Demographic Effects on Public Capital Expenditures of Infrastructure Sectors in Rivers State Local Government Areas, Nigeria (2003-2017)

Sampson Alele Beals

Department of Quantity Surveying, Rivers State University, Port Harcourt, Rivers State, Nigeria

***Abstract*: - Capital investments on public infrastructural development are noted to be influenced by demographic factors though mostly not taken seriously by governments. This study is an empirical assessment of the effect of demographic factors on public infrastructure expenditures in Rivers state local government areas (LGAs) infrastructure sectors. It is a time series study (2003-2017) covering the entire 23 LGAs of Rivers state. Secondary data were collected from government public expenditure records, yearly appropriation bill or budgets, national population commission, National Bureau of Statistics, Central Bank of Nigeria Publications, and some research articles; and comprises capital expenditure (capex) of individual sectors and various demographic variables (population, population density, number of households, and per capita revenue). Data analysis was carried out using mainly multiple regression method. At 5 % level of significance, the study reveals that there is significant relationship between capital expenditure and aggregate demographic factors in Rural electrification, Transportation (roads and bridges), and Community development infrastructure sectors only. However, in relation to individual demographic factors, only population density is relating positively with all sector capital expenditures. Thus this study concludes that capital investments of the said infrastructural sectors are the ones sensitive to the LGAs' demographic demands. With regards to individual demographic variables, population density is a prominent influencer of capital expenditure. The Study recommends among others that at the LGA's infrastructure sectors level, though noted that there is significant and positive demographic effect on capital expenditure of very few sectors, government should endeavour to spread the gesture to possibly all other infrastructure sectors.**

***Key words:* Capital expenditure, Infrastructure sectors, population, population density, number of households, per capita revenue, budget, local government areas**.

I. INTRODUCTION

In the development of any nation, the foundation for a sustainable and durable economic growth is set by Infrastructural development (Akanbi, 2013). Governments around the world have realized that investing in and maintaining a healthy infrastructure is an important government function and it is an investment that has a multiplier effect throughout the economy, generating lasting economic, social and environmental benefits (Craven, 2017). Aregbeyen and Akpan (2013), and Sturm (2001) posit that demographic variables are base line or structural variables which determine public capital expenditure. 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.

Heller, 2010 emphasises that demographic factors should be seen as primary factors in determining infrastructural investment by policy makers. Bello-Schünemann and Porterin (2017) postulates that in 2016, only about 30% of Nigeria's population had access to improved sanitation facilities compared to, on average, more than half of the population in the country's global income peers. The authors revealed further that the situation for access to clean water and electricity is similar. Onwuka, 2006 having postulated that basic services fail Nigerians in access, quality and quantity in part due to robust population, emphasised further that exponentially growth of population expands the provision of basic services giving rise to increased public interventions in appropriate sectors per capita.

Local government capital expenditures in Rivers state are usually carried out through various infrastructural sectors that are typical of the Local government structure. Though aware that the local government infrastructure sectors (or departments) are twenty in number, grouped under four budget sectors, this study is limited to only ten of such sectors. The sectors are as follows:

a. *Economic Sector*: Agric & Rural development; Livestock; Forestry; Fisheries; Manufacturing and Craft; Rural Electrification; Commerce, Finance, Cooperative & Supply; Transportation (Roads and Bridges) (eight departments in all).

b. *Social Services sector*: Education; Health; Information; Social Development, Sports & Culture; Fire Service (five departments in all).

c. *Area Development Sector*: Water resources and water supply; Environment, Sewage and Drainage; Town and Country Planning; Community development (four departments in all).

d. *Administrative Sector*: General Administration (office buildings); Staff Housing; Workshop (three departments in all).

Thus, three from the economic sector (Agric & Rural development, Rural Electrification, Transportation - Roads and Bridges); three from the social sector (Education, Health, Social Development/Sports & Culture), three from the area development sector (Water resources and supply, Environment/Sewage and Drainage, Community development), and one from the administrative sector (Staff housing), were selected. The selection is based on assumption of most preferred in the local government infrastructural demands.

The role demographic variables, as primary factors, play in determining capital expenditure for public infrastructure development, is worth noting. 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. Thus, demographic consideration in public capital spending planning by government is worthy of examination in the local government areas, and particularly of Rivers State. Rivers State has an economic significance of one which is the centre of Nigeria's oil industry; in fact the entire state is called the treasure base of Nigeria, and such enviable economic status should impact infrastructure development much easily.

A. Objectives and Hypothesis

The primary aim of this study therefore, is to analyse the demographic effect on public capital expenditures of infrastructure sectors in Rivers state local government areas with the intention of proffering improvements to the funding of infrastructure in the area. The research covers a period of fifteen years (2003-2017) being a period where most of the budgets of all the twenty three local governments in Rivers State were easily made available. The Rivers State experience of the study may be largely amenable to important policies for general infrastructure development in similar states of Nigeria. The major objectives are:

1. To determine the aggregate demographic effect on each sector's capital expenditure
2. To determine the individual demographic effects (of population, population density, per capita total revenue of government, and number of households) on each sector's capital expenditure.

The research hypothesis is set out as follows:

H1: There is no significant aggregate Demographic effect on each sector's Capital Expenditure.

H2: There is no significant Per Capita Revenue Expenditure effect on each sector's Capital Expenditure.

H3: There is no significant Population Density effect on each sector's Capital Expenditure.

H4: There is no significant Number of Households effect on each sector's Capital Expenditure.

H5: There is no significant Population effect on each sector's Capital Expenditure.

