Demographic Influence on Public Infrastructure Investments in South-South Nigeria

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Abstract- ***The influence of demographic factors on public infrastructure investments in South-South Nigeria was empirically assessed in this study with the primary purpose of ascertaining the extent of consideration of demographic factors in budgetary planning. The specific study variables are government capital expenditure, as dependent, and demographic factors (per capita government revenue, population density, population, and number of households), as independent variables. Secondary data were collected from annual budgets of governments, the population commission and Bureau of Statistics of Nigeria, Publications of the Central Bank of Nigeria, and few research articles containing relevant public records. The 6 states of the South-South region of Nigeria are taken as the population of the study which covers a period of 11 years (2007-2017). The data were analysed employing multiple regression statistical method. The study reveals at 5 % level of significance, that no significant relationship exists between aggregate capital expenditure and demographic factors in South-South states budgetary planning. On individual demographic influence on capital expenditure, number of households and population were found to have negative relationship, while per capita revenue and population density are positive though the relationships are not significant. Thus the study concludes that none of the demographic variables is significantly related to capital expenditure. In other words, the governments of south-south Nigeria as an entity do not consider any of the demographic variables in their capital investment planning. It is recommended inter-alia that the governments of south-south Nigeria should in policy formulation, planning, and funding, give reasonable attention to demographic considerations in their infrastructural development drives. This can be achieved by always keeping an update of demographic statistics which as a matter of policy should be considered by estimators and budget formulators of public capital projects in the event of any infrastructure development planning.***

Indexed Terms- ***Capital investment, Demographic factors, Public infrastructure, South-South Nigeria***

I. INTRODUCTION

There are various facets of government ventures or activities that support the economy of the nation, one of which is notably public infrastructure which are physical facilities or structures in areas such as transportation, energy, telecommunications, social services, and basic utilities. Investment spending encompasses government spending on fixed assets, or capital, used for the good of the public beyond one year (Stupak, 2018). Such spending (on physical infrastructure as far as this study is concerned) is powered by government capital expenditure allocation in her annual budget. The value of public infrastructure to national development and economy cannot really be over emphasised as the quality and quantity of the infrastructure capacity of any nation dictates its level of advancement. Akanbi (2013) emphasized that the provision of physical infrastructure can be viewed as a major responsibility of government, and therefore, government budget allocations towards more capital spending will go far in enhancing infrastructure capacity in the economy. Infrastructure development successes in developed countries point to one basic factor amongst others: consideration given to demographic factors as primary factors to consider in the planning of capital spending for public infrastructure.

For instance, China's progressive need for the development of rail infrastructure is apparent in demographic, track length and usage metrics (Wilkins and Zurawski, 2014). The authors further posited that the rail transport systems in metropolitan centres in China is developed on the basis of demographic

indicators (population and population density) with the needed infrastructure calculated in terms of kilometre per million people. In Japan, Kim (2006) opined that demographic change and economic structure change have extremely strong effects on infrastructure demand. In Germany, Eichler, Wegener, and Zimmermann (2012) noted that increasing infrastructural shortages are exacerbated by the rising demands of a growing population and by urbanisation. The real issue here is that Germany's government infrastructure growth is rooted in its strong drive in raising funds for capital expenditure in relation to the growing demands of population related factors. Local Government New Zealand (LGNZ, 2015) notes that changing demographic and economic growth is a primary identification that influences the sustainability of the local government infrastructure funding system. Even in a developing country like Indonesia, It is evident from a study carried out by Hermawan, Rachmawati, and Wahyono (2015) that demographic pattern has been incorporated in the infrastructure policies in Indonesia.

Demographics are of key importance to development, but this link is often ignored; policymakers cannot afford to ignore the impact of demographic trends and indicators on the achievement of major development goals, including poverty reduction, old-age and health security, and provision of public services and infrastructure (Nugent and Seligman, 2008). Demography provides vital statistics about people of a particular area or country; it is in fact mathematics of people (Lutz and Samir, 2013). It essentially examines how a population is composed into various sub parts such as size of population, population density, number of households, etc. Noted, to shape infrastructural decisions, demographic factors are not (or should not) be the only consideration; however, concerning the kinds of infrastructural investments to make policymakers are required to consider demographic factors (Heller, 2010). Thus, infrastructure deficit can possibly be linked to definite disdain of demographic demands as demography is a chief influencer of infrastructural development. In other words, tying infrastructural development to demographic demands is a necessity for every community.

