



Public spending mechanisms and gross domestic product (GDP) growth in the agricultural sector (1970–2016): Lessons for Nigeria from agricultural policy progressions in China

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How to cite:

Apata, T.G. (2019). Public spending mechanisms and gross domestic product (GDP) growth in the agricultural sector (1970–2016): Lessons for Nigeria from agricultural policy progressions in China. *Bulletin of Geography. Socio-economic Series*, 44(44), 57-72. DOI: <http://doi.org/10.2478/bog-2019-0015>

Abstract. China has pursued a sustainable path of development in line with reality for four decades. Economic restructuring started in its vast rural areas, focusing on reforms targeting income increase for rural farmers. These radical sustainable policies that China's political leaders imbibed were not embraced by Nigeria's past leaders and these resulted in the bane of underdevelopment. The study examines the level and composition of the drivers of public-spending policy mechanisms that contribute to gross domestic product (GDP) growth in the agricultural sector in China and Nigeria and draws up a model of Chinese development for Nigeria. Secondary data was used and were sourced from FAOSTAT and International Monetary Fund's Government-Finance Statistics (various issues) from 1970–2016. Random-effects model results revealed that the policy of public-expenditure (PUEXP) and intervention (INTEV) variables were significant but negative, while enterprise-development (ENTDEV), drivers of development (DRIVERS) and Dummy D1t (modest public-expenditure access) were significant and positive for Nigeria. Three variables were significant and positive. The dummies D1t and D2t (macro-economic stability) were positive and significant for China. Public-expenditure and GDP growth has an inverse relationship in Nigeria, but a direct relationship in China. In Nigeria, PUEXP coefficient is -0.6810 and 0.8902 for China. Hence, macro-economic stability, enhanced market mechanisms and economic progress resulted in China and hereby lessons are drawn for Nigeria. Public leaders are responsible for governing the market in a manner that induces businesses to produce public value. However, if public-policy mechanisms are not well-designed to fit the economy's needs it could significantly influence the economy in a negative way, and the society bears the costs.

Article details:

Received: 2 January 2019
 Revised: 12 March 2019
 Accepted: 6 May 2019

Key words:

Shared policy instrument, gross domestic product, policy successions, China and Nigeria

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1. Introduction

Past studies have argued that for many developing countries, agriculture is the prime sector in terms of contributions to gross domestic product (GDP) and employment. Most people living in poverty worldwide seek income-generating activities from agriculture and agriculture-related activities and reside in rural areas (Saucer *et al.*, 2012; Aparaji and John, 2017; Makhtar, 2017). Hence, agricultural development is decisive both for economic development and for poverty reduction, especially in rural areas, where most of the world's poor live. Public spending's effect on growth indicators such as agriculture is very significant and studies that have examined this have revealed a decisive link (Coady and Fan, 2008; World Bank, 2010; Samson, 2012; Anisimova, 2016). These studies indicated that positive growth and poverty reduction correlates to cost-effective public spending in agriculture. However, most developing countries' public expenditure and support for agriculture is poor or dwindling and this is reflected in modest agricultural outputs (Manyong *et al.*, 2005; Rajkumar and Swaroop, 2008; Hartwich *et al.*, 2010; Ojiako *et al.*, 2016). Past studies indicated that, in Africa, spending in the agricultural sector has remained comparatively low (5.4–7.4%) while, in Asia, it was much higher (8.5–10.5%) than in Africa (Lele, 1991, Eze *et al.*, 2010; Apata, *et al.*, 2011; Eboh, *et al.*, 2012; Arndt *et al.*, 2015; Karamba and Winters, 2015).

Nigeria and China provide an interesting distinction with respect to performance and policy, especially in the agricultural sector. After several decades of Nigeria earning multiple billions of dollars from sales of crude oil in the international markets, the country still faced several economic problems, serious decline in agricultural outputs,

deteriorating external debt and worsened human development indicators (Mongues *et al.*, 2008; Nkonya *et al.*, 2010; Apata *et al.*, 2013; Aragbeyen and Kolawole, 2015). Studies on similar countries engaged in sales of crude oil, such as Indonesia, have been shown to have changed status to developed market economies (Sharma 2007; Dahlman *et al.*, 2008; Xin Zhao and Russell, 2008). The policy question is: what happened to the transitional stages of Nigeria's economic development? Past studies indicated that radical sustainable policies were not adopted by Nigeria's past leaders and this brought about the curse of underdevelopment that the country presently finds itself in (Abu and Usman, 2010; Sanusi, 2010; Nurudeen and Usman, 2010; Emerenini and Ihugba, 2014; Takeshima and Liverpool-Tassie, 2015). Hence, a review of China's transitional economic reform experiences could provide a model of development for Nigeria.

