Determinants of Nigeria-China Bilateral Trade in Manufacturing Products

AKPOILIH, Roland and FARAYIBI, Adesoji

University of Ibadan, Centre for Allied Research and Economic Development

5 April 2015

Determinants of Nigeria-China Bilateral Trade in Manufacturing Products

AKPOILIH Avura Roland
Department of Economics, University of Ibadan,
Ibadan, Oyo State, Nigeria

FARAYIBI Adesoji Oladapo[1]
Centre for Allied Research and Economic Development,
Ibadan, Oyo State, Nigeria

Abstract
In the recent times, there has been an increasing spread of trade tentacles of China into the hinterland of many developing nations of the world. The need to secure resources to meet the development aspiration of her country made China to increasingly forged formidable trade ties with almost all African countries, especially Nigeria, in the area of manufacturing products. While these realities have proved to be beneficial to the trading partners, there is still skepticism about the benefits of such trade relations to Nigeria. There is a perceived disproportionality in the quantum of bilateral inflow of manufacturing products between Nigeria and China. This study therefore addressed these concerns by applying gravity model to analyze the determinants of bilateral trade relation in manufacturing products between Nigeria and China for the period of 1995 to 2012. Thus, from the stylized facts, we find evidence of increasing influx of China manufactured products into Nigeria while that of Nigeria outflow to them is of low magnitude. This paper therefore recommended the diversification of economic base of Nigeria crucial for a more beneficial China-Nigeria bilateral trade in manufactures.

Keywords: Nigeria-China Bilateral Trade, Manufacturing Products, Trade Policy, GDP Growth, Socio-economic development.

1. INTRODUCTION

Achieving rapid, sustainable and pro-poor economic growth and development through trade channel, especially in manufacturing products is often stressed as a development policy objective of all countries of the world and developing countries which Nigerian is not an exception. The pursuit of such policy objective is practically important as it has the potential of affecting the development and growth paradigm of Nigeria as the country is still classified among the world poorest countries. It also reflects a new trend in development theory and policy which sees trade

[1] Corresponding Author. E-mail: carednetwork@gmail.com

as an engine of economic growth and a veritable mechanism for reducing poverty in all regions of the world.

Evidently, Nigeria as a giant of Africa still records dismal growth rate compare to China. For instance, in 1992-2000, 2000-2005 and 2005-2010, the Nigerian's real GDP growth rates were disappointedly put at 2.30 %, 11.77 % and 7.28 % respectively, unlike China's real GDP growth rates which were put at 9.91 %, 9.75 % and 11.23 % respectively for the same periods of time (UNCTAD, 2012)[2]. In reality, African export and that of Nigeria particularly is dominated by crude material minerals (oil and other natural resources), no export diversification but rather increased concentration, and the imports are dominated by manufactures from other continents and countries (Ajakaiye et al, 2009). This poor growth performance in Nigeria is not unconnected with the concentration of the country's export on relatively underdeveloped primary and manufacturing commodities whose unstable and low prices impacts negatively on her economic growth.

Indeed, Nigeria's overriding development challenge is similar to other African countries. These include among other things how to secure rapid and long term growth with structural and social transformations and technological upgrading, to successfully pursue export-led growth, eliminate supply constraints through increased investment in infrastructure (Kaplinsky et al, 2008; Ajakaiye et al, 2009; and Giorgia et al, 2009). To achieve the above development goals, strong synergy and bilateral trade relationship has often being forged between the country and China.

In this regard, it is necessary to note that China's growth and its capacity to move in the last thirty years from under-development and extreme poverty to an emerging global power and one of the largest exporters of manufactured goods has attracted the attention of many scholars from both developing and the developed countries. Evidently, the quantum of the general and sectoral impacts of these growing trends of China's exports to other countries, including Nigeria 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 China's intensification of her trade relation with Nigeria is underscored by her increasing appetite for natural resources and that it has come as a blessing to the country (Oyejide et al, 2007).

On the negative side however, it should be realized that as Chinese exports to Nigeria have grown rapidly, it has created more increasing competition in the domestic markets and most likely crowding-out other imported goods that are not Chinese origin as well as other domestic goods which are basically produced by Nigerian manufacturers (Oyejide et al, 2009). In fact, with the intensification of economic relations with Nigeria, China has started flooding Nigerian

[2]The trend in Chinese's Real GDP growth rate has been on the increase and greater compare with that of Nigeria for the same period. Increase level of Chinese's exports of manufactures godos due to improved technologies could partly account for such variations.

and other African markets with its low-cost manufactures, which is so detrimental to the local producers. African countries in general are therefore vulnerable to the competitive threat posed by China in third markets (Schott, 2008; Oyejide et al, 2009 and Sanfilipo, et al, 2009).
The developments from the above enumerated concerns have informed series of unanswered or partially answered questions in the literature particularly with regard to the potential predictors (determinants) of bilateral trade in manufactures between China and Nigeria. Some of the basic questions among others which this paper seeks to address include: What are some of the variables that predict trade flow of manufactures from China 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 China-Nigerian bilateral trade relation in the manufacturing sector?

Therefore, objective of this study is to empirically analyze the determinants of manufacturing bilateral trade between China and Nigeria. To achieve this, other specific objects of the study include:

i. To examine the trend of bilateral trade flow of manufacturing products between china and Nigeria.
ii. To estimate the impact of major socio-economic, geographical and political variables that determine bilateral trade flow of manufacturing products between Nigeria and China.

The present concerns now is that as China has emerge as an economic driver of many developing countries, including Nigeria, does it enhance increase receipts of Nigerian manufacturing exports goods? Or it only sells its export commodities to Nigeria without complementary trade intensity flow from Nigerian? Although many scholars have examined the scenarios of China impacts on Nigerian economy in terms of trade[3] but there is still scarcity of empirical literature that particularly focus on the determinants of bilateral trade flow in manufacturing products between Nigeria and China. While results of the few available study is still mixed in terms of the impacts and the determinants of the trade relationship between China and Nigeria, this study empirically employs the Newtonian form of the gravity model to examine the determinants of bilateral trade in manufactures between China and Nigeria. This methodological approach is a contribution in this area of study because to the best knowledge of the author, no existing study have applied such modelling approach to examine bilateral trade relation in manufactures between China and Nigeria. It is therefore hoped that this study will immensely benefit academics, trade policy makers and researchers generally because it will highlight and estimate the impacts of various determinants of bilateral trade relation between China and Nigeria with particular references to manufacturing products.