In sub-Saharan Africa, Gutman and Sy (2015), revealed that lack of infrastructures are more crucial and potentially transformational. It is suspected that the demographic growth rate (which is considerably rapid) in Sub Saharan Africa is not put into consideration in planning physical infrastructural development for the public. Kandiero (2009), Gutman & Sy (2015) are of the view that concerning demographic considerations in sub-Saharan Africa, infrastructural development is expectedly poor given that adequate infrastructure that lines up with the demographic needs of the people is lacking greatly. In many sub-Saharan African countries, infrastructure growth has not been in pace with economic and demographic growth and in some cases, infrastructure maintenance was lacking (Estache, Perrault, & Savard, 2012). The demographic factor is noteworthy because a fast demographic growth can be too loaded on the capital investment of a nation. In fact, every nation of the world faces this challenge, though in different degrees. Practically matching the demographic growth with an equal infrastructural provision is a difficult task. However, good policies can be formulated and adhered to by government which is purposefully geared towards lining up demographic growth with infrastructural investment in a positively significant manner.

In the Sub Saharan Africa's growth story, Nigeria remains at the centre. The Nigerian situation, as it stands, is devoid of such infrastructure-demographic positive relationship. The population growth of Nigeria has not been seen to be effected by a corresponding increase in the delivery basic services (Bello-Schünemann & Porter, 2017). Nigeria has six geopolitical zones namely: North West, North East, North Central, South West, South East, and South South. The south-south geopolitical zone is located around the southern tail end part of Nigeria. The zone consists of six states namely: Akwa-Ibom, Bayelsa, Cross River, Delta, Edo and Rivers states. The zone occupies approximately 84,587 square kilometres, has a population of 21, 044,081 (2006 National Population Census), and made up of 123 local government areas. The oil sector, which depends on the zone and Niger Delta as a whole, accounts for some 95 percent of Nigeria's export earnings and over 80 percent of federal government revenue (Francis, Lapin, and Rossiasco, 2011).

The choice of south-south geopolitical region for this study is necessitated by the fact that the six states that make up the region form the core of overall economic importance to the Nigerian nation. As opined by Ugbomeh and Atubi (2010), it has indeed been the economic heartbeat of Nigeria for over six decades. Given its location on the Gulf of Guinea, the South-South geo-political zone is also a very important global energy source, economic and security hub to Africa and the world (Institute for Peace and Conflict Resolution, 2017). The South-South zone, yearly, is the region with the highest federal government allocation inclusive of the 13 % oil derivation fund. Such a region, given its financial capacity compared to other parts of the country, is expected to invest in public infrastructure to a considerable level that meets the demographic growth of the region.

The particular focus of this study therefore, is to investigate and ascertain the possible link between the changing demographic trend in South-South States of Nigeria and the infrastructural growth (measured by the weight and trend of budgeted capital expenditure) it has supported in a time series, using a multiple regression statistical method. The undertone of the study is to improve infrastructure funding of state governments. The results for the South-South study may possibly be directed to the benefits of other regions of Nigeria as pertaining development of relevant policies for the provision of demographic sensitive infrastructure. Among a number of demographic factors, this study is within the scope of only four: population, population density, number of households, and per capita total revenue of government. The study cuts across a study period of 11 years (2007-2017).

II. PROBLEM FORMULATION, OBJECTIVES AND HYPOTHESIS

The evident government neglect of relevant demographic consideration in the policy decisions of infrastructural development results in poor and insufficient infrastructure provision in the land. This fact is corroborated by Olaseni and Alade (2012) who opines that Nigerian government has failed over time to integrate population policy with overall development planning. In Nigeria most infrastructural facilities used today were provided as far back as the 1960s to the 80s. It is surprising that the same amenities provided when the population was between 39.2 million and 65.7 million is still used till date when the population has grown beyond 194million and still counting (Owhor, Ojo, Nkpurukwe & Abdul, 2015). This problem cuts across the whole of Nigeria, possibly with variable intensity from region to region.

The necessary objectives of this study therefore are:

1. To determine the influence of demographic factors as a whole on aggregate capital expenditure.
2. To determine the influence of individual demographic factors on aggregate capital expenditure.

The research hypotheses are formed on the following basis:

H1: Aggregate Demographic variable does not significantly influence Capital Expenditure.

H2: Per Capita Revenue Expenditure does not significantly influence Capital Expenditure.

H3: Population Density does not significantly influence Capital Expenditure.