II. LITERATURE REVIEW

A. Theoretical Issues

Public infrastructure financing in relation to demographic factors is addressed by some public finance theories. The major four theories on which this study is based are: Wagner's Law of Increasing State Activities (Shodhganga, 2006); Solow model (Kasun, 2019); Musgrave and Rostow's Development Model (The Strategist, 2013); and the Peacock-Wiseman (1961) Hypothesis. These theories have an underlying suggestion that infrastructural development is influenced by demographics, implying that there must be a concerted government effort in relating infrastructure financing to demographic growth. Thus significant infrastructural advancement will be missing where this theoretical position is neglected. The approach of this study is quite in line with the mentioned theoretical basis.

B. The Local Government Infrastructure Sectors and Demographic Concerns

The infrastructure sectors of local governments are varied. However, some pertinent ones relevant to this study are here discussed. For economic growth, rural development, and poverty alleviation in rural areas, **agricultural development** is very essential. In assessing the level of agriculture and rural development infrastructure in Africa, Boroh and Nwakanma (2018) opines that Africa continues to suffer both from low levels of agricultural productivity and inability to feed itself and influence rural entrepreneurship mainly due to poor infrastructure. The physical infrastructure that enhances agriculture cuts across transportation, telecommunication, irrigation, energy, power, information technology, storage facilities, farm facilities, and agricultural markets. Noor & Loganathan (2014) are of the view that there are direct and indirect effects of socio-demographic changes (concerning population, urbanization, increasing nuclear households) on agriculture and health.

Available and reliable **rural electrification** is necessary for the best survival of any economy in the world. Poor supply of electricity by the authority in Nigeria has forced some micro enterprises to adopt alternative sources of electricity supply like the use of electricity generating sets (Ighodaro and Oriakhi, 2011). Electrification infrastructure cuts across electric generation, transmission, distribution, and improvements and replacement facilities. Necessarily, among other demographic factors, population density and number of households play prominent roles in the provision of electrification infrastructure.

Transportation - roads and bridges network systems play a pertinent role and facilitate trade and cooperation between one area and another in the world. Road transportation roles contribute to national security and safety, enhance the flow of goods and people, provide access to key social services and health, commercial prospects improvement, and regional links strengthening (Bristow & Gill, 2011). In Nigeria the deplorable state of most roads in the urban areas is no longer news, talk less of the condition and inadequacy of roads in the rural areas. In the river terrain areas of some states of Nigeria, particularly Rivers state, the network of roads connecting one area to another in the rural areas are quite insufficient because bridges that are supposed to form the major linkages are grossly few. Infrastructure here encompasses various road and bridge structures together with expected maintenance and rehabilitations, and these are expectedly determined by demographic factors in a major sense.

Education infrastructure is that which provides the necessary space that enhances learning. Such includes administrative buildings, libraries, laboratories, classrooms, halls, dormitories, equipment rooms, and sanitation facilities. Teixeira, Amoroso, and Gresham (2017) in discussing the benefits of education infrastructure facilitates, strongly opined that high-quality infrastructure enhances teaching, improves student outcomes, and reduces dropout rates. The general experience in Nigeria is that school buildings are available but not adequate. The reason can be linked to the inability of government to meet the demographic growth and demands of the schools. Besides, the poor state of school buildings and other educational facilities have been a consistent issue of discussion among school proprietors and educationists. Study conducted by Ojeje, and Adodo (2018), recommended that state governments should allocate more funds to provide adequate school building facilities in the secondary schools so as not to overcrowd students in classrooms.

The overall service delivery environment of a **health** institution is likely to be meaningfully influenced by the basic infrastructure it has. Such infrastructure includes buildings, power and electricity, telecommunications, water and sanitation, etc. The present lopsided distribution of health facilities between urban and rural areas in Nigeria is a carry-over from colonial era in the sense that the urban areas where the educated, the rich and the powerful live, received the bigger share of the infrastructure as against the rural areas where majority of Nigerians reside (Ademiluyi & Aluko-Arowolo, 2009). This is suggestive of the need to redistribute health infrastructure by government in such a way that all Nigerians have a chance of benefiting optimally. Population concentration, dynamics and distribution patterns play major role in determining education infrastructure.

The availability of **Social Development/Sports & Culture** infrastructure and its use in a community supports several advantages. It makes physical activity possible and, by extension, enhances health and wellness. Infrastructure/facility in this area include public cinema halls, relaxation and amusement parks, assembly halls, civic centres, stadia, various types of ball courts or pitches, general play fields, swimming pools, gymnasium, facility for disabled sport, cultural centres, etc. Diejomaoh, Akarah, and Tayire (2015) express the fact that the Local Government is saddled with the responsibility of providing facilities, equipment and programmes to boost sporting activities. It is worth noting that one main essence of providing such infrastructure is to satisfy demographic interests.

Access to safe **water supply** greatly influences the health, quality of life, and economic productivity of people. Meeting this need is one major challenge that rural communities are confronted with in Nigeria (Ishaku, Majid, Ajayi, and Haruna, 2011). Inadequate investment in water infrastructures and the lack of political will to tackle the tough problems associated with water supply are major constrains to provision of quality water access in rural areas (Hassan, Hayatu, and Mohammed, 2016). The Local Government Authorities are saddled with the responsibility for the provision of rural water supply facilities in their areas, and this cannot be achieved without due respect to demographic concerns. Water resources and supply infrastructure/facilities include: boreholes, pumping stations, wells, water extension and distribution schemes, water treatment plants, and water storage facilities.