[3] See Ogunkola, (1998); Ogunkola et al (2006) and Adewuyi, (2012) among other for an elated review

The rest of the paper is as follows: section two provides the empirical literature in order to find out the existing body of knowledge in this area of research. Section three spells out the methodology of the study, covering the theoretical framework, model specification, and estimation techniques as well as data issues. Section four presents the necessary results of the analysis and discussion of the findings, while section five concludes the study with necessary policy recommendation.

2. LITERATURE REVIEW

In recent times, there have been empirical researches focusing more specifically on the determinants of bilateral trade and specifically on the impact of income, economic size and distance on international trade flow. That is empirical research on the application of traditional gravity model with the mentioned variables as regressors or independent variables abound. Basically, the pioneered work on the application of gravity Model (GM) was championed by Tinbergen (1962), Pöyhönen (1963) and Linneman (1966). After these pioneering studies, subsequent empirical studies to test the workability of GM are numerous especially in the recent decades. For instance, Kepaptsoglou *et al* (2009) analyzed EU and Mediterranean countries' bilateral trade flows of export and import for the period of 1993-2007. These authors found that the basic traditional GM variables (Income or population and Distance) performed well there by meeting the theoretical expectation of the direct and indirect proportionality between trade and income and distance respectively.

Similarly, 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.

Again, Gundogdu (2009) estimates intra-OIC trade for the period of 1995-2007 with GM and finds that OIC member countries have started to trade more with each other and also with the rest of the world as a result of their individual efforts and requirements of being members to free trade areas to remove trade barriers and reduce tariffs. Furthermore, Karimi-Hosnijeh (2008) analyzes bilateral trade flows between Iran and OIC countries for the years 1998-2005 and shows that economic and cultural similarities among OIC countries have a significant positive impact

on their bilateral trade flows of agricultural products. Moreover, he claims that there is still a high potential of OIC countries to increase their exports to non-members up to 36% and imports from them up to 28%.

Furthermore, Egger (1999) estimated the potential for trade between Austria and five Central Eastern Europe (CEE) countries (Hungary, Czech Republic, Slovak Republic, Poland and Slovenia). He used "fixed country effects" to estimate export potential in the framework of these countries and found that "CEE Community's openness to EU exports would increase, without altering the bilateral degree of openness among other countries of the European Union". To be more specific on African continent, most of the existing empirical studies on the impacts of China-African bilateral trade relation are mostly carried out under the Scoping studies embarked on by the African Economic Research Consortium (AERC) on Asian Drivers[4] According to Ajakaiye (2009), the Asian Drivers Scoping studies began with 18 African countries' trade with China and latter developed into 22 more detailed country-specific case studies like this present study. In general, Ajakaiye (2009) submits that in cases where China exports and African country imports, or where Africa exports and China imports, African economies stand to gain from the direct relationship. However, when China exports the same products as does Africa, or when it buys in global markets the same products as does Africa, then these indirect impacts can often be very harmful.

One of these studies that are very significant is the empirical findings of Oyejide, et al (2009). They identify a series of gains to African economies. But at the same time, they observe that China's prowess in manufactures has both direct and indirect impacts which are harmful to Africa's industrial growth because the relationship, according to the authors is capable of freezing Africa's economic structure. They conclude with two policy implications – China needs to provide African countries with preferential market access, and to support the capacity of Africa's producers to take advantage of this access.

One of the country-specific empirical studies that relate to China trade impacts with African countries is the work of Adewuyi et al (2010). These authors, as part of the Scoping studies on Asian Drivers by AERC empirically examined the impact of the increasing trade relationship of China with Nigeria at both macroeconomic and microeconomic level. By employing series of methods ranging from gravity model, trade intensity index as well as survey method (administration of questionnaires), these authors found among other things that intensity of China's export to Nigeria has been high over time, while the intensity of Nigeria's export to China has been low which implies that Nigeria has exported less than it should do to China. The results of the panel regression show that economic size of the two countries plays a major role in

[4] (see http://asiandrivers.open.ac.uk/ for details).

promoting trade relations between them. Lastly, their results suggest that the level of tariffs in China promotes trade with Nigeria, while the level of tariffs in Nigeria hinders trade with China.

Methodologically **o**ver the years, various methods have been developed to empirically investigate possible determining factors as well as their effects on bilateral trade flows of one country with another. The essence of these methods is how to reconstruct trade flow pattern or model and how best to forecast desirable trade flow that will enhance growth among the concerned countries. Thus these methods are intended to be used in assessing possible potential gains and losses from any form of bilateral trade relationship. Indeed, intensive methodological efforts at trade flow modeling has been widely researched over the last three decades[5] and prominent among these methods is simulation and econometric models that attempt to make predictions based on past and actual performance (World Bank, 2005).

Simulation models capture the underlying structure of trade flows comprising of activities such as production, consumption and transportation which respond to inputs used, hence, generalized equilibrium models have been exploited for simulating trade flows which have the advantage of calculating trade flows endogenously and incorporating transportation costs in the model (Transek et al, 2001). In particular, computable generalized equilibrium (CGE) models have been widely applied for modeling trade flows and examining Free Trade Area/Preferential Trade Area (FTA/PTA) effects on trade flow.[6] However, as noted by Kepaptsoglou, et al (2010) CGE models of trade have been criticized by a number of researchers. For instance, World Bank (2005) noted that CGE models require the selection of a considerable number of parameters; since these parameters are chosen and not estimated, statistical properties of the results are therefore unknown.

Similar to this World Bank claim, Hertel *et al,* (2007) comment on the weak econometric foundations of CGEs, which is indicated by past research. Notwithstanding, these authors (World Bank, 2005 and Hertel, *et al*, 2007) find however that some of the results of CGEs are robust (especially those related to the analysis of FTA effects) and conclude that there is a good potential of combining CGEs with econometric models for obtaining better results. Finally, another form of methodological efforts at obtaining robust estimates from GM of trade is the work of Peridy (2005) who exploited a variety of modeling techniques (OLS, fixed effects, random effects, Hausman – Taylor (HTM) and Generalized Method of Moment (GMM) and came up with a number of comments by comparing their results. First, with respect to static models, he found that all models have "significant and similar" parameters, while GMM is the most appropriate dynamic model.