H4: Number of Households does not significantly influence Capital Expenditure.

H5: Population size does not significantly influence Capital Expenditure.

III. LITERATURE REVIEW

3.1 Conceptual Framework

The conceptual framework of this study is schematically presented in figure 1 below. It pictures all the variables of the study and their expected relationships. It portrays the spread of ideas or concepts of the researcher in achieving the goal of the research. The conceptual framework highlights the following: Aggregate Capital expenditure as dependent variable Vs the independent variables of population, population density, number of households and per capita government revenue. The framework idealizes the fact that capital expenditure (public capital investment) be necessarily checked by

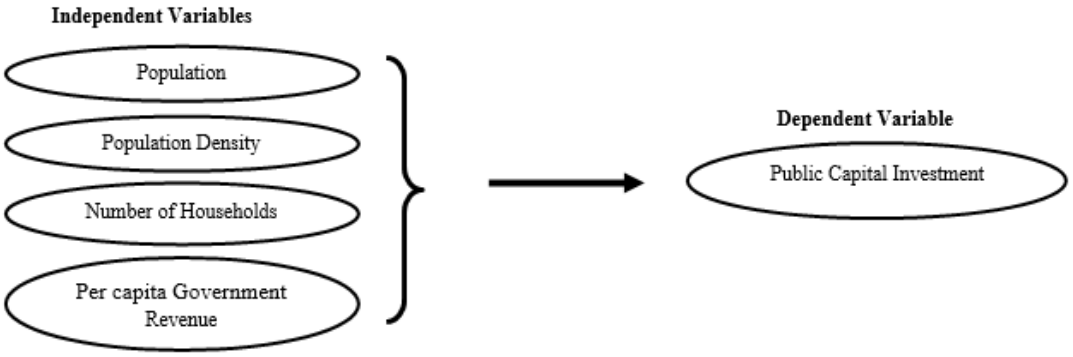

Figure 1: Conceptual Model of Variables that Influence Public capital Investment
Source**:** Author's Concept, 2019.

government to satisfy primarily, demographic needs. In other words, capital expenditure should significantly relate to demographic variables in order to make infrastructure development effective and meaningful to the public. It will be worthwhile at this point to explain the study variables.

3.2 Explanation of Study Variables

The dependent variable of this study is *Capital Expenditure (Capital Investment).* Usually government budgets have three main expenditure components namely total revenue (consisting of the total revenue of the government earmarked for spending in a fiscal year); recurrent expenditures (expenditures that are always occurring and made up of mostly personnel and overhead costs; and capital expenditures (embarked upon to bring about development and they usually attract huge capitals with long durations). Wendorf (2015) postulates that capital expenditures are long-term commitments, and they require a long-term perspective analysis by administrators, and expected to provide benefits for years.

The demographic variable, *Population* is defined as all citizens residing in, or momentarily far away from a country, and foreigners permanently living in a country (Omodero, 2020). The population size of a given community invariably dictates the level of infrastructure that could satisfy its social and other needs. Investing in public infrastructure without due respect to population needs is erroneous and may lead to insufficient, improper, or wrongly located infrastructure. Heller (2010), Busilac & Deluna (2013) postulate that a number of demographic variables influence infrastructure at different levels be it local, national, or regional and population size is the most notable demographic factor that influences public infrastructure provision.

The concentration of population over an area is a measure of *Population Density*, and it is another influencer of government public capital investment. In normal circumstances infrastructure development should be sensitive not only to the size of the population but how distributed the population is over an area. Edame (2014) postulated that population density among other determinants of public infrastructure spending in Nigeria, jointly or individually influence public capital investment on infrastructure in Nigeria. High population density areas may likely need more infrastructure facilities than low density areas. Government's consideration of population density while investing in infrastructure is an inevitable action that will enhance effective infrastructure provision for the populace.

Another demographic variable is *Number of Households*. A household generally consist of one or more persons who live together in the same house whether biologically related or not. Estimates of household parameters at various geographical levels in Nigeria are provided by the Nigerian Bureau of Statistics through General Household Survey and National Demographic and Health survey carried out periodically based on a representative sample of about 5,000 households nationally. Average number of persons per household gives the average household size. At the national level and geo-political zones household estimates are calculated by dividing the total household population by the number of

households. Observing the global scenario, average household size ranges from fewer than three persons per household to more than six (United Nations, 2017). Most infrastructural developments like housing, electrification, drainage and sewage disposal, and water/ gas supply are tied to household demands. Thus the relevance of number of households as a demographic variable that influences public capital investment is quite notable. Susetyo, Zunaidah, Rohima, Valeriani , & Bashir (2018) opines that the amount of household electric customers positively and significantly influence economic growth as relevant infrastructures are put in place to meet consumer needs and enhance the economy.