The literature has argued that during the process of economic transition, for four decades, China has been pursuing a path of development in line with the reality of the country (Herston, 2008). China has successfully combined agricultural growth mechanisms, value chain analysis and a market mechanism (Quah, 2009). This market mechanism has a cardinal public ownership system, which has ushered in an era of unprecedented progress (Perkins, 2008; Huang, 2008). Past studies have indicated that China's gross domestic product (GDP) advanced by an average of 9.3% each year from 1978 to 2015 (NBS, China 2016). This has been adduced to the economic transitional mode and structural adjustment reforms that were adopted; this model radically proved to be the key to the success of transition (Calhoun and Wasserstrom, 2003). These studies indicated that the economic restructuring started in its vast rural areas, focusing on reforms aiming to increase rural farmers' incomes. The commodi-

ty price deregulations that started in 1985 and was reformed, transformed into a market-based pricing system in China (Keyuan, 2003).

Moreover, decollectivising agricultural practices and emphasising the household-responsibility system developed the confidence of rural people to own private plots in their various communities. In addition, this policy helped farmers keep the land's output after paying a share to the state. These reforms recorded huge successes, enhanced agricultural production and living standards, and stimulated rural industry (Zhang and Fan, 2004). Consequently, this bottom-up policy approach brought about the dominance of agricultural entrepreneurs over public enterprise. Financial policy measures were also instituted to cut taxes and fees for small and micro enterprises, and this thus established investment funds to guide entrepreneurship, and promote the "Internet+" and "Made in China 2025" strategies (UNDP China Poverty, Equity and Governance Team, 2012). Consequently, people's creativity and entrepreneurial passion have been unlocked, and a massive wave of entrepreneurship and innovation is sweeping across the country. These reforms promoted by the Chinese administration have been argued to be an important factor in the success of China's economic transition.

China's astonishing growth over the past 30 years was driven largely by the government's focus on agricultural development (NBS China, 2013). Nigeria can draw important lessons from the ways China has achieved this steady trajectory of growth. Beyond growth, productivity increases in China have been dramatically favourable to the poor. Between 1981 and 2004, China moved two thirds of the population from living on less than \$1 a day to \$5 a day (Dahlman *et al.*, 2008). This has been especially true for growth in the agricultural sector, where growth has had four times the impact on reducing poverty than in manufacturing or services. In contrast, growth in Nigeria has been accompanied by much slower poverty reduction. As China continues to take a more active role on the global stage, it would seem ideal for Nigerian policy makers and academia to partner more closely and share the Chinese model of development. This is the rationale driving this study. Hence, the study will:

- evaluate policy conditions under which public-spending-policy mechanisms contribute

positively to GDP growth in the agricultural sector in China and Nigeria.

- draw lessons from the Chinese experience as to what public policy mechanism components might have a stronger and longer-lasting impact on GDP growth in the Nigerian agricultural sector.

2. Theoretical framework

Economic theory and an evidence-based policy mechanism

According to economic theory, public policy mechanism components are intended to enhance public value and productivity, and may be either beneficial or unfavourable (Fei and Ranis, 1964). Past studies argued that in traditional Keynesian macro-economics, many kinds of public spending/expenditures can contribute positively to economic growth, through multiplier effects on aggregate demand. But government consumption may crowd out private investment, dampen economic stimulus in the short run and reduce capital accumulation in the long run (Coady and Fan, 2008). Economy theory of public expenditures is classified into two: *productive* if they are included as arguments in private production functions, and *unproductive* if they are not (Barro and Sala-I-Martin, 1992). This categorisation implies that productive expenditures have a direct effect upon the rate of economic growth, but that unproductive expenditures have an indirect or zero effect.

Public spending has generated heated arguments and concern in the last three decades, and has grasped the attention of several researchers (Barro, 1990; Aparajita and John, 2017). Public spending has been used considerably as a fiscal policy by the governments of many countries, but its effect on economic growth is debatable. The literature has outlined two economic hypotheses as a basis to deliberate on the effect of public spending on growth, i.e. Wagner's law and Keynesian hypothesis. Wagner's law – the law of expanding state role – is a model showing that public spending is endogenous to economic growth and that there exist long-term

tendencies for public spending to grow relative to some national income aggregates, such as gross domestic product (GDP). Wagner (1893) suggested that public spending is an endogenous factor or an outcome – but not a cause – of economic development.

On the other hand, the Keynesian hypothesis states that expansion of public spending hastens economic growth (Barro and Sala-I-Martin, 2003). Thus, government expenditure is regarded as an exogenous force that changes aggregate output (Loizides & Vamvoukas, 2005). Keynesian thought suggests that a proactive fiscal policy is an important instrument for governments to stimulate economic activity and economic growth (Barro, 1990). By increasing public spending and/or cutting taxes, governments can offset slower economic activity; hence, fiscal policy is viewed as a counter-cyclical policy tool that mitigates short-run fluctuations in output and employment (Zhang and Zou, 1998). In addition, the Keynesian hypothesis suggests that any kinds of public spending, even of a recurrent nature, can contribute positively to economic growth. The effectiveness of fiscal policy in stabilising aggregate demand also depends on whether or not public spending crowds out private spending. An increase in government spending that is not matched by an increase in revenues leads to a budget deficit that needs to be financed. If the deficit is financed by issuing domestic debt, it can have negative consequences for domestic interest rates, which crowds out private (consumption and investment) spending (Fei and Ranis, 1964).

