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Demographic Transition and Economic Growth in Nigeria

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Abstract

The transition to sustainable growth is a major concern for developing countries, and this transformation coexists with the demographic transition, as the evolution of the age structure poses a new challenge for poor countries. Nigeria has struggled with high fertility and mortality rates causing a high ratio of children to the adult population. Thus, the demographic transition issue has been of great concern in Nigeria. This paper examines the causality between birth rate, death rate, fertility and economic growth in Nigeria. The study found that demographic transition indicators, such as birth rate and death rate, were found to have significant positive and negative effects on economic growth. Fertility rate was found to have a non-significant positive effect on economic growth. More so, there was an absence of causal effects between fertility rate, birth rate, death rate and economic growth. The paper concludes that government must increase investment in health, education and infrastructural facilities to boost human capacity de-

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velopment for demographic transition to impact positively on economic growth in Nigeria.

Keywords: Birth rate, Death rate, Fertility rate, Economic growth

INTRODUCTION

The demographic transition involves the shift from negligible population growth characterized by high birth and death rates to one of low growth caused by low birth and death rates. Historically, the industrial revolution brought exceptional economic growth to Western Europe and North America with a new era in population dynamics (Galor, 2005). According to the United Nations Department of Economic and Social Affairs, (2015), Nigeria is the most populous country in Africa and the eighth most populous country in the world, with 182 million inhabitants. In 2015, Nigeria accounted for 5% of births globally (and one-fifth of all births on the African continent). It is also projected that by 2050 one in every ten children worldwide will be born in Nigeria (UNICEF, 2014). This indicates a significant increase in both the absolute number of births and children in Nigeria (Kennedy, 2016). Bloom et.al. (2015) argued that Nigeria's dwindling economic growth was in part due to demographic situations. World Bank (2014) further claimed that Nigeria has struggled with high fertility and mortality rates, since 1960, causing a high ratio of children to the adult population. Thus, fertility rate has remained higher in Nigeria than in other countries both in sub-Saharan Africa and the World (Bloom, 2015).

Fertility rate, crude birth rate and crude death rate are expected to decrease over the years in Nigeria given the proposition of demographic transition theory. Thus, Bloom (2015) submitted that the share of working-age people in the population is expected to reasonably rise from now until 2050 when there will be about 1.4% working-age individuals for every non-working age individual. These "extra" adults will drive significant economic growth in Nigeria if productively employed (World Bank, 2014). However, the capability of this opportunity to produce a demographic dividend depends on changes in other factors that have hindered Nigeria's economic growth in the past. Nigeria's institutions, comprising rule of law, government capabilities, corporate ethics, civil liberties and

interaction between public goals and private actions, are ordinary when compared with other African countries and poor when compared with countries in other regions (Nigeria: The Next Generation, 2010). With Nigeria's population expected to grow to 262 million by 2030 and 398 million by 2050 on current trends, the question is will the changes in demographic indicators, such as birth rate and death rate, impact positively on the Nigerian economic growth. Thus, this paper examines the causality between birth rate, death rate, fertility and economic growth in Nigeria. The rest of the paper comprises four sections. Section two covers the review of literature, while section three contains the theoretical framework and methodology. Section four contains results and discussion of results, while section five dwells on the conclusion.

Literature Review

A demographic rebellion began in the late 18th century in Europe and spread to the rest of the world in the 19th and 20th centuries (Fargues, 2011). Generally, the demographic transition is a natural process that results from changing population characteristics and involves four main stages. The first phase is characterised by both high birth and death rates (particularly among children) in pre-industrial society. During the pre-transition period, mortality rates started to decline slightly as a result of improvements in health, nutrition and medical expertise, which is also known as the mortality transition. Gradually, there ensued improved food production and sanitation, enhanced health and life spans, resulting in a lower death rate amidst a high birth rate. This characterised the second stage of the transition. Also, a positive relationship began to emerge between wealth and reproductive success, which promoted population momentum. The third phase is the late transition period and is indicated by lower fertility rates, leading to a plunge in the rate of population growth. Finally, after a period of time, both death and birth rates balance at truncated stages, resulting in little or no population growth (Snopkowski-Kaplan, 2018). An important transition in the economic history of countries occurs when they move from a period of low prosperity, high child mortality and high fertility rate to a state of high prosperity, low child mortality and low fertility rate. Most developed countries have completed this transition and have

low birth rates, while many developing countries are still in the transition process.