Per Capita Revenue of Government is yet another variable. The financial capacity of government dictates her level of infrastructure development. Such capacity is based on the amount of revenue it generates both from internal and external sources which sums up to total revenue of government. This amount can be regarded as the total revenue or government income of the population of a country. The same amount can be given a demographic root by regarding it as total revenue per capita in order to clearly assess the total revenue per individual basis of the population. The power of per capita revenue of government to influence public capital investment is inevitable as revenue forms the background of all government expenditures. In finding out the relationship between the level of government capital expenditure and income, Fisher and Wassmer (2015) found a positive relationship.

3.3 Theoretical Foundation

Issues about government capital investments to public infrastructure are not anything new in literature. The various factors that determine such expenditure are also considerably covered in literature. Notable among earlier studies in these areas that can be termed foundational studies are the works of Adolph Wagner (1883) and Peacock and Wiseman (1961). Wagner's law simply stresses that the activities and responsibilities of government increase proportionately with the economic development of a nation. On the grounds of Wagner's Law of Increasing State Activities, Ukwueze (2015) posited that as there is rise in the national income, there will also be rise in the public expenditure to meet the people's demands; also, as the economy grows with rise in per capita national income, the demand for public goods will rise compelling public provision of goods to increase. Peacock and Wiseman corroborated Wagner's law and went further, based on a study in1979, to affirm that the growth in public expenditure lies greatly on revenue collection which enhances the power of government to provide goods and services to the public and make public capital investments (Omodero, 2020). In linking demographics and government public spending in Wagner's law, Shodhganga (2006) and Hussain, Iqbal and Siddiqi (2010), pointed out the justification of government public expenditure in terms of objective criteria such as population. The summary of the theoretical background is that government public investment is influenced by government revenue (national income) and demographics.

3.4 Benefits of Demographic Considerations in Infrastructure Provision

The planning and execution of infrastructure rests with various technical personnel within various fields of professions. In the construction industry such professionals cut across Architects, Engineers, Builders, Urban and Regional planners, and Surveyors. At the planning stage of infrastructural development, planners consider a number of factors that influence their decision, prominent among them is demographic factors. For example to plan for health care services, education, and economic development projects, infrastructure planners need to study different segments of the population and assess the changes in the composition of the population for purposes of meeting present and future needs.

In defining demographics as statistics about the population of a particular geography such as a town/city, state, or nation, French (2014) opines that demographics give communities information they need to plan future investments and services. In other words demographics profoundly affect how important decisions are made in line with community vision. Demographic information covers population size, population composition, geographic distribution and population projections. Demographic information and analysis are used in the public sector by infrastructure planners and policy makers to help decision making. From the works of various researchers such as

Measure Evaluation (2011); Kloppenborg, Tesch, and Chinta (2010); and French (2014) the following benefits of demographic consideration in public infrastructure planning are culled:

1. To determine the demand of services among different segments and composition of the population (e.g. Household sizes and types, spatial distribution of the population, population density, income levels of population and age-sex distribution.
2. To determine resource needs and allocation, such as the number of facilities, and funds.
3. To identify the best locations to provide services to meet local needs.
4. To determine the feasibility for new projects.
5. To identify problems and community needs
6. To develop alternative strategies to achieve stated goals and objectives.
7. To determine available labour for infrastructural development and services.
8. To identify potential customers for business infrastructure.

Infrastructure assets, such as power stations, road networks, etc., are fundamental to the provision of infrastructure services like heating, housing or transportation. Infrastructure services are used by business, government, households, and organisations. The demand for infrastructure services is invariably decided by population dynamics. The greater the population, the greater the number of households demand on relevant infrastructure. Population is a primary driver of infrastructure service demand (National Infrastructure Commission, 2017). Infrastructure choices can also affect the population in the sense that people are either attracted/ influenced positively or negatively by the nature, size, function, and location of infrastructure. The population profile therefore, is a major resource in planning infrastructure development.