Evidence of the causality between the public spending policy mechanism and economic growth abounds in past studies. These studies have used diverse theories in indicating the model, as well as employing various methods to drive intentions. Outcomes of their analysis have revealed that the effect of public spending on economic growth can be either negative or positive. For instance, Ghura (1995), using pooled time-series and cross-section data for 33 countries in Sub-Saharan Africa (SSA) in 1970–1990 gave evidence indicating a negative relationship between public spending and economic growth. Similarly, Yasin (2000) studied the relationship between public spending and economic growth in 26 Sub-Saharan African countries, using panel data for 1987–1997 and employing both

fixed- and random-effect techniques. The result revealed a positive outcome, in contrast to the negative outcome found by Ghura (1995). Yasin (2000) suggests that government spending on capital formation can have a significant influence if SSA countries increase public spending on capital formation to create a favourable economic environment.

Alexiou (2009) explored seven countries in the South Eastern Europe region spanning from 1995 to 2005, adopting similar econometric approaches as did Yasin (2000). The result revealed that public spending on capital formation and other variables included in the model are positive and has a significant effect on economic growth. Hence, policy makers can create an appropriate environment conducive to nurturing government spending on capital formation, private investment spending and trade. Alshahrani & Alsadiq (2014) used a Vector Error Correction Model (VECM) to examine this causality of government expenditure on economic growth in Saudi Arabia; engaging time-series data for 1969–2010, the study found that private domestic and public spending, as well as health-care expenditure, stimulate growth in the long run. Similarly, Knoop (1999) adopted time-series data to examine the effects of government spending on economic growth in the US; the results revealed that a reduction in government size (reduction in government spending) would adversely impact economic growth and welfare.

However, there are studies that reported a different outcome. For instance, Guseh (1997) used a similar econometric technique to that adopted by Knoop (1999) and exploited a 1960–1985 time-series for 59 middle-income developing countries to examine the effects of government size on economic growth rate. His result suggested that growth in government size has negative effects on economic growth. Attari and Javed (2013) examined rate of inflation, economic growth and government expenditure in Pakistan by using time-series data for 1980–2010, revealing statistically insignificant outputs. Hsieh and Lai (1994) examined the causality between public spending and economic growth in G-7 countries, namely Canada, France, Germany, Italy, Japan, UK and USA. The empirical result suggested that the relationship between government spending and growth can vary significantly across time. There was no robust evidence of a pos-

itive or negative effect of government spending on growth, but public spending contributed at best a small proportion to economic growth. Nurudeen and Usman (2010) studied government expenditure and economic growth in Nigeria by adopting the model of Hsieh and Lai (1994) using time-series data for 1979–2007 and found that public/capital expenditure on education did not influence economic growth. Wu *et al.* (2010) examined the causal relationship between government expenditure and economic growth using a panel data set of 182 countries covering the period 1950 to 2004 and revealed a positive causality between public spending and economic growth.

3. Methodology and data

The study areas are Nigeria and China. The study used secondary data for 1970–2016 collected from FAOSTAT, International Monetary Fund’s Government Finance Statistics (various issues) and other international data centres.

Method of data analysis

Past works on growth literature have shown numerous analytical and empirical analyses that revealed how public spending can influence GDP growth (Bose *et al.*, 2007; Fan *et al.*, 2008). One way is by examining factors increasing the economy’s capital stock (physical or human) to higher flows of public funds. For example, a complementary capital stock can be seen in the public spending on education and health; this spending could stimulate an increase in the stock of human capital. Moreover, public funds can also contribute to growth indirectly by increasing the marginal productivity of both publicly- and privately-supplied production factors. Based upon this premise the study adopted a simple version of endogenous growth theory and data that covers the period 1970–2016.

Following the theoretical framework suggested by Ram (1986), this paper simulates an economy comprised of two comprehensive sectors: the first is the Government sector (G_O) and the second is the Non-Government sector (NGO). Production func-

tions contained in the two sectors could be transcribed as:

$$NGO = NGO(L_{NGO}, K_{NGO}, G_O) \quad (1)$$

$$G_O = G_O(L_{G_O}, K_{G_O}) \quad (2)$$

Consequently, output in each sector varies according to the inputs of labour (L) and capital (K) and likewise, the output of the government sector (G_O) isometrics an external consequence on the output of the non-government sector (NGO). Hence, the total inputs are specified by:

$$L_{NGO} + L_{G_O} = L \quad (3)$$

$$K_{NGO} + K_{G_O} = K$$

Subsequently, the total output (Q) is the addition of outputs in the two segments, given as:

$$Q = NGO + G_O \quad (4)$$

The paper presumes that the virtual factor productivity in the two segments varies, hence it can be written:

$$\frac{G_{OL}}{NGO_L} = \frac{G_{OK}}{NGO_K} = 1 + \delta \quad (5)$$

Where, $G_{OL} = \partial G_O / \partial L$, which signifies the marginal production of labour input in the government segment (or its distinct analogue $\Delta G_O / \Delta L$), $NGO_L = \partial NGO / \partial L$. This expression indicated that the marginal production of labour input in the non-government sector gives, $G_{OK} = \partial G_O / \partial K$, which is the marginal productivity of capital input in the government sector, and $NGO_K = \partial NGO / \partial K$ is the marginal productivity of capital input in the non-government sector.