Demographic transition provides a window of opportunity for the implementation of development-oriented government policies, thus, expected to provide opportunities for development and economic gains. During the transition, population, growth and changes in the age structure of the population are inevitable (Ingle and Suryawanshi, 2011). The debate on the relationship between population growth and economic growth followed from the critics of the theory of Malthus in the 18th century, while economists have often focused on the size of the population and the growth of nation, the composition of population age structure has not been considered under most of the studies (Coale and Hoover, 1958). However, demographers, such as Bloom (1998), have studied the type of composition of the age structure of population and its effect on economic growth and these efforts brought about the concept of "demographic dividend". According to Isiugo-Abanihe (2009), a distinct explanation of these phenomenal changes, as well as the large changes among world regions, stemmed from the demographic transition theory, which was built on the experience of currently developed societies. Hence, the effects of changes in demographic transition are highly germane to developing countries, including Nigeria.

An important measure of economic performance is the real GDP per capita. The Nigerian real GDP per capita has not significantly changed over the years compared to her peer countries like Indonesia and Pakistan. In 1980, Nigeria's real GDP per capita was slightly higher than that of Indonesia and Pakistan. Since then, Nigeria's economic growth has been stagnant, while Pakistan, and especially Indonesia, has grown considerably. Indonesia's income per person is now roughly twice that of Nigeria. This drag on the Nigerian economy has been partly attributed to her demographic status. Since independence, Nigeria has struggled with high fertility rates and high mortality, resulting in a high ratio of children in the population. Fertility rates began to decline slowly in the 1980s and Nigeria's fertility rate still remains high in sub-Saharan Africa as a whole and is more than twice the world average. The burden of all these on society is re-

flected in the ratio of the working-age to the non-working age population which has declined since independence. With 0–14 accounting for about 43.7% and 65+ making up about 3%, this implies that only about 1.2 working-age people are available to care for Nigeria's children.

Studies have contributed to the analysis of the relationship between demographic and economic variables using time series as well as cross-sectional data. Researchers have empirically examined the causal relationship between demographic and economic variables. Rostow (1990) used cross-section data from seventy-six countries and found that birth and death rates were negatively correlated with per capita GNP. Hondroyiannis and Papapetrou (2002), using annual data for the period 1960 to 1998 for nine European countries (Germany, France, Italy, United Kingdom, Spain, Ireland, Netherlands, Finland and Sweden), showed that in low mortality economies (industrial) reductions in infant mortality would decrease fertility. In another study, Hondroyiannis and Papapetrou (2003) statistically estimated the link between the fertility choice, infant mortality rate, marriage decision, real wage and per capita output for Greece for the period 1960-1998. The authors found that a decrease in infant mortality rate caused a reduction in fertility rates in the long run, taking into account economic performance and the labour market. The results of Vector Error-Correction Models (VECM) and impulse response function show that fertility changes should be considered endogenous to infant mortality, the labour market and the growth process.

Basu and Basu (2014) considered the prospects of a demographic dividend in Africa in the near future. While acknowledging that fertility declines which change population age structures and thus dependency ratios have been slow to begin, they argued that there were many underlying features of Africa that might speed up the process. These features have to do with some of the preconditions under which fertility fell in other parts of the world, such as economic development, social modernization, mortality decline and a rise in 'natural' fertility. They also include the fact that the global world is now interested in and proactively working towards investments in voluntary family planning. However, Ewomazino and Akanji (2015), on demographic transition and rural development in Nigeria, draw-

ing from the lessons of countries that have transformed from underdevelopment to developed nations, argued that demographic dividend can be harnessed for the development of rural areas in transitional countries like Nigeria. The authors questioned whether population growth cannot be a blessing to growth for the rural areas. The argument led to numerous suggestions and attempts at population control and huge budgetary spending, neglecting positive aspects of population size, particularly in the period of demographic transition, and stressing that growth in population size, especially during certain periods, cannot promote development. It was submitted that, in order to tackle the pervasive poverty in Nigeria, the utilization of the rural population for the supply of economic goods and services for the overall development of the country should be embraced.