Environment/Sewage and Drainage: Water-carried waste, simply put, is referred to as sewage. Examples are the stuff that discharges from the toilet, wastewater from industrial plants, commercial or agricultural activities, surface runoff, storm water, and any sewer inflow or sewer infiltration (Tilley, Ulrich, Lüthi, Reymond, & Zurbrügg). In rural Nigeria, typical of Africa however, the on-site system (dislodging waste on the ground) is used in some communities partly and otherwise toilet sewage is dislodged directly into latrine pits without septic tanks. Some other communities adopt the full sewage system in a crude manner that involves discharging the sewage directly into a nearby river or the like without any form of treatment. Excepting the septic tank and soak-away method the other methods in rural Nigeria are hazardous to living creatures. Types of rural wastewater Infrastructural works involve construction and maintenance of drainages, public toilets/latrines, environmental sanitation facilities, sewage disposal facilities, etc. Environment/sewage facilities must necessarily be made to match the demands of population, population density and number of households.

Community Development is quite essential because it supports the wellbeing and greater growth capacity of the community. Community development infrastructure includes market stalls, town halls, waiting halls, security and justice support buildings, and other constituency projects. Although the government has the responsibility of creating the enabling environment for community development, Egbe (2014) opines that the rural development initiatives by the government have ended up creating a culture of dependence on the part of the people instead of development orientations initiated from the people themselves. In community development, no doubt, demographic factors are major points of consideration.

Housing refers to the physical structure used by man as shelter and the facilities/ amenities and other aspect of the social environment which links man with his remote and immediate environment (Olawole, Lawal, and Alabi, 2015). This suggests that Housing is not just a building but a combination of all amenities for the comfort of occupants which are provided in the building. Universally speaking, shelter is one most essential human necessity perhaps after food. The local government in Nigeria is saddled with the responsibility of providing housing for its officers and staff generally. Such housing may include building and maintenance of various categories of staff quarters, chairman's lodge, council quarters, guest house, purchase of furniture and electrical/mechanical assets, and other facilities that necessarily boost the quality of housing. Demographic data is surely needed to effectively determine staff housing.

C. Demographic Effect on Investments for Physical Infrastructures

For the development of any nation, demographics are of key importance, but most times this link is ignored. When investing in different types of infrastructure, countries have tough choices to make. The choices cover areas of education, irrigation and other agricultural needs, roads, bridges, electricity, water supply, etc. Though there will always be competing and immediate needs for both public and private infrastructure, the population demographic characteristics is expected to help ascertain investment. The demographic variables considered in this study are population, population density, number of households, and per capita total revenue. Every infrastructure must serve a given population, a given population density, a given number of households, and be financed through a given total revenue. The **population size** of the local government area is a strong determinant being that whatever development is located in an area must be geared towards meeting the needs of the population size. The extent of distribution of the population over an area (**population density**) determines the extent and cost of infrastructure to be provided for the area (Holcombe and Williams, 2008, Conklin, 2004). The total **revenue per capita** as a demographic variable plays crucial role in determining the financing of infrastructures because as expected when revenue of government increases, her capital expenditure increases. **The number of households** in the community usually dictates the linking up of services like telecommunications, water, power, and sanitation to households.

D. Empirical Review

A study carried out by Plotnikova (2005) supports the claim that government spending is determined by a host of causal factors that can be grouped into four broad categories: demographic-economic factors, representing both demand for public capital and source of its financing; political decision-making factors that reflect electorate/party in power preferences for spending; capital stock variables that relate to the age of infrastructure and control for spending culture in a state; and budget composition/spending rules. Heller, Tait, & Mondiale (1982), postulates that six groups of factors which significance can be empirically tested are identifiable as likely to influence spending in a given functional sector: demographic influences, sociological concerns, structure of the economy, the level of economic development, technological factors, and environmental factors.

Concerning the annual capital spending in the 48 contiguous United States for 1983 and 1984 by Temple (1994), the variables used in a regression to explain the spending are median income, federal grants, tax price, capital stock, debt share of capital expenditure, population growth, population density, the percent elderly, and a location control. Among other results, Temple finds that federal grants, population change, and the existing capital stock have positive effects on capital spending, whereas density and the percent elderly have negative effects. The variables of GDP, population density and per capita income, according to test results conducted by Nurlis (2016), have a significant effect on capital expenditure. This means that, in determining the amount of income allocated for capital expenditures, local governments will consider regional growth rates, population density, and per capita income.

Poterba (1995) analyzes differences in state and local government per capita capital spending (excluding highways) for the 48 contiguous United States in 1962. The variables used in the empirical analysis include per capita income of citizens and income squared, federal grants per capita, population growth rate, population under 18, population over 65, percent homeowners, percent urban, outmigration in 1960, and set of controls for the four Census Regions. The rate of population density has a significant effect on capital spending; and areas that have a high population density will require a lot of facilities and infrastructure as well so that local governments should allocate additional budget to build public facilities (Nurlis, 2016). Hermawan, Rachmawati, and Wahyono (2015) conducted a research 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. It was evident from the study that demographic pattern has been incorporated in the infrastructure policies in Indonesia.

The determinants of public expenditures were classified in three groups by Abu-Tayeh & Mustafa (2011), in Jordan. The first group being policies referred to as counter-cyclical include variables such as unemployment, inflation, and budget deficit. The second group considers the demographic factor of population growth. The last group consisted of political factors such as interest groups, political stability, and previous real government spending. A major result of their research is that population, unemployment and inflation rates are significantly related to the public expenditures.

The summary of empirical studies in the study area so far, suggests that demographic factors influence capital expenditure which is meant for public infrastructure provision. The studies carried out mostly use descriptive and regression analysis to arrive at results. Selected demographic variables for studies change from one study to another. It is important to note further, that most studies on public capital expenditure are based on aggregate values of the capital expenditure. Minor cases of disaggregate capital expenditure are noted in literature but analysed with descriptive statistics in relation to total capital expenditure.