Consequently, the symbol signifies which sector has upper marginal factor productivity. Hence, an optimistic value of indicates more input productivity in the government sector, while a pessimistic value of denotes a different result. Therefore, by totally differentiating and manipulating the production functions of equations (3) and (5), the paper deduces that:

$$\partial Q = NGO_L \partial L + NGO_K \partial K + NGO_{G_O} \partial G_O + \frac{\partial}{1+\delta} \partial G_O \quad (6)$$

Dividing by Q , we obtain:

$$Q * \alpha \left(\frac{L}{Q} \right) + \beta L + \left[\left(\frac{\alpha}{1+\delta} \right) \right] \theta G_O (G_O / Q) + \theta G_O \quad (7)$$

Where the variable I is investment (government public spending) which is presumed to equal to dK , is the marginal product of K in the NGO sector, β is the elasticity of non-government output NGO with respect to L , and θ equals $NGO_{Go} (G_o/NGO)$ (See Feder [1983] and Marta *et al.* [2017] for further information about the parameters and the models).

Equation (7) shows that the variables that affect economic growth (Q) include the investment rate (I/Q), labour force growth (L) government expenditure growth (Go) and government size (Go/Q). Taking a cue from Feder (1983) and Marta *et al.* (2017) the paper considered an easy approximation for the growth equation, and to examine the direction of the government public spending and its effect on growth:

$$Q^* = \alpha + \beta G_o^*(G_o/Q) \quad (8)$$

Where an asterisk over the variable signifies its rate of growth, Q^* means dQ/Q , or its discrete equivalent $\Delta Q/Q$. G_o^* signifies government spending, and $G_o^*(G_o/Q)$ equals $\Delta G/Q$. A constant term and a random stochastic disturbance term with the usual properties have been included. To express these relationships, standard panel techniques for the econometric estimation were adopted, taking a cue from Greene (2003). This estimation model allows great flexibility in modelling differences across the countries considered (China and Nigeria). The basic framework is a regression model of the form:

$$Q_{it}^* = \alpha_i + \beta X_i + \mu_i \quad (9)$$

The influence of the disturbance term u_{it} on the dependent variable has been dominant and it became necessary to find a means of decomposing the disturbance term u_{it} . Various econometric effects have been instituted to decompose the disturbance term u_{it} . Furthermore, past studies have argued that the use of a random- or fixed-effects model may lead to better P-values, since this approach applies a more efficient estimator (Pham, 2010). Hence, this study will adopt the model that will give unbiased estimates and that also addresses the disturbance term u_{it} . Taking a cue from the studies of Arellano and Bond (1991), the study modified the model in equation (1) in line with the objective of the study by decomposing the disturbance term u_{it} . The disturbance term is divided into an individual specific

effect component, u_{it} , and a remainder disturbance component, v_{it} , that differs over cross section (country) and time (year).

$$u_{it} = u_i + v_{it} \quad (10)$$

Hence, Eq. (9) will now showcase a new equation by the substitution for u_{it} from Eq. (10) to give the subsequent equation:

$$Q_{it} = \alpha + \beta x_{it} + u_i + v_{it} \quad (11)$$

To examine all the variables that affect GDP, Q_{it} , in a cross-sectional way, data is required that will not vary over time, and hence there is a need to introduce dummy variables (Barro *et al.*, 2003). In line with the works of Pham (2010) the study therefore adopted the econometric terms of the least squares dummy variable approach (LSDV) for the estimation procedure:

$$GDP_{it} = \beta x_{it} + \mu_1 * D1_i + \mu_2 * D2_i + \mu_3 * D3_i + \dots + \mu_N * DN_i + v_{it} \quad (12)$$

where $D1_i$ and $D2_i$ signify a dummy variable with value 1 for all observations in the sample, and zero otherwise. To avoid the problem of perfect multi-colinearity between the dummy variables and the intercept, also known as the "dummy variable trap", the alpha (α) is removed (Pham, 2010).

Estimation procedure

The literature has indicated that the most widely used method to estimate the strength of coefficients is Ordinary Least Squares (OLS) (Henderson and Parmeter 2015). This study argued that the rationality of the method relies on the fulfilment of several assumptions, e.g. errors are linearly independent of one another, the disturbance term is normally distributed and the errors have a zero mean, the variance of errors is constant and finite over all values of X_i , and there is no autocorrelation. The works of Barro (1990), Bose *et al.* (2007) and Pham (2010) that applied this method on a cross-section analysis evidenced that a negative relationship was established between government expenditures and GDP growth. In the same vein, a study by Agenor *et al.* (2007) also verified an insignificant partial

correlation between the size of government expenditure and economic/GDP growth. These studies attributed their findings to the unfitting cross-section model to investigate the relationship between government expenditure and economic/GDP growth.

Moreover, part of their reason lies in its conceptual framework and qualitative measurement problems. Another methodological problem evidenced by these studies is that the OLS method with panel data cannot provide unbiased estimated betas and is therefore subject to biased conclusions. To address these shortcomings these studies adopted a random-effects model. This model allows different parameters cross-sectionally and can give better P-values, since this approach applies a more efficient estimator. Hausman (1978) was also used to test the hypothesis of the effectiveness of the random effects model in the analysis.