---

[5] see Kepaptsoglou, et al, 2010 for the summary of most of the recent review.

[6] for detail empirical studies which apply CGE models readers should see Kouparitsas, 2001; Augier et al, 2003; Chisic, 2003; Baier and Bergstrand, 2004; Bond, *et al,* 2004; Raff, 2004; Ornelas, 2005; Abrego *et al.* 2006; Siriwardana, 2007 Abbott *et al.* 2008; and Lee *et al*. 2009).

In fact all these variations in methodological approach have been adopted to correct for misspecification and omission variables bias problems in the GM and consequently, improve the explanatory power and robustness of the regression results. It is expedient to state here that studies which have to do with methodological contributions to the estimation of GM in one form or the other are inconclusive and yet there seem to be no generally acceptable approach that is more plausible compare to others, although majority of researchers tends to favor the use of Fixed effects (Brun, 2005). However, in line with Egger (2002) selection between fixed and random effects models depends on the interests of the analysis, the country sample, the data properties and the underlying theoretical model used.

As the above literature review showed, both empirical and theoretical works on the gravity model have come a long way over the last fifty years. The main shortcoming, as the history of the model revealed is the weak theoretical foundation of the model as presupposed by the founders. However, the subsequent researchers have been able to establish the theoretical foundation of the gravity model as will be seen in the next chapter.

3. THEORETICAL FRAMEWORK AND RESEARCH METHODOLOGY

3.1 Introduction

This chapter détails the various methodological issues necessary for establishing the bilateral trade determinants of manufactures goods between Nigeria and China. Basically, in line with other empirical reviews, the theoretical foundation for gravity model used in the analysis and the model specification for China-Nigerian Bilateral trade in manufactures are specified, as well as model estimation techniques and the various data types and their respective sources.

3.2 Theoretical Framework

Gravity model (GM) has become so instrumental for analyzing patterns of bilateral trade (Eichengreen and Irwin, 1998). It was initially initiated by Isaac Newton in physics. GM has become a common knowledge in regional science for describing and analyzing spatial flows, and was pioneered in the analysis of international trade by Tinbergen (1962), Pöyhönen (1963) and Linneman (1966). The model works well empirically, yielding sensible parameter estimates and explaining a large part of the variation in bilateral trade (Rose, 2005).

Despite the success of the gravity model in analyzing international trade flows, it has long been disputed for a lack of theoretical foundation. This, perhaps account for the neglect of the model from the late 1960s to the late 1980s. Notwithstanding, as much investigation into the theoretical foundations of the GM were on the increased, there seem to be a welcome revival of the empirical robustness and theoretical plausibility of the model in the international trade literature. In fact, Carrere (2006), noted that the model has acquired a second youth partly due to its recent extensive use to study trade patterns and mainly because justifications and theoretical explanations have been developed for it based on international trade theories like Hecsher-Ohlin

theory of trade and increasing return theory among others[7]. Therefore, algebraic demonstration of such theoretical basis of GM according to the seminar paper of James Anderson in 1979 on "*a theoretical foundation for the gravity equation*" is shown below:

Anderson (1979) used the pure expenditure system model to build the gravity equation which in its conventional form is as below;

$$M_{ijk} = \alpha_k \, Y_i^{\beta k} \, Y_j^{\gamma k} \, N_i^{\varepsilon k} \, N_j^{\rho k} \, d_{ij}^{\mu k} \, U_{ijk} \qquad (3.1)$$

where M_{ijk} represents dollar flow of goods from country i to country j, Y_i and Y_j are the incomes in countries i and j respectively and N_i and N_j are population in both countries while d_{ij} is the distance between countries i and j respectively. U_{ijk} is a lognormal distributed error term with $E(ln\, U_{ijk}) = 0$. The work specifically assume in general terms a range of countries in which the structure of traded goods is very similar and where tax structure and transportation cost are also similar. He built the model in stages starting with the simplest derivation of the gravity model in which bilateral trade is solely a function of countries' income and went on to incorporate other variables like population size, distance and border taxes.

Based on the foregoing, it is justifiable to conclude that apart from its success in empirical works, GM has found a theoretical basis in international trade theories, and this served as the basis for its adoption here in this study.

3.3 Model Specification

To successfully model bilateral trade relation of China with Nigeria in Manufacture products, we start by representing the initial Newtonian GM in Physics, and as later developed by Tinbergen (1962) and Linermann (1966) in international trade flows.

The model is expressed in its original form as:

$$F = G\frac{M1M2}{R^2} \qquad (3.2)$$

$\mathbf{R^2}$

F = the force of attraction

G = constant

M1 = mass of object 1

M2 = mass of object 2

R = the distance between the two objects.

The analogy of equation (2) in empirical bilateral trade literature can be denoted as:

$$trade_{ij} = A\frac{GDP_i^{b_1} GDP_j^{b_2}}{D_{ij}^{b_3}} \qquad (3.3)$$

[7] See Anderson, (1979); Bergstrand, (1985); Helpman and Krugman, (1980); Deardorff, (1998); Baier and Bergstrand, (2001); Evennet and Keller, (2002); Anderson and Van Wincoop, (2003) among others for a succinct review).

Where $trade_{ij}$ is the value of bilateral trade between countries i and$j$; GDP_i and GDP_j are the national incomes or outputs of countries i and j and they are usually used as proxies to measure the economic size; D_{ij} captures the bilateral distance between the two countries and A is a constant term.

The economic version of the model can be obtained by linearizing equation 3 and due to the additive nature of Logarithms; we convert it to arrive at an estimable equation 4 following a panel framework, as:

$$\ln trade_{ijt} = \alpha + b_1 \ln GDP_{it} + b_2 \ln GDP_{jt} + b_3 lnD_{ij} + v_{ijt} \quad (3.4)$$

where t represents the time period, $\alpha = \ln A$, and α, b_1, b_2 and b_3 are the coefficients of the regressors.