Disaggregated capital expenditures that points to isolated areas of infrastructural development like electrification, roads and drainage, water supply, education, etc. with respect to demographics are hardly looked into and especially as regards Nigeria and particularly Rivers state LGAs. This is a gap of literature that is filled in this study. In other words disaggregate capital expenditures of sectors are analysed in relation to demographic factors. The intention is to pry into selected sensitive infrastructural sectors to attain statistical relationships that reveal government's emphases on specific infrastructural development, all with respect to demographics.

III. METHODOLOGY

Quantitative research approach of causal design is used for this study. The causal design usually determines the effect of independent variables (demographic variables) on a dependent variable (sector capital expenditure). Multiple regression analysis using SPSS version 22 is used for this research. In carrying out this research work, secondary sources of data were used which include National Population Commission, and National Bureau of Statistics, State budget department publications, Central Bank of Nigeria's statistical bulletins, Ministry of Economic Planning (budget department), Ministry of finance. The population and sample size in this study is the twenty three (23) local government areas of Rivers State. Data is collected for the period of twelve (15) years (2003-2017).

The regression analysis of this study shows that population and population density are highly correlated, with population density being the chosen contributor to the model and population excluded. The SPSS regression analysis thus treats population as an excluded variable. Therefore population will not be included in the model even though the exclusive SPSS regression analysis report for population is noted.

A. Model Specification and Estimation

The equation for the multiple linear regression used in this study is as follows:

$$Y = b_0 + b_1X_1 + b_2X_2 + ... + b_nX_n$$

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

X_1 through X_n = n distinct independent or predictor variables

b_0 = value of Y when all of the independent variables (X_1 through X_n) are equal to zero

b_1 through b_n = the estimated regression coefficients.

Based on the conceptual considerations, Local government disaggregate capital expenditure of infrastructure sectors can be expressed as a function of demographic variables as follows: Local government disaggregate capital expenditure of infrastructure sectors = f (government total revenue per capita, population, density of population, number of households). Hence the specification of the equation will be:

$$Capex.i = b_0 + b_1Rev.i + b_2Pop.i + b_3Den.i + b_4House.i + e$$

Where $Capex.i_1$ = Capex Agric = Public capital expenditure on Agriculture/Rural Dev.

$Capex.i_2$ = Capex Elect = Public capital expenditure on Electrification

$Capex.i_3$ = Capex Trans = Public capital expenditure on Transportation

$Capex.i_4$ = Capex Edu = Public capital expenditure on Education

$Capex.i_5$ = Capex Health = Public capital expenditure on Health

$Capex.i_6$ = Capex Social = Public capital expenditure on Social Development and Sports

$Capex.i_7$ = Capex Water = Public capital expenditure on Water Resources

$Capex.i_8$ = Capex Env = Public capital expenditure on Environment

$Capex.i_9$ = Capex Comm = Public capital expenditure on Community Development

$Capex.i_{10}$ = Capex House = Public capital expenditure on Staff Housing

Rev = Government total revenue per capita

Pop = Population

Den = Density of population

House = Number of Households

e = A random error term

b_0 = Constant

IV. RESULTS AND TESTS OF HYPOTHESIS

Below are capital expenditure values of infrastructure sectors of the average local government area of Rivers state, Nigeria from 2003-2017.

1.	Agriculture and Rural Development	231,916,336
2.	Rural Electrification	1,111,847,468
3.	Transportation (Roads and Bridges)	2,120,533,637
4.	Education	774,236,972
5.	Health	495,717,529
6.	Social Development, Sports & Culture	789,819,460

7.	Water Resources	724,042,576
8.	Environment, Sewage and Drainage	1,005,770,909
9.	Community Development	1,072,951,538
10.	Staff Housing	626,039,762
	TOTAL	**N 8,952,876,187**

Source: Collated/computed by author from Rivers State Local Govt. published data

The total sum of N8,952,876,187 (being the sum of the average local government's infrastructure sector expenditures) which is 61.4% of the total capital expenditure of the LGAs (N14,579,266,205) is taken by these selected ten sectors.

The data presented in table 1 depicts the aggregate average values of the variables of this study in 15 years (2003-2017) period for all 23 LGAs of Rivers State. National Bureau of Statistics (2012) annual population growth rate of 3.46 % for Rivers state were used to compute figures for the total population of each LGA. Table 2 is the spread sheet data displaying the capital expenditures of individual infrastructure sectors over a 15 years period for the entire 23 LGAs. Each value of sector capital expenditure is the average of the 23 LGAs which is regressed against the demographic variables of table 1.

A. Test of Hypothesis

The research objective is to ascertain the demographic effect on disaggregate capital expenditure of selected infrastructural sectors in Rivers State local government areas. The hypothesis states that there is no significant demographic effect on disaggregate capital expenditure of selected infrastructural sectors in Rivers State local government areas. To test this hypothesis the capital expenditure of each of the selected infrastructural sub sectors for a 15 years period is regressed against demographics (per capita revenue, population, population density, and number of households). Ten regressions are thus carried out, one for each sector using SPSS version 22. Results of the first regression are fully shown in table 3 – 5. Summary of the rest nine regressions will be captured in tables 6-14.