In addition, the use of a random effects model would help the robustness of the results. Consequently, the study looked into the quality of public spending more precisely in connection with the governance variable and its impacts on human development indicators. Moreover, past studies have argued that richer countries subsidise the agricultural sector more than less developed countries (or as GDP grows, agricultural subsidies increase) (Zimcik, 2016; Marta *et al.*, 2017). This implies that GDP growth (or higher GDP *per capita*) leads to higher public expenditure on agriculture. This is an endogeneity issue and it is addressed in the paper by using a large data set of 1970–2016 to be able to capture the public-spending-policy effect as reflected in the GDP growth, or otherwise, over time.

Empirical exploration of government expenditure and GDP growth in the agricultural sector

To test the above relationship, this study employs five variables consisting of: 1) GDP as a dependent variable; 2) PUEXP_p, being public expenditure in agriculture (where PUEXP_p = PUEXP_{ca} + PUEXP_{rc}; PUEXP_{ca}: Public Capital expenditure in agriculture; PUEXP_{rc}: Public Recurrent expenditure in agriculture); 3) ENTDEV, being other factors influencing public investment that motivate enterprise growth

in agriculture, such as infrastructures (good farm access roads, storage facilities), education, health care facilities; 4) DRIVERS, being the drivers of agricultural growth that motivate enterprise development, such as research and development, credit delivery services, extension services; and 5) INTEV, being indirect factors influencing agricultural enterprise growth, such as intervention – both internal and external – and political climates.

Thus, the model specification is:

$$GDP = B_0 + B_1X_{it} + B_2X_{2t} + B_3X_{3t} + B_4X_{4t} + U_1D_{1t} + U_2D_{2t} + V_{it} \dots \quad (13)$$

Where:

GDP = Gross Domestic Product

X_{it} = Public expenditure in agriculture (PUEXP)

Where

PUEXP_p = PUEXP_{ca} + PUEXP_{rc}

PUEXP_{ca} = Public Capital expenditure in agriculture

PUEXP_{rc} = Public Recurrent expenditure in agriculture

X_{2t} = Public investment that motivates enterprise growth in Agriculture (ENTDEV), such as infrastructure (good farm access roads, storage facilities), access to qualitative education, good healthcare facilities

X_{3t} = Drivers of agricultural growth (DRIVERS)

X_{4t} = indirect factors influencing agricultural enterprise growth, such as intervention – both internal and external – and political climates (INTEV).

D_{1t} = Dummy variable: access to timely and effective (Modest public funding to agricultural sector and government fiscal discipline) public spending = 1, otherwise 0

D_{2t} = Dummy variable: macro-economic stability = 1, otherwise 0

V_{it} = Omitted variables

The error term is decomposed into errors and residuals (Eq. 10) in this paper so that the study has a robust analysis. The dummy variables (Eq. 13) are added to the decomposed errors to account for the effectiveness of timely access to modest public spending and political will. In addition, it boosts the multiple determination of the independent variables (R²) of the results and lessens errors. The coefficient of the dummy variables included in the equation will show what difference it makes to have timely access to modest public funding in the agricultural sector. It is hoped that adding the dummy variables to the decomposed errors will thus improve estimates in the random-effects model.

4. Results and discussions

Results of government expenditure and GDP growth in the agricultural sector (China and Nigeria)

The results of the random effects model revealed different components of government expenditure on GDP growth in the agricultural sector. The weighted specification results show that the explanatory variables as a group significantly explained the variability in the dependent variable, which is indicated by the F-statistic and the p-values. In addition, this model shows an exceptional explanatory power, displayed by R^2 (0.7416), in China. This suggests that 74% of the variables considered explained the dependent variable; the whole model also explained the dependent variable.

The explanatory variables used in the model include public expenditure (PUEXP), enterprise development (ENTDEV), drivers (DRIVERS) and intervention (INTEV). In Nigeria, the model results revealed that, of the four variables and two dummies considered, four variables were significant at difference level of significance. The PUEXP and INTEV variables were significant but negative, while ENTDEV, DRIVERS and D_{it} were significant but positive. Similarly, for China, of the four variables and two dummies considered, three variables were significant and positive at a difference level of significance (Table 2).

The classical growth theory suggested that capital will positively contribute to economic growth. In Nigeria, the effect of capital in the form of government expenditure on GDP growth is significant but with a negative coefficient, and, hence, the effect of public expenditure on GDP growth has an inverse relationship, but has a direct relation in the case of China (Table 2). In Nigeria, the PUEXP coefficient is -0.6810, which implies that the rate of GDP growth will be 68% lower, but 89% higher in the case of China, implying that the rate of GDP growth is positive (Table 2). Similarly, INTEV has its coefficient significant at the 5% level but that is negative, thus revealing that the rate of GDP growth will be 21% lower (Table 1). The dummy variables that were used in this analysis due to the presence

of outliers aimed to capture the occurrence of public expenditure effectiveness and macro-economic stability in the growth of GDP. For Nigeria, only the D_{it} dummy is highly significant in explaining the variation of the dependent variable at the 5% level of significance. Dummy D_{it} has a coefficient of 0.1328, which implies that when public expenditure is effective, the rate of GDP growth will be 13% higher than non-public expenditure effectiveness, holding everything else constant (Table 1). In the case of China, the two dummies were positive and significant at the 1% level.

