. As explained, international trade and foreign direct investment only happen in open economies. Some authors argue that one leads to the other; some even say that they are complementary or they substitute each other. Generally, foreign direct investment can answer problems of import and export because when foreign brands come to a country with their products, there is no need to import the same products abroad. Some previous studies believed that small countries would not benefit from bilateral or multilateral trade, while others believed that small countries would benefit the most. Alshara (2011) have also compared the bilateral trade between developed and developing countries, and found that developing countries have benefited more from bilateral trade than developed economies.

Market products such as clothing, machinery, farm tools, food, transportation equipment, footwear, stationery, and other manufactured goods form part of Ghana-Nigeria trade (as showed in Graph 1.1 & 1.2). Similarly, many raw materials such as minerals, oilseeds, and cash crops are exported and imported from both economies.

Trade ties are particularly important, and Nigeria's high levels of liquidity serve as an important source of capital for Ghana. Trade between the two economies has been on raise for decades. For instance, in 2019, Nigeria exported $4.04B to Ghana. The main products that Nigeria exported to Ghana are Flexible Metal Tubing ($2.1B), Scrap Vessels ($1.03B), and Special Purpose Ships ($328M). During the last 23 years the exports of Nigeria to Ghana have increased at an annualized rate of 18%, from $89.5M in 1996 to $4.04B in 2019. Nigeria and Ghana are the largest and second largest economies in West Africa, respectively, and the two largest oil producers in the region, despite the huge differences in production between the two countries. Nigeria is Ghana's third largest trading partner in 2010,

accounting for nearly 10% of Ghana's total foreign trade. In turn, Ghana was Nigeria's ninth largest trading partner in the same year, accounting for 1.3% of Nigeria's trade (including 1.9% of exports). Nigeria is also a very important source of investment for Ghana. For example, in recent years, several Nigerian banks and Nigerian telecommunications company such as Globacom have opened branches in Ghana.

Ghana Exports to Nigeria was US$164.06 Million in 2019, while its imports from Nigeria was US$112.29 Million in 2019 according to the United Nations COMTRADE database on international trade. Table 1.1 & 1.2 below shows the various goods Ghana export and import to/from Nigeria in 2019.
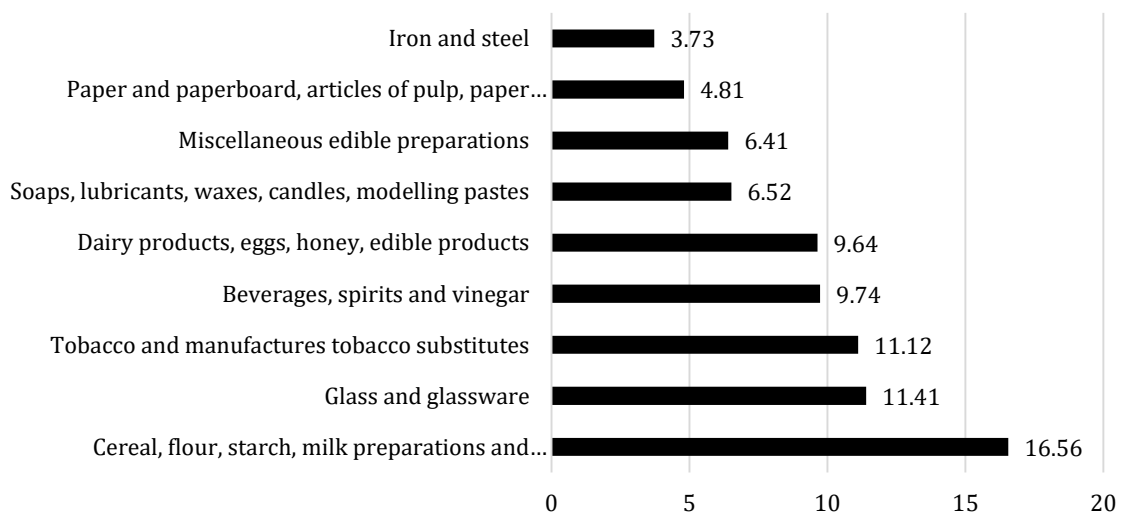
Source: UNCOMTRADE, 2020