Table 1: Expenditures and Demographic Variables for Rivers State LGAs

	TOTAL REV EXP	CAPT. EXP.	PER CAP. REV EXP	POP TOTL	POP DENSITY	NO. HH
2003	624873777.7	154961305.4	3066.38	203782.6	452.37	43358
2004	586521926.4	147320398.9	2763.19	212262.7	471.19	54426
2005	897347375.5	287153026.1	4108.97	218387.6	484.79	50788
2006	1204365687	449621693.3	5328.32	226031.1	501.76	46129
2007	1512409369	618991821	6467.07	233863.1	519.14	63206
2008	2094147928	776222246	8650.78	242076.1	537.37	55017
2009	2584985394	1211611859	11218.88	250413.9	555.88	62604
2010	2790382691	1320280869	10769.07	259110.9	575.19	57580
2011	3191403880	1653136920	11911.93	267916.5	594.74	51522
2012	4146070723	2256447692	14955.59	277225.5	615.4	50405
2013	4328500532	2207398747	15091.55	286816.3	636.69	70741
2014	3382174694	1350154510	11397.77	296740.1	658.72	61821
2015	3008547922	980039687	9823.73	306253.1	679.84	62501
2016	2339537791	544421172	7367.19	317561.9	704.94	69035
2017	2381271271	621504258	7231.54	329289.5	730.97	88997
TOTAL	**35072540962**	**14579266205**	**130151.96**	**3927731**	**8718.99**	**888130**

Source: Collated/computed by author (2019) from Local government and National published data

1: Agriculture and Rural Development Capex Vs Demographics

The model summary of the SPSS result is shown in table 3 below with the adjusted R square value given as -0.021. This indicates that only -2.1% of the Capex Agric variance can be explained by the demographic variables. This is suggestive of a very weak association between capital expenditure and demographics. With the F-statistics = 0.904 and the significant F change (p value) = 0.470 > 0.05, the relationship between Capex Agric and demographics is positive but not significant. Thus **for hypothesis 1_1** the null hypothesis is accepted. On individual demographic basis, the coefficients table 4 below suggests that all the demographic variables – per capita revenue, population density, and number of households are not significantly related with the Capex Agric of the LGAs (p-values: 0.422, 0.132, and 0.279, all > 0.05 respectively). However, per capita revenue and number of households are in a negative direction with Capex: t-values of -0.833 and -1.140 respectively. These negative directions depict that as the said variables are increasing Capex Agric is reducing. Total population is taken as an excluded variable because of collinearity with population density. The result for total population is showing the direction of relationship as positive (t-value = 0.022) but insignificant (p-value = 0.983 >0.05). See table 5 below. In summary, the results show that **hypothesis 2_1, 3_1, 4_1, and 5_1** (suffix 1 being Agric sector) are all accepted (that is case of insignificant relationship).

Table 3: Model Summary of Agric. and Rural Dev. CAPEX Vs Demographics for LGAs

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	.445[a]	.198	-.021	9,206,384.871	.198	.904	3	11	.470
a. Predictors: (Constant), Number of Households, Per Capita Revenue Expenditure, PopulationDensity									
b. Dependent Variable: Agric and Rural Dev									

Table 4: Coefficients of Agric/Rural Dev. CAPEX Vs Demographics for LGAs

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-7174265.197	18169917.771		-.395	.701
	Per Capita Revenue Expenditure	-8.212	9.854	-.273	-.833	.422
	Population Density	83795.909	51441.864	.825	1.629	.132
	Number of Households	-402.784	353.379	-.512	-1.140	.279
a. Dependent Variable: Agric and Rural Dev						

Table 5: Excluded Variables in Agric/Rural Dev. CAPEX Vs Demographics for LGAs

Excluded Variables[a]						
Model		Beta In	T	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
1	Population	273.578[b]	.022	.983	.007	5.295E-10
a. Dependent Variable: Agric and Rural Dev						
b. Predictors in the Model: (Constant), Number of Households, Per Capita Revenue Expenditure, Population Density						

2: Rural Electrification Capex Vs Demographics

From table 6 the adjusted R square value given as 0.432. This indicates that only 43.2% of the Capex Elect variance can be explained by the demographic variables. This is suggestive of a weak association between Capex Elect and demographics. With the F-statistics = 4.556 and the significant F change (p value) = 0.026 < 0.05, the relationship between Capex Elect and demographics is positive and significant. Thus the null hypothesis 1_2 is rejected. On individual demographic basis, table 6 suggests that per capita revenue is not significantly related with Capex Elect (p-value =0.052 > 0.05), while population density, and number of households are significantly related with the Capex Elect (p-values: 0.004, and 0.031, all < 0.05 respectively). However, per capita revenue and number of households are in negative directions with t-values of -2.183 and -2.465 respectively. These negative directions depict that as the said variables are increasing Capex Elect is reducing. Total population is taken as an excluded variable because of collinearity with population density. The result for total population is showing the direction of relationship as negative (t-value = -0. 086) but insignificant (p-value = 0.933 >0.05).

3: Transportation (Roads and Bridges) Capex Vs Demographics

From table 7 the adjusted R square value given as 0.362. This indicates that only 36.2% of the Capex Trans variance can be explained by the demographic variables. This is suggestive of a weak association between Capex Trans and demographics. With the F-statistics = 3.647 and the significant F change (p value) = 0.048 < 0.05, the relationship between Capex Trans and demographics is positive and significant. Thus the null **hypothesis 1_3** is rejected.