The results revealed that government expenditure on GDP growth shows a significant positive influence for China and a negative one for Nigeria. This thus suggests that the Nigerian economy is highly capitalistic and strongly inclined to *laissez-faire*. Therefore, investments in GDP growth are focused on long-term improvement and not according to the business cycle. The effects are probably not observed in the time-span of the analysis. In addition, the negative coefficient for Nigeria can also be explained by analysing the expenditure pattern. Past studies have argued that government budget deficits and foreign debt negatively influence GDP, and this has been predominant in Nigerian annual budget estimates in the last 15 years (Apata *et al.*, 2013; Bose *et al.*, 2007). Other reasons include several inefficiencies in government expenditure allocation, corruption, lack of ability to prioritise expenditure goals, the non-optimal level of government expenditure, and public theory of bureaucracy, among others. For government expenditure on general development, the explanation could be that it does not contribute directly to GDP, e.g. investment in police force training yields benefits in terms of maintaining security and keeping the peace. On the other hand, government expenditure on economic development does demonstrate a highly significant positive effect on GDP growth.

Descriptive analysis of the major components of economic growth

Analysis from Table 3 indicated that, in Nigeria, there is an increase in annual growth rate of 3.2% (1970–1979), while population growth rate was

Table 1. Random-Effects Model Results (Nigeria)

Random-Effects Model Results				
Variables	Coefficients	Std. Error	F-Statistics	Prob.
Constant	68,137.37	29,041.38	7.941	0.000
GDP	0.4058	0.2303	4.851	0.000
PUEXP	-0.6810	0.6015	6.031	0.000
ENTDEV.	0.3016	0.3005	5.041	0.061
DRIVERS	0.4105	0.5711	10.910	0.000
INTEV	-0.0213	0.0154	6.802	0.013
D _{it}	0.1328	0.0882	5.043	0.037
D _{zt}	0.2839	0.2113	2.163	0.359
Effects Specifications				
Cross-section random S.D./Rho			14,821.04	0.0813
Period random S.D./Rho			0.0000	0.00000
Idiosyncratic random S.D./Rho			19,036	0.8043
Weighted Specification				
R. squared	0.6402	Mean Dependent Error		10,056.05
Adjusted R. squared	0.5616	S.D. dependent		8,056
S.E. of Regression	44,032	Sum of Square residual		1.69E+10
F-Statistics	1,110	Durbin Watson Statistics		1.083
Prob. Statistics	0.0000			
Unweighted Statistics				
R. squared	0.6519	Mean Dependent Variable		32,017.5
Sum of Square residual	1.94E+10	Durbin Watson Statistics		0.519

Source: Computer results. Results for estimation: GDP, Capital Earnings and Total expenditures on development dependent variable: GDP. Method: Panel EGLS (Two-way random effects)

Sample: 1970–2016. Cross-sections: 6. Total panel (balanced) observations 78

Swarmy and Arora estimator of component variances

3.2% in the same period (Table 3). In China, a slight increase in population growth rate was observed, and a slight increase in GDP growth rate (Table 3). Over the years 1980–1998 in Nigeria, agricultural public expenditures as a percentage of GDP growth and population growth rate both decreased at a constant rate of 3.35%. Compared to China, a modest GDP growth is discerned. From this analysis it could be said that agricultural public expenditure as a percentage of GDP growth declined over the period under consideration in Nigeria, while in China it remained at relatively steady levels (21%) throughout the study period.

Table 4 indicated that GDP *per capita* growth in percentages in Nigeria was 6.23% in the 1970s, and

declined from 1980 to 2016 by 4.29%, 2.65% and 1.915% per decade, respectively (Table 4). Meanwhile, China's indices remained at relatively steady levels (9.41%) throughout the study period. Public spending as a percentage of GDP witnessed a similar trend in the two countries. In addition, public spending in the agricultural sector revealed a similar trend as GDP *per capita* in both countries under examination, remaining modest. Hence, it will be rational to examine factors influencing these trends in both countries.

Table 5 revealed that there is a strong relationship between public spending and indicators of development. In Nigeria public spending on the productive sector was 71.03% and 63.15% in the

Table 2. Random-Effects Model Results (China)

Random-Effects Model Results				
Variables	Coefficients	Std. error	F-Statistics	Prob.
Constant	49,471.05	18,581.38	5.9361	0.0000
GDP	0.4104	0.1781	4.1056	0.0000
PUEXP	0.8902	0.2604	3.7914	0.0002
ENTDEV.	0.2671	0.0152	1.7058	0.0852
DRIVERS	0.8852	0.6057	4.5931	0.0042
INTEV	-0.2051	0.1061	1.8491	0.6831
D _{1t}	0.8472	0.3384	9.4036	0.0000
D _{2t}	0.6281	0.4281	6,8316	0.0000
Effects Specifications				
Cross-section random S.D./Rho			11,572	0.0482
Period random S.D./Rho			0.0000	0.00000
Idiosyncratic random S.D./Rho			42,061.37	0.7491
Weighted Specification				
R. squared	0.7416	Mean Dependent Error		44,831.26
Adjusted R. squared	0.6319	S.D. dependent		18,436
S.E. of Regression	38,431	Sum of Square residual		3.92E+10
F-Statistics	2,816	Durbin Watson Statistics		1.172
Prob. Statistics	0.0000			
Unweighted Statistics				
R. squared	0.7602	Mean Dependent Variable		28,941.41
Sum of Square residual	2.52E+10	Durbin Watson Statistics		0.612

Source: Computer results.