The disturbance term (v_{ij}) captures shocks that may affect bilateral trade between the two countries.

This gravity model claims that higher income tends to support trade by leading to more production, higher exports and also higher demand for imports (see De Grauwe and De Cushman: 1983, Bellefroid: 1986; Matyas: 1997, and Balogun, 2007 for a good review).

Furthermore, larger distances between countries are expected to decrease bilateral trade by leading to higher transportation costs and some other difficulties to trade such as informational asymmetry (see Clark et al.: 2004; Glick and Rose: 2002; Rose et al.:2000 for example). In fact, the inclusion of the core variables in the model--- income and distance in a trade equation are justified by many trade theories, especially imperfect competition and the Hecksher – Ohlin model (see Ghosh and Yamarik 2004).

Equation (4) is the basic traditional gravity model and the underlying a priori expectation is that bilateral trade is positively related with economic size and negatively related with distance. Thus, as income and output increase, there would be both greater demand for goods and services and increased production; thus, $b_1, b_2 > 0$ (positive). Also, the farther the bilateral distance between the two trading partners' capital city, the higher the transportation costs and if all things being equal, the lower the volume of trade transactions; therefore,

$b_3 < 0$ (negative).

Aside from the basic traditional gravity model variables, several additional variables have been adduced and included in the GM equation by many researchers to control for differences in geographic factors, historical ties, socio-economic and political factors. In particular, we include Total Land Area (landmass), population. Other controlled variables such as measure of the rate of country's openness, Governance Indicator as a measure of Political stability[8] and exchange rate are also included.

---

[8] See Anderson and Marcouiller (2002) and particularly De Grauwe, (2009) that made used of governance indicator as a regressor in their works. In the terminology of Anderson and Marcouiller (2002) a country with a low governance quality (or weak institutions) will display insecurity on trade and this generates a mark-up on traded goods.

On the part of openness, the more open an economy is, the higher the expected level of trade. Exchange rate is considered to be another significant variable for determining international trade flow. While Hooper and Kohlhagen (1978); Gotur (1985); IMF study (1984) and Bacchetta and van Wincoop (2000) found no statistically significant effect of exchange rate on bilateral trade flow, studies like Ethier (1983); Cushman (1983) and Akhtar and Hilton (1984) found a significant negative effect of exchange risk on trade.

By injecting the above stated additional controlled variables to the traditional GM, the augmented version of equation 4 is presented as:

$$\ln MXP_{ijt} = \alpha + b_1 \ln GDP_{it} + b_2 \ln GDP_{jt} + b_3 \ln D_{ij} + b_4 \ln POP_{it} + b_5 \ln POP_{jt} + b_6 \ln AREA_{it} + b_7 \ln AREA_{jt} + b_8 \ln EXR_{i_t} + b_9 \ln EXR_{jt} + b_{10} \ln \text{OPENSS}_{it} + b_{11} \ln OPENSS_{jt} + b_{12} \ln \text{POLSTAB}_{it} + b_{13} \ln \text{POLSTAB}_{jt} + v_{ijt} \quad (3.5)$$

In addition to the earlier definitions of variables, MXP_{ijt} are bilateral manufactured exports between i (the source countries) and j (the trading partner or the reporting countries). Similarly, the variable *AREA* denotes the country's total land area, including areas under island, bodies of water and some coastal waterways (see Jugurnath *et al.* 2007). It is expected theoretically that larger countries will export more, therefore, b_6, and $b_7 > 0$. The sign of the coefficient of exchange rate is basically indeterminate (IMF study 1984; Bacchetta and van Wincoop 2000; Lanea and Milesi-Ferretti 2002). However, it is expected that higher exchange rate worsen the purchasing power of the local currency. Thus, we expect that b_8 *and* $b_9 < 0$.

Also, we anticipate that the coefficients sign for openness will be positive because the more open a country is, the more trade is facilitated. i. e b_{10} and $b_{11} < 0$. On the part of political stability as a governance indicator, we expect that good governance and absence of violence will facilitate trade across different continents of the world. Therefore, we expect on a priori ground that b_{12} and $b_{13} > 0$

Lastly, v_{ijt} is the stochastic term or the disturbance handler of the random error terms capturing the effects of other possible exogenous variables not included in the model, we expect its normal distribution behavior and this will be reflected in the signs and magnitude of the residual term measure through Durbin-Watson statistic.

3.4 Estimation Technique

We estimate model 5 above with pooled Least Square for the panel data.

3.5 Data Issues and Data Sources

Total bilateral export of manufactured product is used as the dependent variable for this study. Thought, it is necessary to include imports of manufactured products, but in line with other empirical works like Elbadawi (1997) who was indifferent between the use of import or export, arguing that both are influenced by the same factors, we used only bilateral export of

manufactured goods. Economic size is usually measured with GDP even though opinions differ as to whether it should be measured in terms of Purchasing Power Parity (PPP) or official exchange rate. For Cassim (2001), PPP is a better measure of relative standards and thus this study adopts the PPP version of GDP for analysis. The data used for the empirical analyses were obtained from the following sources:

(1) Bilateral Export of manufactured products: **UNCTADSTAT (2012**): Merchandise trade by partner and product, 1995-2010. Find data at:
(2) http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx.
(3) GDP, GDP per capita and Total land area: **WDI (2011)**: World Bank.
(4) Bilateral distances, Border: **CEPII distance database** (http://www.cepii.fr/anglaisgraph/bdd/distances.htm).
(6) Political Stability Figures: **World Governance Indicators (2012).**

4. PRESENTATIONS OF THE EMPIRICAL RESULTS AND DISCUSSION OF THE FINDINGS

4.1.Introduction

Basically, the main objective of this study is to empirically investigate and estimate the determinants of bilateral trade relation between China and Nigeria in terms of manufactured goods for the period of 1995-2012 through the application of gravity model econometric approach. To specifically complement and reaffirm the dynamics of the trend of manufactured export trade between these two countries as explained in the stylized facts and background analysis, two major models were run. The first model estimates the basic traditional or the classical Newtonian form bilateral trade gravity model equation as stated in our equation 3. The second is the augmented GM stated previously in equation 5 which include vital control variables as regressors to be able to explore further other possible exogenous variables that could enhance or retard trade flow between the trading partners. The results are presented and discussion of the findings followed.