3.5 Empirical Review

Among a number of empirical studies that relate to this study, a few are here discussed. Government expenditure is determined by some major variables grouped differently by some authors. The studies of Sturm (2001) and that of Aregbeyen and Akpan (2013) particularly, and that of few other studies, can be summarized into a new grouping system by merging factors that are related or rearranging them as necessary. The resultant grouping can be presented as follows: the first is *Baseline or Structural variables* (total revenue of government, population size, population density, population growth rate, number of households, age distribution, and urbanization rate). The second is *Economic variables* (real economic growth, government budget deficits, government debt, private investment, foreign aid and direct investment, trade openness, average income of the populace, unemployment, inflation). The third is *Institutional/Political Variables* (regime or governance, corruption and economic sabotage, poor maintenance culture, electoral cycles, economic and political freedom, political/security instability, technological factors, and environmental concerns). This study is actually concerned with the first group which is basically demographic but as earlier said limited to only four of them.

A study conducted by Busilac & Deluna (2013) examined the relationship between population dynamics and investments for energy and telecommunication infrastructures in the Philippines from 1990-2011. Ordinary Least Squares (OLS) was explored to estimates the coefficients of the models. Results show that total population negatively affect capital expenditure for energy and telecommunications but positively affect the level of population under 15 years of age and above the age of 65. Omodero (2020) investigated the influences of selected macroeconomic factors such as: inflation, exchange rate, total expenditure, population, debt servicing and Real GDP on government capital investments from 2000 to 2017. Employing the technique of ordinary least squares, results reveal that population and Real GDP have negative impact on capital investments insignificantly.

In Indonesia, using case study method to investigate whether public infrastructure policies have taken into account the demographic pattern such as migration, population growth and economic development, Hermawan, Rachmawati, & Wahyono (2015) found out that demographic pattern has been inbuilt in the infrastructure policies of government. Wako (2012) examined the interrelationship between demographic variables and economic performance of Ethiopia.

Using the vector error correction model (VECM) approach and controlling for openness, domestic investment and regime changes, it assessed the direction and strength of causality between the growth rates of population and workers on the one hand and the level of real GDP per capita on the other. The results indicated robust and negative long run relationship between per capita income and population growth and a positive one between per capita income and growth of workers. The findings of the author point to a better attention (on the side of the government) to issues of population control and their incorporation into various national policies and policy-debates.

In an empirical study of analysing the factors that determine public expenditure in Jordan by Abu-Tayeh and Mustafa (2011), the correlation analysis results showed that government expenditure was significantly related to the variables of population, inflation rate, and unemployment rate. In their study, Bassetto and McGranahan (2011) investigated the relationship between public capital spending and population dynamics at the state level in USA, and empirically documented a robust fact that States with faster population growth do not spend more (per capita) to accommodate the needs of their growing population. In summary, Earlier studies have focused more on determining capital expenditure (infrastructural investment) in relation to: economic growth (measured in gross domestic product, GDP), politics and governance factors, and socio – economic factors on national and state basis. Others considered the effect of government expenditure on public infrastructure specifically, vis-a-vis economic growth and obtained positive signs using the Ordinary Least Squares (OLS) analytical technique. Some others too considered the effect of fiscal rules and procedures on capital spending.

Fairly close to this study are researches on the impact of population and population density on the cost of providing services per capita of the populace (Büttner, Schwager and Stegarescu, 2001; Sole'-Olle'and Bosch, 2005). In such case however, the emphasis is not just on the cost of providing infrastructure by government but on the cost of consumption or use by the people as well. Another category of researchers carried out studies on effects of capital spending on public infrastructure but mixed up few demographic factors and others like income, federal grants, tax price, and dept share of capital expenditure. Some notable studies of such include Fisher and Wassmer (2012), Nurlis (2016). The peculiarity of this study, besides considering purely demographic factors as independent variables instead of mixing with other determinants of capital expenditure, is in the selected demographic variables, a combination that is exceptional. Moreover the very nature of this study is rare in the Nigerian context and more so with respect to South-South region of Nigeria.

IV. METHODOLOGY

The research approach used for this study is Quantitative and the design causal (a variable having influence on another). Multiple regression analysis using SPSS (statistical package for social sciences) was used for the data analysis. The data were from secondary sources namely: State budget department publications, Ministry of Economic Planning (budget department), Ministry of finance, National Population Commission, Central Bank of Nigeria's statistical bulletins, and National Bureau of Statistics, collected for the period of eleven (11) years (2007-2017). The population and sample size is the entire 6 states of South-South region of Nigeria. Population and population density were found to be highly correlated from the SPSS result leading to population being excluded as a variable in the model and population density included as contributor to the model. Thus, though the separate SPSS regression analysis report for population is observed it will not be applied in the model.