Table 3. Description of Gross Domestic Product (GDP) growth (%) and population growth rates

Years	Country	GDP growth (%)	Population growth rate
1970–1979	Nigeria	23	3.2
	China	10.5*^	45.1*
1980–1989	Nigeria	21	3.7
	China	9.3*^	12.4*
1990–1999	Nigeria	12	3.4
	China	10.6*^	11.7*
2000–2016	Nigeria	8	3.1
	China	12.5*^	5.8*

Sources: Calculated using data from International Monetary Fund's Government Finance Statistics (various issues); * – Census of China, *^ – Maddison historical GDP data, <http://www.ggd.net/maddison/Maddison.htm>, National Economic Research Institute, China's Marketization Index Database

1970s and 1980s, respectively. Surprisingly, public spending declined rate from 63.15% in the 1980s to 41.05% and 45.27% in the 1990s and 2010s, respectively, in Nigeria. China's economic indicators of public spending on development revealed consistency throughout the study period. Surprisingly, public spending on economic, education and health

sectors in Nigeria witnessed a high intervention of 27.91%, 19.37% and 11.66%, respectively (1990–1999). This huge amount is believed to have had a significant role in Nigeria's economic growth in this period.

Table 6 reflects evidence of the relevance of government efficiency on spending and corruption

Table 4. Gross Domestic Product (GDP) per Capita Growth (%), Public Spending (% GDP), Fiscal Balance (% GDP), Year and Coefficient

Years	Country	GDP <i>per capita</i> Growth (%)	Public Spending % GDP	Fiscal Balance % GDP	Year	Gini Coefficient
1970–1979	Nigeria	6.23	22.58	1.26	1976	55.61
	China	8.02	42.53	0.04	1984	54.20
1980–1989	Nigeria	4.29	26.16	1.81	1987	57.03
	China	8.81	37.91	-0.63	1989	44.93
1990–1999	Nigeria	2.05	15.83	0.62	1994	37.19
	China	9.21	47.15	0.83	1995	40.04
2000–2016	Nigeria	1.91	09.38	0.41	2004	33.29
	China	11.60	51.05	1.14	2005	35.61

Sources: Calculated using data from International Monetary Fund's Government Finance Statistics (various issues), Maddison historical GDP data: <http://www.ggdc.net/maddison/Maddison.htm>.

control. Corruption is a big issue and receives global attention. Cases of corruption are not exceptional and have long been debated in Nigeria and China. The governments of these two countries have put in place several profound measures to fight corruption by setting up anti-corruption agencies. Nigeria has an Economic and Financial Crimes Commission (EFCC) and an Independent Corrupt Practices Commission (ICPC), among others. China's government established an act in 1952 that defined corruption and its punishment. This act has a strong criminal law that contains a legal measure for fighting corruption, and stiffer punishment, including the death penalty in certain cases. For this act to be effective, multiple anti-corruption agencies were founded and structured into three sectors, namely: the Supreme People's Procuratorate (SPP) responsible for handling and preventing cases of embezzlement and bribery, the Central Commission for Disciplinary Inspection (CCDI) to check corruption among political elites, and the Ministry of Supervision (MOS) to restrain corruption and maladministration within the civil service (Keyuan, 2003; UNDP, 1999; Glynn *et al.*, 1997).

Although many actions have been taken by these governments to fight corruption, the problem still exists and remains serious, particularly in Nigeria (Table 6). Nigeria had a very low corruption perception index (CPI), a high corruption score and was low in government efficiency, as compared to China indicators of economic growth (Table 6). Table 6 indicates functions attributed to government

components, which thus reflect diverse economic strategies and degrees of intervention, as well as their approaches to successfully fighting corruption. Meanwhile, China is considered a better manager of components of growth than Nigeria. Regarding the size of the government budget, China government has managed to keep a relatively modest size of total public spending, which is below 30% of GDP compared to Nigeria's, which is below 10%. Table 5 indicates that the Chinese government has managed to maintain a modest share of public-spending-to-GDP during the four decades of analysis, with a ratio of 25.19%, as compared to Nigeria's, which was 18.49% (Table 5). China reflects a clear predominance of productive spending, which is sustained through the decades of analysis, with some fluctuations as expected, while Nigeria's case revealed a clear predominance of unproductive spending.