Graph 1.1 Commodity Value of Ghana Imports from Nigeria 2019 in Million US Dollar
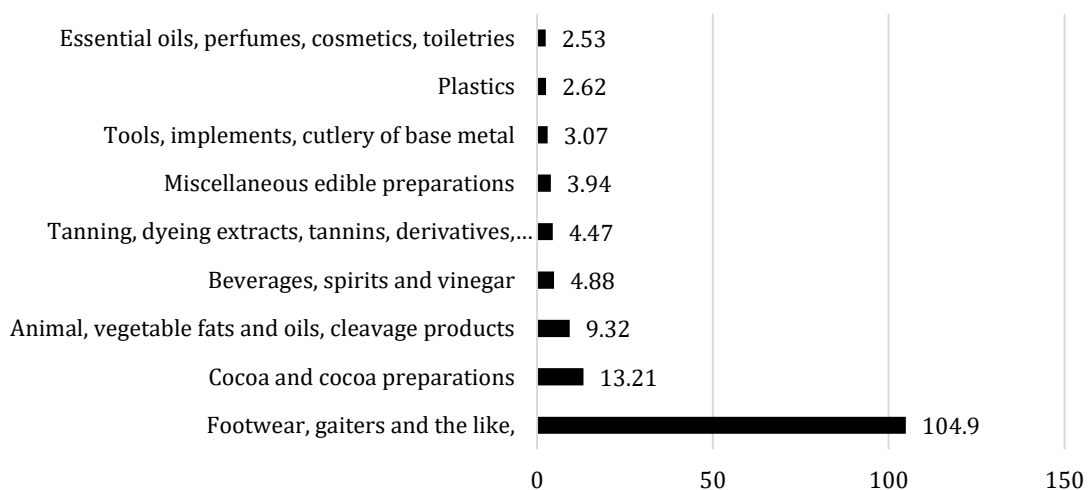
Source: UNCOMTRADE, 2020

Graph 1.2 Commodity Value of Nigeria Imports from Ghana in Million US Dollar

Evidently, the quantum of the general and sectoral impacts of these growing trends of Ghana- Nigeria exports trade has been a phenomenon of mixed feelings. To some analysts the relationship has been positive, to others it is negative. For instance, on the positive side, it has been argued that Nigeria intensification of her trade relation with Ghana is underscored by her increasing appetite for bigger markets and that it has come as a blessing to the country.

In fact, Ghana and Nigeria's main development challenges are similar to those of other African countries. These Including how to ensure rapid and long-term growth through structural and social aspects Transform and upgrade technology, successfully achieve export-oriented growth, and eliminate limit supply by increasing investment in infrastructure (Kaplinsky et al., 2009; Ajakaiye et al., 2009; and Giorgia et al., 2009). To achieve the above development goals, strengthen Synergies and bilateral trade relations are often formed between the two countries.

Recent research lacks the ability to comprehensively compare the specific factors that affect the import, export, and total trade of trade cooperation, which are necessary for appropriate economic policies, trade policies, and increase trade benefits in cooperation. Since the factors that affect a country's imports are not necessarily the same as those that affect its exports or total trade, it is necessary to examine these trade components one by one in order to expand a comprehensive understanding of Ghana-Nigeria trade forecast factors. The direction of this research is to empirically test the factors that affect trade between two countries through the use of basic and extended gravity models. Notwithstanding this, some of the basic questions among others which this paper seeks to address include: What are some of the variables that predict trade flows from Ghana to Nigeria and vice-versa? What is the extent of bilateral trade volume between the two trading partners? What are the possible policy measures that could facilitate a more formidable and increased gains from the ongoing Nigeria-Ghana bilateral trade relation in the traded products?

This study therefore tries to empirically investigates the determinants of Ghana-Nigeria trade by using the gravity model of trade. To the best of our knowledge this is first research to use the gravity model of trade to study the influencing factors of trade between the two countries. To fill the gap and analyze the model, we employed monthly data from 2008 to 2019 due to the increasing bilateral trade and some decided agreement that support the economic integration between these two countries.

Literature Review

The connection between international trade, and economic growth is one of the fascinating deliberations in international economics. A couple of research have been carried out on the phenomena using various data and typologies. The results, however, vary from one author(s) to another. This section of the paper looked at some of the various empirical studies interlinking these economic indicators.

Akpoilih and Farayibi (2016). Studied Determinants of Nigeria-China Bilateral Trade in Manufacturing Products for the period of 1995 to 2012. From the stylized facts, they find evidence of increasing influx of China manufactured products into Nigeria while that of Nigeria outflow to them is of low magnitude. The paper therefore recommended the diversification of economic base of Nigeria crucial for a more beneficial China-Nigeria bilateral trade in manufactures.