4.1 Model 1: The basic Gravity Model for China-Nigeria Bilateral Trade in Manufactured Goods.

Generally, the tenet of the basic bilateral trade GM in its Newtonian form expresses trade flow between two or more countries as a positive function of the economic size of the trading partners, proxy by the either the Gross Domestic Products (GDP) and a negative function of the bilateral distance between the partners. To confirm this, we first estimate the GM using natural log of bilateral export of manufactured goods flows between the trading partners as dependent variable and log of GDP, as well as log of Distance as the independent variable. See table 4.1 below:

Table 4.1: Regression Results for Newtonian form of GM for China-Nigeria Bilateral Trade in Manufactured Goods

Variables	*Coefficients*	*t-ratio*	*p-value*	*Remark*
Constant	0.005276	0.283988	0.7783	
Log(GPD_S)	0.005841	3.227350	0.0029	*
Log(GDP_R)	0.005162	1.699853	0.0992	***
Log(Dist)	-0.009288	-1.932156	0.0625	***
Log((MEXP_S)-1)	0.997466	1800.695	0.0000	*
R-squared = 0.999999		Adjusted R-squared = 0.999999		Durbin-Watson stat 1.737583
F-statistic = 14057160		Prob(F-statistic) = 0.000000		

Source: Authors' Computation, 2013.

*Note: ***, **, * represent 10%, 5% and 1% level of statistical significance respectively.*

The estimated results show that the regressors (lnGDP and lnDist) jointly explained total variation in the rate of bilateral flow of manufactured goods between the trading partners up to 99.9 percent. This is judged from the value of the coefficient of the determination of the estimated model (R^2, supported by Adjusted R^2). This implies that it is only 0.1 per cent of the total variation in the value of the dependent variable (Manufactured export) that is explained outside the explanatory power of the regressors. This is a strong indication that the Newtonian form of the gravity model of trade works well empirically.

Again, the coefficients of the explanatory variables show that a 1 percent increase in terms of income elasticity of the exporting country (source country) will on the average lead to approximately 0.01per cent change (increase) in total exports of manufactured goods from source country to the importing (reporting) country if other factors are held constant. Similarly, for the importing (reporting) country, a 1 percent increase in income elasticity of her total GDP will lead to approximately 0.01 per cent change (increase) in her total imports of manufactured goods from its trading partner. The same coefficient was noted for both trading partners and it signify a situation of bilateral trade relation being determined by the same factor (economic size).

For the distance, the coefficient of the variable signed correctly in conformity to the theoretical expectation. It revealed that changes in distance could lead to approximately 0.01 per cent change (decrease) in the volume of bilateral exports of manufacturing goods due to increase transport cost. To correct for autocorrelation problem, we made the GM a dynamic one by making a one period lagged value of the endogenous variable and added it to other regressors. Through this method, the value of Durbin Watson is 1.737583 which is approximately 2.03. This has now satisfied the condition of absence of serial autocorrelation.

Judging from the p-values and the t-ratios for all the explanatory variables, we found that all the variables were statistically significant at 1 and 5 per cent. See table 5.1 above and appendix for detail.

5.1 Model 2: The Augmented GM for China-Nigeria Bilateral Trade in Manufactured Goods

The estimated results of the augmented GM for China-Nigeria BT in Manufactured goods show some important issues that are worth noting. Firstly, in terms of the coefficient of the determination of the model which measures the explanatory power of the regressors in determining the rate of variation in the dependent variable, we found from the pooled Least Squared regression results that the explanatory variables jointly accounted for 97.1 per cent of the total variation in the volume of export of manufacturing products traded between China and Nigeria. Better still, the value of the Adjusted R-squared also accounted for 95.4 per cent after making an adjustment for possible loss in the degree of freedom. This implies therefore that the remaining 2.9 per cent of the total variation in the depended variable is explained by other exogenous factors outside the prowess of the included explanatory parameters in the model. Thus, the exogenous parameters of the model jointly have high explanatory power in determining total bilateral flows of manufactured Products between Nigeria and China and Vice-versa as trading partners (See table 5.2 below and appendix for details).

Table 5.2: Least Square Dummy Variable Gravity Model for China-Nigeria Bilateral trade in Manufactured Goods

Variables	*Pooled OLS Coefficients*	*Variables*	*Pooled OLS Coefficients*	*Variables*	*Pooled OLS Coefficients*	*Variables*	*Pooled OLS Coefficients*
Const	25.26860 (1.680696)	lnOPen_S	-2.487792*** (-1.931704)	lnPop_S	0.052809 0.909395)	lnPop_R	0.048429 (0.836681)
lnGDP_S	1.759957 (1.678464)	lnOPen_R	-0.086922 -0.066265)	lnarea_s	5.02E-07** (2.136546)	lnarea_r	7.37E-07*** (1.969951)
lnGDP_R	4.077370* (4.127497)	polstab_S	-0.487801 (-1.092427)	lnEXR_s	0.223329 (0.548575)	lnEXR_R	-0.038830 (-0.097776)
lnDist	-8.923544* (-3.573050)	polstab_R	0.741759 (1.108107)	Prob(F-statistic) = 0.000000	No of Countries = 2	No of Cross-sectional units = 2	No of Observation = 36
R-Squared = 0.971239	Adjusted R-Squared =0.954244	D-Watson = 2.239197	F-statistic 57.14781				

Source: Author's Calculation, 2013.

Note: *, **, *** represent 1%, 5% and 10% levels of statistical significance. The t-statistics for the Coefficients are in italics and bracket below them. The subscripts r and s denote trading partner and source countries respectively.

Although, this study made use of one African country (Nigeria), but it is worth stating that this high overall explanatory muscles of the model is not significantly different from most empirical results of GM estimated in the literature. For instance, De Grauwe, (2012) estimated a similar augmented GMs for China trade with Africa, France, Germany, UK and USA and found the coefficient of the determinations for his various models to be 57 per cent, 71 per cent, 59 per cent, 70 per cent and 57 per cent respectively. In our case, the coefficient is higher,

notwithstanding the methodology of Seemingly Unrelated Regression (SUR) estimation technique which he applied.