5. Conclusions and policy implications

The results of the analysis of random effects revealed that the coefficient of government expenditure influenced GDP growth. In Nigeria it is -0.6810 , which implies that the rate of GDP growth will be 68% lower, but 89% higher in the case of China. Evidence from the regressions results of this study revealed the positive and significant role that public spending played in agricultural outputs and factors influencing agricultural productivity. This thus sug-

Table 5. Composition of public spending

Years	Country	Public spending composition			
		Productive (%)	Economic %	Education %	Health %
1970-1979	Nigeria	71.03	14.24	10.03	4.70
	China	28.81	14.04	33.68	5.23
1980-1989	Nigeria	63.15	21.05	11.29	4.51
	China	35.28	28.26	41.64	6.04
1990-1999	Nigeria	41.06	27.91	19.37	11.66
	China	33.73	25.71	46.03	8.16
2000-2016	Nigeria	45.27	24.62	21.62	8.49
	China	48.91	26.03	49.38	9.92

Sources: Calculated using data from International Monetary Fund's Government Finance Statistics (various issues)

Table 6. Corruption Perception Index (CPI), Corruption Control and Government Efficiency in Percentile Rank and Governance Score

Year	Country	Corruption Perception Index (CPI) ¹	Corruption Control		Government Efficiency	
			Percentile Rank	Governance Score	Percentile Rank	Governance Score
1970- 1979	Nigeria	3.90	71.04	0.62	71.94	0.82
	China	4.02	44.83	0.35	68.61	0.41
1980- 1989	Nigeria	4.67	63.92	0.58	63.72	0.63
	China	4.92	62.72	0.42	68.72	0.49
1990-1999	Nigeria	2.14	31.03	0.31	46.04	0.33
	China	5.01	71.83	0.47	81.36	0.88
2000-2016	Nigeria	4.89	24.20	0.22	33.27	0.28
	China	7.84	69.03	0.33	86.47	3.17

Sources: Calculated using data from International Monetary Fund's Government Finance Statistics (various issues). Compiled from <http://www.transparency.org>, http://info.worldbank.org/governance/wgi/sc_chart.asp

Footnotes: The Corruption Perceptions Index (CPI) ranks countries and territories based on how corrupt their public sector is perceived to be. A country or territory's score indicates the perceived level of public sector corruption on a scale of 0 (highly corrupt) to 10 (very clean/least corrupt).

gests that the public-spending-policy mechanism plays a significant role in agricultural development. Moreover, agricultural expenditure intensity in Nigeria is extremely low (less than 5%), whereas in China it is more than 20%.

The study observed that the divergence between China and Nigeria has been argued to be due to the quality of leadership during their transitions, as evidenced by the descriptive analysis. Nigeria did not impose the sort of export discipline on manufacturing as China imposed on its industrialists. The lack of export discipline encouraged cronyism

and ensured that assembling plants thrived, rather than manufacturing plants. Nigeria allowed politically connected persons to own banks and to use them to get rich. As they say, "To steal a country, own a bank." These crony capitalists used the banks to finance skyscrapers and shopping malls, whereas banks in China were forced to finance agriculture and manufacturing. The result is that a few Nigerians became billionaires and the country lagged behind in industrialisation, whereas, in China, a few Chinese were millionaires while their country advanced as an industrial economy.

Moreover, the study's literature review identified that the pragmatism of the successful Chinese economy was a product of both the pedigree, training and temperament of the leaders who appeared on the scene after their independence. These leaders were well informed about the conditions of colonialism and the ideological basis of their underdevelopment. They came from the right side of the social divide, namely the peasantry. These leaders were patriotic and driven by a passion for their country to take off industrially. Although they were flawed men in some way, they were undivided in their mission. They were not prisoners to narrow and sectional interests. One thing was very clear, they forged no strategic business liaison with the foreign or local business class. This helped their countrymen to exercise a clear-sighted and emphatic direction in economic relations. They never believed that the private sector would develop their country. Rather, they believed that the public sector would develop the country using the private sector. Theirs was entrepreneurial governance, mobilising and incentivising for long-term transformation, not short-term profits. The private sector has never developed a country and will not. Business men and women will continue to look for opportunities to make money. Wherever they see an opportunity they move in. This is legitimate. But, it is not the job of the private sector to create public value. Public leaders are responsible for governing the market in a manner that induces businesses to produce public value while trying to make money. This is what China did. In development, the invisible hand is not the hand of the market – it is that of the government.

Although much can be learned from China's GDP growth in the agricultural sector, Nigeria must create the conditions to define its own growth path, and this must be based on its own history, culture and institutions. Various models for structural transformation, such as those offered by different groups of academics, will need to be adapted to the unique local circumstances and conditions. The importance of such self-reliance is well-expressed as a *sine qua non* of growth. Nigerians need to depend on their own efforts, and on the creative powers of their entire people. Nigerians should move away from placing their hopes on foreign aid cul-

ture for their structural transformation and agricultural growth.

The evidence in this paper suggests that the public-spending-policy mechanism indeed has a significant influence on economic growth in the long run, as demonstrated in China. Therefore, significant public spending and political will are crucial components of fiscal policy in order to achieve the economic objectives of GDP growth in the agricultural sector. However, if government spending patterns are not well designed to fit the economy's needs it could significantly influence the economy in a negative way, and society would bear the costs. This is the lesson the Nigerian agricultural policy maker must learn.

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