Table 2: Capital Expenditure for Infrastructural Sectors of Rivers state LGAs

YEAR	AGRIC	ELECTRI	TRANSPORT	EDUCATN	HEALTH	SOCIAL DEV	WATER	ENVIRON	COMM DEV	STAFF HOUSN
2003	2396087	12683108	22107796	10095131	9785861	5516739	7351709	8426441	7629347	10757391
2004	28838488	12961739	34604533	13957116	12178880	7208566	11480018	9098845	8099161	12553478
2005	5217391	26297069	42975543	30235396	20334782	14441456	15741304	17404705	18473931	18103789
2006	6387131	29089400	70733078	38381550	27138970	22671874	183555511	325033128	29181900	27864179
2007	7385652	41402254	100380689	47211393	44469179	21324094	16673672	31216742	41778261	36629779
2008	11447336	74510428	160538507	55468519	40265524	40397287	24782065	37303804	28997770	36004241
2009	25196055	83608558	185556470	64443774	55300353	52154380	44168528	68611585	80207552	51281931
2010	17891111	82703305	189141642	93444667	45693904	67652103	47564441	73169520	77473294	45194229
2011	26816506	124138752	207764595	72434382	41614236	97434579	62016169	71778221	136722153	70599023
2012	32003913	186888543	381484609	106420866	88868113	144434782	76532008	103779674	213271834	94026332
2013	22335217	161158652	316027560	114322040	66502510	158752174	99897391	120144721	189960851	122288746
2014	16913043	87324391	174857067	46801307	43565217	43767742	52704609	53394339	154126285	51739130
2015	19207841	82217091	99173636	40994364	26850000	53465000	40033182	37682273	55220455	23322727
2016	14296818	50112273	66776864	17615227	15051364	40672636	20252727	22388636	13737273	17042273
2017	14772381	56751905	68411048	22627381	16850476	19926048	21756667	26700000	17993810	8674762
Total	**231916336**	**1111847468**	**2120533637**	**774236972**	**495717529**	**789819460**	**724042576**	**1005770909**	**1072951538**	**626039762**

Source: Collated/computed by author (2019) from Rivers state Local government annual budgets

4: Education Capex Vs Demographics

From table 8 the adjusted R square value given as 0.152. This indicates that only 15.2% of the Capex Edu variance can be explained by the demographic variables. This is suggestive of a weak association between Capex Edu and demographics. With the F-statistics = 1.834 and the significant F change (p value) = 0.199 > 0.05, the relationship between Capex Edu and demographics is positive but not significant. Thus the null hypothesis 1_4 is accepted. On individual demographic basis, the table suggests that all demographics are not significantly related with Capex Edu (p-value =0.077, 0.056, and 0.136, all > 0.05). However, per capita revenue and number of households are not significantly related and worst in a negative direction with t-values of -1.950 and -1.611 respectively. These negative directions depict that as the said variables are increasing Capex Edu is reducing. The result for total population is showing the direction of relationship as negative (t-value = -0. 542) but insignificant (p-value = 0.600 >0.05).

5: Health Capex Vs Demographics

From table 9 the adjusted R square value given as 0.201. This indicates that only 20.1% of the Capex Health variance can be explained by the demographic variables. This is suggestive of a weak association between Capex Health and demographics. With the F-statistics = 2.171 and the significant F change (p value) = 0.149 > 0.05, the relationship between Capex Health and demographics is positive but not significant. Thus the null **hypothesis 1_5** is accepted.

On individual demographic basis, the table suggests that per capita revenue and number of households are not significantly related with Capex Health (p-value =0.059, and 0.089, all > 0.05). Population density is significantly related with Capex Health given t-value of 2.297 and p-value of 0.042 < 0.05. However, per capita revenue and number of households are in negative directions with t-values of -2.106 and -1.866 respectively. These negative directions depict that as the said variables are increasing Capex Health is reducing. The result for total population is showing the direction of relationship as positive (t-value = 0. 032) but insignificant (p-value = 0.975 >0.05).

6: Social Development, Sports and Culture Capex Vs Demographics

From table 10 the adjusted R square value is given as 0.218. This indicates that only 21.8% of the Capex Social variance can be explained by the demographic variables. This is suggestive of a weak association between Capex Social and demographics. With the F-statistics = 2.298 and the significant F change (p value) = 0.134 > 0.05, the relationship between Capex Social and demographics is positive but not significant. Thus the null **hypothesis 1_6** is accepted.

On individual demographic basis, the table suggests that per capita revenue and number of households are not significantly related with Capex Social (p-value =0.105, and 0.084, all > 0.05). Population density is significantly related with Capex Social given t-value of 2.581 and p-value of 0.026 < 0.05. However, per capita revenue and number of households are in negative directions with t-values of -1.765 and -1.899 respectively. These negative directions depict that as the said variables are increasing Capex Social is reducing. The result for total population is showing the direction of relationship as negative (t-value = - 0. 420) and insignificant (p-value = 0.683 >0.05).

Table 6: Demographics on Rural Electrification Capex

Results	Rural Electrification				
	Per Capita Revenue	Population Density	Number of Households	Population	Combined Demographics
t-stat	-2.183	3.639	-2.465	-0.086	F-stat = 4.556
p-value	0.052	0.004	0.031	0.933	p-value = 0.026
Adjusted R^2					Adjusted R^2 = 0.432
Remarks	Not Sig.	Sig.	Sig.	Not Sig.	Significant
Decision	Accept $H2_2$	Reject $H3_2$	Reject $H4_2$	Accept $H5_2$	Reject $H1_2$

Table 7: Demographics on Transportation (Roads and Bridges)

Results	Transportation				
	Per Capita Revenue	Population Density	Number of Households	Population	Combined Demographics
t-stat	-2.498	3.161	-2.353	0.112	F-stat = 3.647
p-value	0.030	0.009	0.038	0.913	p-value = 0.048
Adjusted R^2					Adjusted R^2 = 0.362
Remarks	Sig.	Sig.	Sig.	Not Sig.	Significant
Decision	Reject $H2_3$	Reject $H3_3$	Reject $H4_3$	Accept $H5_3$	Reject $H1_3$

7: Water Resources and Water Supply Capex Vs Demographics

From table 11 the adjusted R square value given as -0.012. This indicates that only -01.2% of the Capex Water variance can be explained by the demographic variables. This is suggestive of a very weak association between Capex Water and demographics. With the F-statistics = 0.947 and the significant F change (p value) = 0.451 > 0.05, the relationship between Capex Water and demographics is positive but not significant. Thus the null **hypothesis 1_7** is accepted.