Furthermore, from table 5.2 above, Gross Domestic Product of the source country, i.e Log(GDP_S) countries which measures the economic size or the strength is statistically insignificant at 1 per cent, 5 per cent and 10 per cent level of significance. This is however contrary to the a priori expectation of significant and positive impact of the economic size of the source country as a determinant of bilateral trade. By implication, neither GDP of Nigeria nor China is significant when it comes to accounting for determinants variables of their rate of export of manufacturing products to each other. Those other factors that may largely determine their export flows of manufactured products to each other may therefore be industry-specific.

On the contrary however, GDP of the reporting country (importing countries) indicates a correct sign of positive relationship with imported manufactured products. This is in conformity with our theoretical expectation of the potential impacts of economic size of import-dependent economy to attract higher imported manufactured products. By indication, the coefficient on the elasticity on income for the reporting (importing) countries, that is, Log(GDP_R) is found to be 4.1 per cent and if we operate at cetris paribus condition, it implies that a 1 per cent increase in elasticity of economic size of the importing countries shall averagely results into about 4.1 per cent increase in the coefficients of the elasticity of bilateral imports inflow of either China or Nigeria to her trading partner. In a more precise manner, it implies that GDP of either Nigeria or China significantly determined the level of their total imports of manufactured Products from each other.

This finding is also in line with other empirical works. For example, Olofin *et al* (2012) found the coefficient of the GDP reporting countries to be 0.77 in their pooled LSDV regression model for regional trade in West Africa. In comparison with this present work, the variable (GDP_R) performed high in our model than theirs. Lastly, when comparing the results of the coefficients of GDP obtained for the reporting country in this study with a similar work on African-China bilateral trade done by De Grauwe, (2012), we can discovered that our coefficient (4.1 per cent) for the economic size performed better.

Concerning the coefficients of the elasticity of bilateral/geographical distance between the capital cities of the trading partners, we found from the results presented in table 5.2 above that the coefficient of distance proved to be correctly signed (negative) and conformed to our a priori expectations of the negative relationship between distance and volume of total exports accruable to a particular country from its trading partners. The reasoning is that as distance increases, the transport cost increases which significantly reduce the volume of export flows between trading partners. The coefficient of this variable in terms of its elasticity unit is 8.9 per cent and it is significant at 1 per cent level of statistical significance (see Table 5.2 above for detail). By implication, the farther the distance between the trading partners, the more the transport cost, and

the more trade is inhibited. The result is not significantly different from empirical coefficient of distance in most studies involving bilateral trade under the gravity model framework (see Longo and Sekkat, 2004; Carrere, 2006; Jugurnath et al., 2007; Agboji, 2008; Vicard, 2009; Martinez-Zarzoso et al., 2009 and Olofin *et al*, 2012 among others).

It should be noted that even if the coefficient of distance does not proved to be statistically significant, it is still in conformity to recent realities because with technology, travelling on long distances is rapidly diminishing; an exporter in a given source country can post goods to his or her importers in the reporting countries by shipping the goods, while the importer only pay for shipping and other cost for clearing of the goods from the ports. Thus physical distances are fast becoming irrelevance with technology in this era of globalization.

We found from the results that population of each of the trading partners as well as exchange rate and trade openness of the reporting countries were not significant in determining the level of bilateral trade in manufactured goods between China and Nigeria. For the geographical landmass or the area of the trading partners, we found that changes in this variable for both source and reporting countries were significant. This variable explains the extent of the vegetation coverage and other natural and man-made resources that could help in production and for subsequent increase in export. Our results shows that a 1 per cent change (increase) in land mass or the area of the exporting countries, if all things been equal will leads to 0.001 per cent increase in total exports flows of manufactured products among the trading partners. The same magnitude of impacts is exhibited by the landmass (Area) of the reporting countries. We found that the coefficients of areas are significant and correctly signed, but their impacts are relatively small. Even though if there are insignificant, the results will still be in agreement with the positions maintained by Cassim, (2001) and jugurrnath et al, (2007)[9]

It is also important to comment on the coefficient of openness as a socio-economic determinant of bilateral trade flow. It was expected on the a priori ground that the more open an economy is, the more the level of trade. From our empirical results, we found that the coefficient of the elasticity of openness for exporting country was significant, but incorrectly signed, and that of the reporting country is insignificant (though correctly signed). Thus, for the source country, we found that a 1 per cent increased in the level of its trade openness, trade will decrease up to 2.5 per cent. This finding does not greatly confirm some of the empirical studies in this regard. For

[9] These authors clearly show that the effect of Area or Landmass on trade is mixed with some implying that it is positive while others subscribe to a negative effect. To them, when there is an increase in the land mass or the area of the trading partner, especially the reporting countries, natural resources are likely to increase, and with proper harnessing of such resources the need for increase importation from the rest of the trading partners tend to reduce. Also, smaller countries tend to compensate for their size by specializing based on comparative advantage and resource endowment and therefore trade more in their area of disadvantage. This explanation probably justifies the positively signed coefficients of Area, but with small impacts (magnitudes) of the coefficients for both reporting and the source countries in this study.

instance, Zahra *et al* (2011) found the coefficient of openness in his study on the analysis of bilateral trade among the D8 Islamic countries to be 1.02 per cent. This is the contrast of our own finding. We however have an opinion that the level of openness of an economy reflects its development, which will increase domestic demand for such products, thereby reducing total exportable manufactured goods.

Political stability is a good measure of governance indicator included in this study. It was expected theoretically that the more stable a given country is, the more conducive the macroeconomic environment will become, thereby facilitating trade. But unfortunately our empirically results revealed that governance indicator (political stability) for China and Nigeria was statistically insignificant for either countries as either a source or a reporting country). In reality, incessant political instability of country of origin of a particular product will lead to decrease in total outflow of her manufactured exports and vice versa for the importing country.

These insignificant statistical behaviors of this variable are not in consonance with the position of Longo et al (2004). In their study, they found negative coefficient of relationship between the political stability and the rate of export trade for various trading partners. The reality however is that the more stable an economy is politically, the more the possibility of increase in bilateral trade flow between the trading partners.