Elif (2010) investigated bilateral trade flows and their determinants among six big OIC (Organization of the Islamic Conference) economies for the period of 1985 to 2009. The author basically extends the traditional gravity model of bilateral trade with population and volatility of exchange rates as additional variables and they found that income and population of a country, distances between two countries and volatility of exchange rates were significant determinants of bilateral trade flows among six big countries of OIC. Specifically, the author noticed that the impact of population on bilateral trade flows is positive for the exporter country, while it is negative for the importer country. Other studies on the same OIC Countries include the work of Hassan et al (2010) who investigated economic performance of the OIC countries within the framework of the gravity model and find that D8 which is eight bigger OIC countries is trade creating. They claim that two countries in D8 block would trade 4.28 times more among themselves than two other similar countries in outside of the block.

Akoto and Sakyi (2019), investigated the determinants of trade balance in post-liberalization Ghana, covering the period 1984–2015. Their study finds that household consumption expenditure, government consumption expenditure and domestic prices are negative and significant in the long and short run, whereas foreign income and money supply are positive and significant in the short run. Results from the variance decomposition show that innovations in household consumption expenditure highly contribute to the forecast error variance of the trade balance compared with other explanatory variables. A key finding of the study suggests that depreciation of the Ghana cedi is not an appropriate step to help in improving the country's trade balance position.

Ignatius et al, (2018) noted in their studies international trade, foreign direct investment, and economic growth in togo's economic perspective that, international trade and foreign direct investment have a positive impact on economic growth. Their study employed the Autoregressive distributed lag and Error correction models for the econometric and empirical analysis. The empirical results revealed that in the short run Togo's economic growth can be boosted and revitalized through foreign direct investment, trade freedom, trade openness, and exchange rate appreciation, however, in the long run only trade openness promote economic growth.

Wisdom et al., (2017) noted in their studies "Evolution of Institutions in Ghana and Implications for Economic Growth" that, GDP growth rate in Ghana was quite intriguing under quality and better institutions and throughout her recent two decades of democracy. The econometric method employed in the study was the ordinary least square (OLS) estimations procedure. This was used to determine whether democratic regimes deliver better growth outcomes (GDP growth rates) than the military regimes, it was also employed to empirically verify whether the indicators of the two institutions (Political and civil liberties and Property rights) vary significantly across the three regimes/eras (precolonial, military and democratic regimes). The results show a mixer of relationships. Their studies again revealed that, out of the three formal institutions employed in the study, Civil and Political liberties and Property Rights are better indemnified under democratic regimes, compared to the colonial era and the military regimes. However, the reported indicators of Political instability from the empirical results revealed on the average less favorable outcomes under democratic regimes.

Owolabi Akeem (2011), also conducted a study about the Nigeria trade the theme of the study is "Nigeria's Foreign Trade and Economic Growth Performance Evaluation (1970-2005)". He found that for every 1% increase in exports, the economic growth rate would drop by 19%. He suggested to work hard consciously to fine-tune the various macroeconomic variables in order to provide an enabling environment to stimulate foreign trade. Key determinants of the increased inflows of trade into Africa and varied findings have been achieved. Some of these studies conclude that, the abundance of natural resources in Africa has been the major determinant of trade cooperation with the other parts of the world such as Africa –China relation.

Ignatius et al. (2018), empirically investigates the impacts of institutions on international trade in Ghana's economic perspective. The econometric tool employed in the study is the Ordinary Least Squares (OLS) technique. The results revealed that business freedom and freedom from corruption has no significant effects on Ghana's trade, however,

property rights, monetary freedom, trade freedom and exchange rate exhibit great robust influence on trade in Ghana's economic perspective. The study recommended that the economic institutions and all the auxiliary sectors in supporting and promoting the course of Ghana's trade should be strengthen and focused so as to enhanced and maximize the potential gains from international trade.

Ignatius et al. (2019), investigated the determinants of export service in selected West African countries (Ghana, Benin, Côte d'Ivoire, Gambia, Mali, Niger, Sierra Leone, Togo, Nigeria and Burkina Faso). The study adopted the export demand function introduced by Bahmani-Oskooee (1986) with little additions and modifications of variables based on the reviewed literature. It was discovered from the empirical results that the value added by the services has no impact on service export. However, variables such as foreign direct investment, communication facilities, real exchange rate, and foreign income level possesses a significant robust impact on export trade in services in the selected countries. These countries should therefore widen their opportunities to strive in exporting services worldwide. This can be materialized by exploiting their potentials with relative competitiveness and reasonable negotiations in the global export markets.