On individual demographic basis, the table suggests that all demographic variables of the model - per capita revenue, population density, and number of households are not significantly related to Capex Water (p-value =0.304, 0.172, and 0.150, all > 0.05). However, per capita revenue and number of households are in negative directions with t-values of -1.079 and -1.549 respectively. These negative directions depict that as the said variables are increasing Capex Water is reducing. The result for total population is showing the direction of relationship as negative (t-value = -1.200) and insignificant (p-value = 0.258 >0.05).

8: Environment, Sewage and Drainage Capex Vs Demographics

From table 12 the adjusted R square value given as -0.074. This indicates that only -07.4% of the Capex Env variance can be explained by the demographic variables. This is suggestive of a very weak association between Capex Env and demographics. With the F-statistics = 0.677 and the significant F change (p value) = 0.584 > 0.05, the relationship between Capex Env and demographics is positive but not significant. Thus the null **hypothesis 1_8 is accepted**.

On individual demographic basis, the table suggests that all demographic variables of the model - per capita revenue, population density, and number of households are not significantly related to Capex Env (p-value =0.391, 0.348, and 0.231, all > 0.05). However, per capita revenue and number of households are in negative directions with t-values of -0.893 and -1.267 respectively. These negative directions depict that as the said variables are increasing Capex Env is reducing. The result for total population is showing the direction of relationship as negative (t-value = -1.057) and insignificant (p-value = 0.315 >0.05).

9: Community Development Capex Vs Demographics

From table 13 the adjusted R square value given as 0.484. This indicates that only 48.4% of the Capex Comm variance can be explained by the demographic variables. This is suggestive of a weak association between Capex Comm and demographics. With the F-statistics = 5.383 and the significant F change (p value) = 0.016 < 0.05, the relationship between Capex Comm and demographics is positive and significant. Thus the null **hypothesis 1_9** is rejected.

Table 8: Demographics on Education Capex

Results	Education				
	Per Capita Revenue	Population Density	Number of Households	Population	Combined Demographics
t-stat	-1.950	2.131	-1.611	-0.542	F-stat = 1.834
p-value	0.077	0.056	0.136	0.600	p-value = 0.199
Adjusted R^2					Adjusted R^2 = 0.152
Remarks	Not Sig.	Not Sig.	Not Sig.	Not Sig.	Not Significant
Decision	Accept $H2_4$	Accept $H3_4$	Accept $H4_4$	Accept $H5_4$	Accept $H1_4$

Table 9: Demographics on Health Capex

Results	Health				
	Per Capita Revenue	Population Density	Number of Households	Population	Combined Demographics
t-stat	-2.106	2.297	-1.866	0.032	F-stat = 2.171
p-value	0.059	0.042	0.089	0.975	p-value = 0.149
Adjusted R^2					Adjusted R^2 = 0.201
Remarks	Not Sig.	Sig.	Sig.	Not Sig.	Not Significant
Hypothesis Decision	Accept $H2_5$	Reject $H3_5$	Reject $H4_5$	Accept $H5_5$	Accept $H1_5$

On individual demographic basis, the table suggests that all demographic variables of the model - per capita revenue, population density, and number of households are significantly related to Capex Comm (p-value =0.015, 0.002, and 0.014, all < 0.05). However, per capita revenue and number of households are in negative directions with t-values of -2.897 and -2.937 respectively. These negative directions depict that as the said variables are increasing Capex Comm is reducing. The result for total population is showing the direction of relationship as negative (t-value = -0.465) and insignificant (p-value = 0.652 >0.05).

10: Staff Housing Capex Vs Demographics

From table 14 the adjusted R square value given as 0.191. This indicates that only 19.1% of the Capex House variance can be explained by the demographic variables. This is suggestive of a weak association between Capex House and demographics. With the F-statistics = 2.102 and the significant F change (p value) = 0.158 > 0.05, the relationship between Capex House and demographics is positive but not significant. Thus the null **hypothesis 1_{10}** is accepted.

On individual demographic basis, the table suggests that only population density is significantly related to Capex House (t-value = 2.281 and p-value = 0.043 < 0.05). Per capita revenue and number of households are not related significantly to Capex House (p-values = 0.060 and 0.122). Per capita revenue and number of households are in negative directions with t-values of -2.095 and -1.675 respectively. These negative directions depict that as the said variables are increasing Capex House is reducing. The result for total population is showing the direction of relationship as negative (t-value = -0.521) and insignificant (p-value = 0.613 >0.05).