4.1 Model Specification and Estimation

The multiple linear regression equation globally recognised and applied in this study is given as:

$Y = a_0 + a_1X_1 + a_2X_2 + ... + a_nX_n$

Where: Y = predicted or expected value of the dependent variable

X_1 through X_n = n distinct independent or predictor variables

a_0 = Y value when all of the independent variables (X_1 through X_n) equals zero

a_1 through a_n = the regression coefficients estimates

South-South states aggregate capital expenditure can be expressed as a function of demographic variables thus:

South-South states aggregate capital expenditure = f (government total revenue per capita, density of population, number of households, and population). The specification thus becomes:

$Capex.i = a_0 + a_1Rev.i + a_2Den.i + a_3House.i + a_4Pop.i + e$

Where : Capex = Capital expenditure
Rev = Per Capita Total Revenue of Government
Den = Population Density
House = Number of Households
Pop = Population
e = Random error term
a_0 = Constant

The fact that demographic variables influence the capital expenditure of governments is emphasised in literature. The extent of this influence is testable statistically through the instrumentation of regression analysis. Such analysis showcases the level of relationship between capital expenditure (CAPEX) as dependent variable and demographic factors (population, population density, per capita revenue expenditure, and number of households) as independent variables used in this study. The data presented below in table 2 shows the aggregate average values of variables of this study for six states of the south-south region of Nigeria in the space of eleven years (2007-2017). The table establishes the fact that capital expenditure (in billions) is dictated by the total revenue of government (in billions), but it is noteworthy that from 2014 - 2016 there is a dovetailing of total revenue of government and thus the capital expenditure.

V. RESULTS AND TESTS OF HYPOTHESIS

Table 2: Average Expenditures and Demographic Variables for South-South States

	TOTAL REV EXP	CAPEX	PER CAP. REV EXP	POP	POP DENSITY	NO HH
2007	149,084,000,000	86,948,000,000	41,210.49	3617622.33	256.61	944549
2008	231,022,000,000	144,572,000,000	61,913.12	3731390.33	264.68	863748
2009	248,776,000,000	152,060,000,000	64,637.92	3848762.33	273	955028
2010	239,871,666,000	139,521,666,000	60,423.31	3969852.83	281.59	1005026
2011	273,846,666,000	157,030,000,000	66,713.81	4104797.33	291.17	789384
2012	323,528,333,000	207,578,333,000	76,411.89	4234005.21	300.33	769819
2013	324,498,332,000	222,086,666,000	74,301.65	4367309.65	309.79	1149292
2014	330,186,666,000	209,166,666,000	73,295.96	4504841.44	319.54	938509
2015	281,538,322,000	152,286,666,000	60,588.41	4646735.53	329.61	948313
2016	269,383,332,000	148,086,666,000	56,064.51	4804881.33	340.82	1186391
2017	305,513,332,000	176,431,666,000	61,321.20	4982181.46	353.4	1335706

TOTAL	2,977,248,649,000	1,795,768,329,000	696,882.27	46,812,380	3,321	10,885,765

5.1 Test of Hypothesis

Objective 1 of this study seeks to determine the effect of demographic factors on aggregate capital expenditure in South-South States of Nigeria. To achieve this, multiple regression statistical technique was used with the help of SPSS. *Hypothesis 1* states that Aggregate Demographic variable does not significantly influence Capital Expenditure of South-South states of Nigeria. The report of the SPSS analysis is shown in tables 3. The adjusted R square is shown in the table as 0.206 which implies that only 20.6% of the aggregate capital expenditure variance can be explained by the demographic variables. This is suggestive of a weak association between aggregate capital expenditure and demographics. The table shows an F-statistics value of 1.867 and p-value of 0.223 > 0.05. This indicates that aggregate capital expenditure does not significantly relate with demographics in south-south Nigeria. Thus the null hypothesis is accepted. Table 4 below is the coefficient table showing the t-statistics and probability of significance values for individual demographic variables.