Method

Data source

Essentially, the main purpose of this research is to empirically investigate and estimate the decisive factors in the bilateral trade relationship between Ghana and Nigeria in merchandize goods from 2008-2019 through the gravity model of trade.

This study only looked at total bilateral trade between the two countries, therefore total bilateral trade of merchandize products was used as the regressand while the other influencing factors includes, GDPs of the two economies, population of both countries, exchange rate and bilateral distance. Total bilateral trade data was gotten from UNCTADSTAT and UNCOMTRADE, GDPs, exchange rate and population were taken from World Bank data indicators, bilateral distance data was obtained from CEPII distance database.

Empirical Methodology

The Gravity Model has become an important tool for analyzing bilateral trade patterns (Eichengreen and Irwin, 1998). It was originally initiated by Isaac Newton in physics. The gravity model has become common sense in the description and analysis of the spatial flow of regional science, and the model has worked well empirically and has produced

reasonable parameter estimates and explains most of the changes in bilateral trade (Tinbergen, 1962: Pöyhönen, 1963).

Tinbergen (1962) and Linnemann (1966) adopted the analogy of Newton's gravity notion into an empirical bilateral international trade flow model as follows:

$$Trade_{ij} = A\frac{GDP_i^a * GDP_j^b}{D_{ij}^c} \tag{1}$$

Where $Trade_{ij}$ is the size of bilateral trade between country i and j; GDP_i and GDP_j are the Gross domestic products or national incomes of country i and j, D_{ij}^c captures the bilateral geographical distance between the two countries (their capital cities) and A is a constant term. However, there are other factors that influence trade flows, but are not included in equation 1. We therefor augment this equation by elongating Eq (1) to obtain our total bilateral trade model as:

$$\begin{aligned} LnTBT_{ij} = {} & A + Ln\beta_1(GDP_{it} * GDP_{jt}) + Ln\beta_2(POP_{it} * POP_{jt}) + Ln\beta_3(EXH_{it} \\ & * EXH_{jt}) + Ln\beta_4(DIS_{ij}) + v_{ijt} \end{aligned} \tag{2}$$

Where TBT_{ij} total bilateral trade, GDP is gross domestic product of country i (j), POP is population (market size), EXH, donate exchange rate of each country currency relative to the dollar, and DIS is distance.

Discussion

To specially supplement and reiterate the dynamics of commodity trends in the official facts and background explanation of the export trade between the two countries for analysis, we first estimated the basic traditional or the classic Newtonian form of the bilateral trade gravity model equation by Tinbergen (1962) and Linnemann (1966) in equation 1, followed by the enhanced gravity model, we included life control variables as regressors variables so that other possible exogenous variables can be further be explored, strengthen or that may hinder trade flows between trading partners in equation 2.

Generally speaking, the Newtonian principle of basic bilateral trade gravity model expresses the trade flow direction between two or more countries as a positive function of the size of the trade economy partners, gross domestic product (GDP), and a negative bilateral distance between partners. To confirm this, we first use the natural estimate gravity model of bilateral total trade flows of merchandize products between the trading partners as a regressand; and the logarithm of GDP, and the logarithm of distance are used as independent variables as displayed in table 4.1. We went further to perform a least square dummy variable analysis of the augmented gravity model, where additional

variables were incorporated. These variables are exchange rate and population of both partners. The results are displayed in table 4.2.

Table 4.1 Regression Results for the basic Gravity Model for Ghana-Nigeria Bilateral Trade in Merchandize Products

Variables	Pooled OLS Coefficients	t-ratio	p-value	Conclusion
Dependent Variable TBT				
$logGDP_{iN}$	0.016234	0.137492	0.0728	*
$GlogDP_{jG}$	0.038411	0.237330	0.0011	***
$logDIS_{ij}$	-0.04223	-1.014355	0.0732	*
Constant	0.013419	0.022786	0.0422	**
R-squared	0.8227845			
Durbin-Watson stat	1.317586			
Prob(F-statistic)	0.000000			

Note; the asterisk *, **, and *** represents 10%, 5% and 1% significance levels (Source; authors calculation, 2021).