Exchange rate and its popular volatility is another important determinant of bilateral trade flow between two or more trading partners. The volatility of the exchange rate and the type of regime adopted has the possibility of shaping the landscape of international trade flows to and from a particular trading country. Unfortunately, the result of our estimated model for both the source and the reporting countries were not statistically significant. This finding is however the opposite of the empirical findings of Bamidele, et al (2011) who found that exchange rate elasticity coefficient for African (Sub-Saharan Africa) export trade with China was 0.29 %. Notwithstanding the results, exchange rates play vital roles in bilateral export of products between countries of the world and as Dollar, (1992) notes, a stable exchange rate will create incentive that is consistent over time as two countries or regions engage in bilateral trade.

In all, the above analysis show that the included variables in the two models i.e. the traditional gravity model and the augmented type proved to be relevance in the determination of bilateral trade flow of manufactured goods between Nigeria and China.

5. CONCLUSION AND RECOMMENDATION

This paper examined the determinants of bilateral trade flow in manufactured products between China and Nigeria. The periods covered in this study was 1995 to 2012 and gravity model was used for the analysis in a panel data econometric framework. After culling all the necessary data from relevance sources as mentioned earlier, an estimation of the variables were done and from

the foregoing therefore, Nigeria needs to develop its productive base and widen its market size for a more effective and beneficial bilateral trade with China. This can be achieved by promoting policies that stimulate and strengthen domestic production base both for domestic consumption as well as exports. Through that it is envisioned that Nigeria will only import goods and services where they have comparative cost disadvantages rather than the current trend where there is an influx of all kinds of products from China to her economy. Also, Nigeria may need to propose a more pragmatic framework that provides markets for her exports to China. In essence, the trade relationship between China and Nigeria should be symbiotic rather than being lopsided. Expectedly, based on the nature of endowed resources, Nigeria have comparative advantages in the production of some goods and services and thus she should facilitate and design a more proactive bilateral agreements with China, among others, where such products can be optimally traded and utilized.

5.1. Policy Recommendation

In realization of the fact that Nigeria has long been caught in the web of trade relationship with China for a long time now and based on the empirical findings of this study, there is need to carefully articulates policies that will lead to more profitable trade relationship between the trading partners.

First, the idea of trade liberalization which promotes a higher degree of openness should be treated with caution given the fragile nature of most domestic industries in Nigeria which cannot compete with other foreign industries yet. Some level of protectionism may still be required to strengthen these fragile industries and to discourage turning Nigeria into dumping grounds of substandard products which appears to be the current practice.

Second, given the market size of Africa, especially Nigeria with attendant opportunities, improved real sector productivity guaranteed by deliberate policy actions by the respective governments will drive increased domestic production and foreign supply which by extension can accelerate the achievement of sustainable growth and development.

Third, Political instability is also found to be another crucial factor that could hinder bilateral trade relations. Evidently, political instability has remained pervasive in Nigeria despite the returned of democratic regimes for more than one decade now. This is occasioned by persistent civil unrests and political tensions. The increasing incidence of this unfavorable trend may shrink bilateral trade flows between Nigeria and its trading partners including China. Therefore, Nigeria should be more proactive in addressing political instability in the continent. In addition, civil unrests thrive particularly in countries where youths are not gainfully employed; therefore, respective governments should intensify efforts towards widening their industrial base to accommodate the teeming unemployed population in the continent. This can be achieved by promoting a private-sector led economy where both small, medium and large scale enterprises

are offered an enabling environment to thrive. Among the plausible initiatives of promoting an enabling environment include investment in infrastructure such as transport, power and communications to reduce the cost of doing business in Nigeria among others.

5.2 Limitations to the Study and Suggestions for Further Study

As previously noted, the major tenet of this study focuses on an empirical attempt to investigate the determinants of bilateral trade in manufactured products between China and Nigeria. Thus, in terms of coverage, this study spanned from 1995-2012. To achieve these aims of the study, the methodological approach is the application of modified gravity model of trade. Therefore, it is pertinent to state here that not all issues regarding the dynamics of Nigeria-China trade (and vice versa) have been explored here. For instance, critical examinations of trade complementarities and trade intensity between the two partners to be able to identify the gainers and losers countries have not been done. Also some variables that may prove insignificant in exerting influential force on trade using the two countries together (pooled regression) may prove significant in close country specific analysis. These limitations among others warrants further vacuum to be covered in the literature by other potential authors.

Hence, other researchers could beam their searchlight on some related areas which were not covered in this study such as:

(i) Analysis of political economy of China-Nigeria trade relation

(ii) A comparative study of the determinants of intra-regional trade in Sub-Saharan Africa, and

(iii) Impact of trade policy on China-Nigeria bilateral trade performance.

These suggested areas will further enrich the literature on the dynamics of China trade linkages with African countries.

REFERENCES

Adewuyi, A.O., Alarudeen, A. and Kareem, O.I. (2010). Impacts of China-African Trade Relation: The case of Nigeria. A Final Report of the African scoping studies. Trade Policy Research and Training Programme, Department of Economics, University of Ibadan, Ibadan Nigeria.

Agbodji, A. (2008). The Impact of Sub-regional Integration on Bilateral Trade: The Case of UEMOA. *AERC Research Paper*, 186, 1-40.

Ajakaiye, O. (2006). China and Africa: Opportunities and challenges. Paper presented to the African Union Task Force on Strategic Partnership between Africa and the Emerging Countries of the South; 11-13 September, Addis Ababa.

Carrere, C. (2006). Revisiting the Effects of Regional Trade Agreements on Trade Flows With Proper Specification of the Gravity Model. *European Economic Review*, 50, 223-247.

De Grauwe , P., Houssay , R. and Piccilloz, G. (2012). African trade dynamics: is China a different trading partner? *Journal of Chinese Economic And Business Studies* 10 (1), 15-45.

Egger, P. (1999). The Potential for Trade between Austria and Five CEE Countries. Results Of a panel Based Econometric Gravity Model. *Austrian Economic Quarterly* 4(1), 55-63.

Eichengreen, B. and Irwin, D. (1996). The Role of History in Bilateral Trade Flows. *NBER Working Papers,* 5565, 1-53.

Bacchetta, P. and Wincoop, E. (2000). Does Exchange–Rate Stability Increase Trade and Welfare? *The American Economic Review,* 90 (5), 1093-109.