Hypoyhesis 2 states that Per Capita Revenue Expenditure does not significantly influence Capital Expenditure. The result suggests that the demographic variable – per capita revenue is not significantly related with the aggregate capital expenditure of the South-South region with p-values: 0.242 > 0.05. However the relationship is in a positive direction indicated by a t-value of 1.278. *Hypoyhesis 3* states that Population Density does not significantly influence Capital Expenditure. The result suggests that population density is not significantly related with the aggregate capital expenditure of the South-South region with p-values: 0.328 > 0.05. However the relationship is in a positive direction indicated by a t-value of 1.052. *Hypothesis 4* states that Number of Households does not significantly influence Capital Expenditure. The result suggests that number of households is not significantly related with the aggregate capital expenditure of the South-South region with p-values: 0.560 > 0.05. This relationship though insignificant is yet in a negative direction with a t-value of - 0.611. These negative directions call for more concern as they depict that as the said variables are increasing CAPEX is reducing. Table 5 below is an excluded variable table showing population as excluded from the model because of collinearity with population density. *Hypothesis 5* states that Population size does not significantly influence Capital Expenditure. The result for total population shows insignificant relationship (p-value = 0.732 > 0.05) and negative (t-value = -0.359).

VI. FINDINGS AND DISCUSSION

The pertinent findings of this study flow across the stated objectives. The findings indicate that aggregate capital expenditure does not significantly relate with demographics in south-south Nigeria. None of the individual demographic variables are significantly related to capital expenditure even though they are positive, except number of households and population which has a negative relationship. It is clear that the south-south states do not consider demographic changes in their capital expenditure budgeting. The effect of demographics on aggregate capital expenditure in south-south states is at a weak level of 20.6%, and aggregate capital expenditure does not significantly relate with demographics.

Table 3: Model Summary of Aggregate Capital Expenditure and Demographics

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.667[a]	.444	.206	34,452,264,715.567	.444	1.867	3	7	.223

a. Predictors: (Constant), Number of Households, Per Capita Revenue Expenditure, Population Density

b. Dependent Variable: Capital Expenditure

Table 4: Coefficients of Aggregate Capital Expenditure and Demographics

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	4353326051.599	105708384002.382		.041	.968
	Per Capita Revenue Expenditure	815899.109	638289.877	.419	1.278	.242
	Population Density	538540946.979	512003996.789	.443	1.052	.328
	Number of Households	-51763.816	84658.005	-.230	-.611	.560

a. Dependent Variable: Capital Expenditure

Table 5: Excluded Variables in Aggregate Capital Expenditure and Demographics

Excluded Variables[a]

Model		Beta In	T	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
1	Population	-1135.544[b]	-.359	.732	-.145	9.051E-9

a. Dependent Variable: Capital Expenditure

b. Predictors in the Model: (Constant), Number of Households, Per Capita Revenue Expenditure, Population Density

It is clear that the south-south states do not consider demographic changes in their capital expenditure budgeting. The effect of demographics on aggregate capital expenditure in south-south states is at a weak level of 20.6%, and aggregate capital expenditure does not significantly relate with demographics. Table 6 displays a summary of the regression results which indicates that CAPEX vs the demographic variables (per capita revenue, population density, number of households, and population) as a whole is not in a significant relationship in the south-south states (p-value = 0.223 >0.05). The R^2 value (0.206) suggests that only 20.6% of the CAPEX variance can be explained by the demographic variables. For the individual demographic variables, all are not significantly related with CAPEX. Number of households and population are negative in relationship with CAPEX.

One of the main objectives of this study (particularly objective 1) is to determine the demographic effect on

aggregate capital expenditure in south-south states. Statistical analysis result (adjusted R square) has shown that only 20.6% of the aggregate capital expenditure variance can be explained by the demographic variables. The association between aggregate capital expenditure and demographics, from this finding, is weak. Simply put, the effect of demographics on aggregate capital expenditure in south-south states is at a weak level of 20.6%. With the F-statistics value close to 2 and p-value greater than 0.05 there is the indication that aggregate capital expenditure does not significantly relate with demographics in south-south Nigeria. The t-statistics and probability of significance (p) values for individual demographic variables also show that none of the variables are significantly related to CAPEX at 95% confidence interval, even though they are positive except number of households and population which has a negative relationship.