From the regression results, in table 4.1, the coefficients of the explanatory variables indicate that every 1% increase in the income elasticity of the exporting country (Nigeria) will result in an average of about 0.02% change (increase) in the total bilateral trade of goods from the importing country (Ghana). Similarly, for the importing country (Ghana), a 1% increase in the total income elasticity of its GDP will result in a change (increase) of approximately 0.035% in its total trade with its trading partner, Nigeria. Similarly, the distance variable is also significant, at 0.04%. The negative value attached explains that the shorter the distance between trading partners, the higher the value of trade between the two countries. The result confirms the previous study of Elif (2010) and Akpoilih and Farayibi (2016). This strongly shows that Newtonian form of the trade gravity model has worked well empirically.

In table 4.2, the GDPs of the exporting country and importing country are statistically significant at approximately, 5% and 1% respectively. Again, the population variable which measures the market size of their respective economies are found to be strongly significant at 10% and 1% respectively. Nonetheless, the exchange rate of Nigeria is significant at 10%. Its also vital to note that a depreciation of the Nigeria currency will lead to higher exports to Ghana; this is evidence in the positive sign of the exchange rate value. The study again confirmed Ghana exchange rate to be insignificant in explaining the bilateral trade relationship between both countries, however, it was found to be insignificant but it showed that an appreciation of the Ghana currency will lead to an increase in imports from Nigeria. It gives a confimation the previous study of Akoto and Sakyi (2019) and Ignatius et al. (2019).

Table 4.2 Least Square Dummy Variable Gravity Model for Ghana-Nigeria Bilateral Trade in Merchandize Products.

Variables	Pooled OLS Coefficients	t-statistic	p-value	Conclusion
Dependent Variable TBT				
$logGDP_N$	0.224854	0.91862	0.0151	***
$logGDP_G$	0.159733	0.237330	0.0000	***
$logPOP_N$	2.457901	2.228942	0.0633	**
$logPOP_G$	0.062979	1.33871	0.0019	***
$logEXH_N$	0.923925	0.037639	0.0862	*
$logEXH_G$	-0.963590	-3.25496	0.9716	
$logDIS_{NG}$	-3.04784	-0.02278	0.0000	***
Constant	6.033712	0.098765	0.8395	
R-squared	0.993976			
Durbin-Watson stat	2.186301			
Prob(F-statistic)	0.000000			
F-statistics	23.41873			
No. of observations	26			
No. of Countries	2			

Note; the asterisk *, **, and *** represents 10%, 5% and 1% significance levels (Source; authors calculation, 2021).

The results revealed a positive relationship between trade flows in the tested variables, thus, there is a positive correlation between the size of the economy between Ghana and Nigeria and the flow of bilateral trade. This shows that trade improves as the GDP between these two countries increases or decreases. the results of the distance variable tested have proven a negative relationship between trade flows and distance. Thus, we confirm that our result is inline with the previous study of Elif (2010) which provide an increase in trade with lower distance of neighbouring partner.

The results showed that the real exchange rate had a small but significant positive impact on the bilateral trade between Ghana and Nigeria, but more importantly, it had a positive impact on the Nigerian economy. Exchange rate fluctuations have an impact on trade, but in the case of Ghana, their contribution to trade is quite limited. The results calculated from this model are consistent with the theoretical findings. It confirms the study of Ignatius et al. (2019) and Akoto and Skayi (2019).

The research results of this article are consistent with other empirical results in using the gravity model to explain changes in bilateral trade Model. According to Thai (2006), economic scale and Market size has a big impact on trade; a country can produce more goods and services for export; High income and large market size will increase Imported commodity demand and negative coefficient. The actual exchange rate of bilateral trade is also in line with other papers, such as the paper by Akpoilih and Farayibi (2016), Elif (2010) and Dell'Aricaca (1998).

Conclusion

The purpose of this research is to evaluate the influencing factors of Nigeria-Ghana trade in merchandize products through the gravity model of trade from 2008-2019. We conclude that our gravity model is cofimed due the change in bilateral model between these two neigbouring economies. The empirical results have many policy implications. Nigeria and Ghana appear to be growing rapidly in West Africa. A number of studies have shown that based on the current economic performance of the two countries, they will be the most powerful and leading countries in economic performance, and they are likely to become the controlling countries in the sub-region. Therefore, the economies of the two countries must maintain and strive to strengthen their bilateral relations in order to produce trade spillover effects while their economics grow. Since there is a positive correlation between the economic scale of the two countries and the flow of bilateral trade, policies that promote the economic growth of the two countries should be implemented to increase trade volume.

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