Beijing, A. (2006). A Summit Paper to Workshop on China-Africa Links, 11-12 November 2006, Hong Kong University of Science and Technology.

Elif , N. (2010). The Impact of Population on Bilateral Trade Flows in the case of OIC. International University of Sarajevo.

Feenstra, R.C. (2002). Border Effects and the Gravity Equation:Consistent Methods for Estimation. *Scottish Journal of Political Economy* 49, 491-506.

Ghosh, S. and S. Yamarik (2004). Are Regional Trading Arrangements Trade Creating? An Application of Extreme Bounds Analysis. *Journal of International Economics*, 63, 369-395.

Giovannettia, G. and Sanfilippo, M. (2009). Do Chinese Exports Crowd-out African Goods? An Econometric Analysis by Country and Sector. *European Journal of Development Research*, 21, 506-530. doi: 10.1057/ejdr.2009.20

Gundogdu Ahmet (2009). Determinant of Intra-OIC Trade: Policy or Exchange Rate. *Journal of Economic Cooperation and Development*, 30(3), 1-42.

Jugurnath, B.,M. Stewart and R. Brooks (2007). Asia/Pacific Regional Trade Agreements: An Empirical Study. *Journal of Asian Economics*, 18, 974-987.

Kaplinsky , R., McCormick, D. and Morris, M (2007). The Impact of China on Sub SaharanAfrica. *Working Paper* No. 291, Brighton Institute of Development Studies.

Kepaptsoglou, K., Karlaftis, M. and Tsamboulas, D. (2010). The Gravity Model Specification for Modeling International Trade Flows and Free Trade Agreement Effects: A 10- Year Review of Empirical Studies. *The Open Economics Journal* 3, 1-13.

Krugman, P. and Obstfeld, M. (2009). International Economics : Theory and Policy, Eight Edition, Pearson Education, Inc.: US.

Lane, P. and Milesi-Ferretti, G. (2002). External Wealth, the Trade Balance and the Real Exchange Rate. *European Economic Review* 46, 1049-1071.

Linnermann, H. (1966). *An Econometric Study of International Trade Flows*, North-Holland , Amsterdam.

Martinez-Zarzoso, I., Felicitas, H. and Horsewood, N. (2009). Are Regional Trading Agreements Beneficial? Static and Dynamic Panel Gravity Models. *North American Journal of Economics and Finance* 20, 46-65.

Oyejide , T.A. and Ogunkola, E.O. (2004). Trade, investment and growth in Africa: Patterns, Trends and puzzles. *The Nigerian Journal of Economic and Social Studies* 46(1), 125-146.

Rose, A. K. (2000). One Money, One Market? The Effects of Common Currencies on International Trade. *Economic Policy,* 15, 7-46.

Tinbergen, J. (1962). *Shaping the World Economy: Suggestions for an International Trade Policy*. New York: Twentieth Century Fund Press.

UNCTAD, (2011). Merchandise trade by partner and product.: A data base maintained by The United Nations Conference on Trade and Development. (See http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx for the link)

UN-OECD-NEPAD, (2011). Economic Diversification in Africa: A Review of Selected Countries. A joint study by the United Nations and the NEPAD-OECD Africa Investment Initiative.

APPENDICES

Regression Results for Newtonian form of GM for China-Nigeria Bilateral Trade in Manufactured Goods

Dependent Variable: LOG(MEXP_S)
Method: Panel Least Squares
Date: 09/26/13 Time: 07:44
Sample: 1995 2012
Periods included: 18
Cross-sections included: 2
Total panel (balanced) observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.005276	0.018579	0.283988	0.7783
LOG(GDP_S)	0.005841	0.001810	3.227350	0.0029
LOG(GDP_R)	0.005162	0.003037	1.699853	0.0992
LOG(DIST)	-0.009288	0.004807	-1.932156	0.0625
LOG((MEXP_S)-1)	0.997466	0.000554	1800.695	0.0000

R-squared	0.999999	Mean dependent var	11.35254
Adjusted R-squared	0.999999	S.D. dependent var	3.535425
S.E. of regression	0.002789	Akaike info criterion	-8.797799
Sum squared resid	0.000241	Schwarz criterion	-8.577866
Log likelihood	163.3604	Hannan-Quinn criter.	-8.721036
F-statistic	14057160	Durbin-Watson stat	1.737583
Prob(F-statistic)	0.000000		

Pooled Least Square Gravity Model for China-Nigeria Bilateral trade in Manufactured Goods

Dependent Variable: LOG(MEXP_S)
Method: Panel Least Squares
Date: 09/26/13 Time: 07:40
Sample: 1995 2012
Periods included: 18
Cross-sections included: 2
Total panel (balanced) observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	25.26860	15.03461	1.680696	0.1070
LOG(GDP_S)	1.759957	1.048552	1.678464	0.1074
LOG(GDP_R)	4.077370	0.987856	4.127497	0.0004
LOG(DIST)	-8.923544	2.497458	-3.573050	0.0017
LOG(EXR_S)	0.223329	0.407106	0.548575	0.5888
LOG(EXR_R)	-0.038830	0.397134	-0.097776	0.9230
LOG(OPENNSS_S)	-2.487792	1.287875	-1.931704	0.0664
LOG(OPENNSS_R)	-0.086922	1.311740	-0.066265	0.9478
LOG(POP_S)	0.052809	0.058071	0.909395	0.3730
LOG(POP_R)	0.048429	0.057883	0.836681	0.4118
AREA_S	5.02E-07	2.35E-07	2.136546	0.0440
AREA_R	7.37E-07	3.74E-07	1.969951	0.0616
POLSTAB_S	-0.487801	0.446530	-1.092427	0.2865
POLSTAB_R	0.741759	0.669393	1.108107	0.2798

R-squared	0.971239	Mean dependent var	11.35254
Adjusted R-squared	0.954244	S.D. dependent var	3.535425
S.E. of regression	0.756253	Akaike info criterion	2.564420
Sum squared resid	12.58222	Schwarz criterion	3.180233
Log likelihood	-32.15957	Hannan-Quinn criter.	2.779356
F-statistic	57.14781	Durbin-Watson stat	2.239197
Prob(F-statistic)	0.000000		