Table 10: Demographics on Social Development Capex

Results	Social Development				
	Per Capita Revenue	Population Density	Number of Households	Population	Combined Demographics
t-stat	-1.765	2.581	-1.899	-0.420	F-stat = 2.298
p-value	0.105	0.026	0.084	0.683	p-value = 0.134
Adjusted R^2					Adjusted R^2 = 0.218
Remarks	Not Sig.	Sig.	Sig.	Not Sig.	Not Significant
Hypothesis Decision	Accept $H2_6$	Reject $H3_6$	Reject $H4_6$	Accept $H5_6$	Accept $H1_6$

Table 11: Demographics on Water Resources Capex

Results	Water Resources				
	Per Capita Revenue	Population Density	Number of Households	Population	Combined Demographics
t-stat	-1.079	1.462	-1.549	-1.200	F-stat = 0.947
p-value	0.304	0.172	0.150	0.258	p-value = 0.451
Adjusted R^2					Adjusted R^2 = -0.012
Remarks	Not Sig.	Not Sig.	Not Sig.	Not Sig.	Not Significant
Hypothesis Decision	Accept $H2_7$	Accept $H3_7$	Accept $H4_7$	Accept $H5_7$	Accept $H1_7$

Table 12: Demographics on Environment, Sewage and Drainage Capex

Results	Environment				
	Per Capita Revenue	Population Density	Number of Households	Population	Combined Demographics
t-stat	-0.893	0.980	-1.267	-1.057	F-stat = 0.677
p-value	0.391	0.348	0.231	0.315	p-value = 0.584
Adjusted R^2					Adjusted R^2 = -0.074
Remarks	Not Sig.	Not Sig.	Not Sig.	Not Sig.	Not Significant
Hypothesis Decision	Accept $H2_8$	Accept $H3_8$	Accept $H4_8$	Accept $H5_8$	Accept $H1_8$

V. FINDINGS AND DISCUSIONS

The results of this study have shown that in Rivers State local government areas there is only significant and positive demographic effect on disaggregate capital expenditure of Rural electrification, Transportation (roads and bridges), and Community development infrastructural sectors. Literature supports a positive and significant relationship between capex and demographics, and here, only three out of ten sectors meet the criteria. With regards to individual demographic variables, per capita revenue is significant but negative in relationship to transportation and community development only. Population is not significantly related with any sector. Literature supports the fact that population growth must be matched with relative capital expenditure growth. This is no where observed in this study.

Number of households is significantly and negatively related with capex of electrification, transportation, health, social development, and community development. Looking at the infrastructural sectors, rural electrification, water resources/supply, environment/ sewage /drainage, and staff housing are ‘number of households’ sensitive. In other words they service households. The results of this study however, show that number of households is not significantly related with any of these except electrification and sadly in a negative direction. This development is not tallying with the norms of literature findings. Population is positively and significantly related with capex of electrification, transportation, health, social development, community development, and staff housing. It is in fact relating positively with all sector capital expenditures. This a notable finding which projects population density as more significantly related density with sector capex than any other demographic variable.

With regards to individual demographic variables, per capita revenue is significant but negative in relationship to transportation and community development only. Population is not significantly related with any sector. Number of households is significantly but negatively related with capex of electrification, transportation, health, social development, and community development. Population density is positively and significantly related with capex of electrification, transportation, health, social development, community development, and staff housing. It is in fact relating positively with all sector capital expenditures. Population density is more significantly related with sector capex than any other demographic variable.

Table 13: Demographics on Community Development Capex

Results	Community Development				
	Per Capita Revenue	Population Density	Number of Households	Population	Combined Demographics
t-stat	-2.897	3.896	-2.937	-0.465	F-stat = 5.383
p-value	0.015	0.002	0.014	0.652	p-value = 0.016
Adjusted R^2					Adjusted R^2 = 0.484
Remarks	Sig.	Sig.	Sig.	Not Sig.	Significant
Hypothesis Decision	Reject $H2_9$	Reject $H3_9$	Reject $H4_9$	Accept $H5_9$	Reject $H1_9$

Table 14: Demographics on Staff Housing Capex

Results	Staff Housing				
	Per Capita Revenue	Population Density	Number of Households	Population	Combined Demographics
t-stat	-2.095	2.281	-1.675	-0.521	F-stat = 2.102
p-value	0.060	0.043	0.122	0.613	p-value = 0.158
Adjusted R^2					Adjusted R^2 = 0.191
Remarks	Not Sig.	Sig.	Not Sig.	Not Sig.	Not Significant
Hypothesis Decision	Accept $H2_{10}$	Reject $H3_{10}$	Accept $H4_{10}$	Accept $H5_{10}$	Accept $H1_{10}$

VI. CONCLUSION

Across infrastructural sectors, there is a significant and positive demographic effect (excepting population) on disaggregate capital expenditure of Rural electrification, Transportation (roads and bridges), and Community development infrastructural sectors only. Thus this study concludes that capital investments of the said infrastructural sectors are the ones sensitive to the LGAs' demographic demands. With regards to individual demographic variables, population density is a prominent influencer of capital expenditure especially to electrification, transportation, health, social development, community development, and staff housing, yet positively related to all other sector capex. Per capita revenue and number of households are in negative direction to capital expenditure of some sectors (electrification, transportation, health, social development, and community development for number of households; transportation and community development for per capita revenue). Top priority is given by government to transportation and least priority to agriculture and rural development in the area of capital investments.

VII. RECOMMENDATIONS

1. At the LGA's infrastructural sectors level, though noted that there is significant and positive demographic effect (excepting population) on disaggregate capital expenditure of Rural electrification, Transportation (roads and bridges), and Community development infrastructural sectors, government should endeavour to spread the gesture to possibly all other infrastructural sectors.
2. Any relationship of number of households with capital expenditure is always negative in Rivers state LGAs. But number of households as a factor is a major player to capital investments on rural electrification, water resources/supply, sewage and drainage, and housing. It is therefore recommended that the local government, as a matter of concern, should consider the value of number of households as a demographic variable that determine their capital expenditures.
3. Capital expenditures to health and agriculture/rural development are the least. This is disturbing as the sectors cater for health and food respectively, being major survival needs of citizens. The local government should therefore build up their capital expenditures in these sectors.

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