Table 6: Summary of Test of Hypothesis Results

Hypothesis	Adjusted R^2	Statistical Tool	Location of Result	F/t Statistics	p (Sig.)	Remarks	Decision
H1: No sig. aggregate demographic effect on capital expenditure	0.206	Regression	Table 3	1.867	0.223	Not Significant	Accept H_0
H2: No sig. Per Capita Revenue expenditure effect on Capital Expenditure.		Regression	Table 4	1.278	0.242	Not Significant	Accept H_0
H3: No significant Population Density effect on Capital Expenditure.		Regression	Table 4	1.052	0.328	Not Significant	Accept H_0
H4: No sig. Number of Households effect on Capital Expenditure.		Regression	Table 4	-0.611	0.560	Not Significant	Accept H_0
H5: No sig. Population effect on Capital Expenditure		Regression	Table 5	-0.359	0.732	Not Significant	Accept H_0

Critical observation of the capital expenditure trend table 3 shows that from 2014 – 2016 there is a dovetailing of total revenue of government and invariably the capital expenditure. 2010 figure is also down, away from the progression pattern. Mostly, budget figures rise year by year, especially when the incremental budgeting system is adopted. The change of this pattern especially beyond 2014 is worrisome. However, considering the economic decline of Nigeria for some years now this dovetailing of capital expenditure is expected. But the rise of capital expenditure from 2017 is suggesting an erratic budgeting pattern of government as against demographics that progressively increase all along, except per capita revenue that follows same odd pattern because of link with capital expenditure through the total revenue expenditure. It is clear that the south-south states do not consider demographic changes in their capital expenditure budgeting.

The views of Edame (2014), Busilac and Deluna (2013), Heller (2010), among others, who opined that demographic variables (like Population size, components of population change - density , number of households, per capita revenue, etc.) in principle, influence the need for infrastructure seem to be

significantly different from the reality of south-south states of Nigeria. Noteworthy however, is the fact that the relationship between CAPEX and demographics is actually positive though not significant. The exception is 'number of households' and population which is in negative relationship with CAPEX. Heller (2010) had specifically pointed out that as demographic conditions continue to change, so too will infrastructure needs, and governments would do well to carefully monitor the connection between the two in order to achieve maximum benefits from their investments. The position of south-south states in this regard as per the findings of this study is out of place.

The fact that number of households as a demographic variable is in negative (though insignificant) relationship with CAPEX is not a welcomed finding as some notable infrastructures like electricity, water resources, housing, sewage and drainage, are household sensitive. Invariably, the finding suggests that as number of households' increases CAPEX reduces or vice versa. Population, though an excluded variable because of collinearity with population density in the regression model is also in negative relationship with CAPEX, a situation that is discouraging for the south-south states. Aregbeyen and Akpan (2013) had pointed to the fact that higher population (mostly in urban areas) should lead to higher government spending. They deduced that the long-run behaviour of government expenditure in Nigeria does not respond (as expected) to the demographic structure of the nation. The results of this study tallies with the stand of the authors.

VII. CONCLUSION AND RECOMMENDATIONS

On aggregate capital expenditure relationship with demographics in south-south Nigeria, the study concludes that there is no significance. This means that the region's infrastructural investment pursuits do not significantly consider demographic changes. On individual demographic influence on capital expenditure, number of households and population has negative relationship, while per capita revenue and population density are positive though the relationships are not significant. Thus the study concludes that none of the demographic variables is significantly related to capital expenditure. In other words, the governments of south-south Nigeria as an entity do not consider any of the demographic variables in their capital investment drive. More of concern is the negative relationship that variables like number of households and population are having on capital expenditure. This indicates that capital expenditure moves in opposite interest to such demographic demands. The following recommendations are made.

1. The governments of south-south Nigeria in policy formulation, planning, and funding, should give reasonable attention to demographic considerations in their infrastructural development drives. This can be achieved by always keeping an update of demographic statistics which should by matter of policy be looked into by estimators and budget formulators of public capital projects at any given time of infrastructural development.
2. Negative relationship exists between number of households and capital expenditure. Number of households as a factor however, is a major player to capital expenditure especially when it comes to specific infrastructure sectors like sewage disposal, electrification, water supply, etc. It is thus recommended that South-South region governments should necessarily capture the value of the demographic variable 'number of households' as one that should determine their capital allocation for infrastructure development.

The fact that population size moves in opposite direction to the value of infrastructure investment may prove two things: either population size is too enormous or the capital base is inadequate. Thus, the governments of South-South Nigeria should endeavour to meaningfully control the growth of population on one hand and strategise on increasing revenue on the other hand possibly by internal drives or through foreign aids, or via public- private partnership (ppp) with every caution of resisting things that can undermine public finance like corruption and the likes. Besides increasing revenue to align capital investment with demographic changes, an alternative measure is to carry out infrastructural development in convenient financial phases.

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