Bloom, et.al (2015) quantified the potential for economic growth created by Nigeria's demographic transition. Using a cross-country economic growth model, the study first estimated the size of the demographic dividend Nigeria could enjoy under suitable conditions. Then, using an original analysis of the economic life-cycle of Nigeria's population, the study explored the conditions needed to realize the dividend, focusing particularly on labour productivity and investments in health and education. The study concluded with a policy discussion on the challenges Nigeria must overcome to realize its full potential for economic growth. Bloom and Jocelyn (2015) argued that Nigeria's potential demographic dividend could raise per capita incomes by 30% or more by 2030, increase the size of the economy to 3 times today's size, and lift around 32 million people out of poverty by 2030. Also, Olaniyan, Soyibo, and Lawanson (2012), in their study of demographic transition, demographic dividend and economic growth in Nigeria, identified and simulated the period of the potential window of opportunity or demographic dividends created by Nigeria's demographic transition. Their results revealed that Nigeria entered the window of opportunity in 2003 and will last beyond 2050. The authors noted that Nigeria needs to embark on strategies that will develop her human capital and position herself towards capturing demographic dividends. Adewole (2012) on the effect of population on economic development in Nigeria discovered that population growth has a positive and significant impact on the real gross domestic product (RGDP) and per

capita income. Olayiwola, Bakare-Aremu Abiodun (2021) likewise alluded to a favourable causation between certain population characteristics and economic growth. They also indicated that the rate of changes in population size, the level of fertility and mortality significantly interact with the social and economic welfare of the people. Therefore, literature had and is still investigating the effects of demographic transition on economic growth, and this argument still remains unsettled.

Theoretical Framework and Methodology

Thompson's (1929) and Notestein's (1945) theories of the transition outline different stages in a society's transformation from a higher to a lower level of mortality and fertility (Loschky and Wilcox, 1974). For instance, Thompson (1929) showed the different types of changes that occur in population rates. However, Thompson's (1929) article had a little wider impact because his idea was assumed to be politically influenced and more applicable in the United States. Notestein (1945) established a more formal structure for the theory of demographic transition (Friedlander, Okun and Segal, 1999). But this does not also have a deep impact in the developing countries. Therefore, this study is based on the demographic dividend hypothesis. The demographic dividend hypothesis assumed the demographic dividend operates through a number of mechanisms, such as labour supply, savings and human capital (Singh, 2016). Each country was assumed to go through the different phases of the demographic transition, and the third phase occurs when a country is approaching a low fertility and mortality rate, while the size of the working masses is increasing (Joe, Kumar and Rajpal, 2018). During this transition period, when a country welcomes a large proportion of young people owing to a rapid decline in fertility and mortality in the development process, there will be a low dependency ratio and the older age group of the workforce has the ability to improve the country's economic prosperity (Misra, 2015).

The share of the population between the ages of 0 and 14 years in this period falls to 30%, while the proportion of senior citizens (60 years and over) drops to less than 15% (Narayana, 2018). This means that the working-age population being the larger share can influence the nation's social and financial growth (Bloom, Canning and Sevilla, 2003). For in-

stance, per capita income increased by more than 6% between 1960 and 1995 in East Asia, as the region was able to take the advantage of the opportunity (Fang, 2016; Sengupta, 2015). The demographic bonus is distributed via several mechanisms. The demographic shift affects the supply of labour in two main ways. First, there is a basic automatic effect that results from the steady ageing of the baby boom cohort (Bloom et al., 2009; Bloom et al., 2012; Bloom, Canning and Sevilla, 2003). When this peer group is between the ages of 15 and 64, they are more likely to be working, which reduces the dependency ratio of the non-dependent population. Second, due to smaller family sizes, the likelihood of women participating in the labour market and obtaining an education will increase, since they will be less occupied with household chores. The demographic transition also helps to increase the growth of savings, which ultimately improves the investment and growth of a country. For instance, young people and the elderly consume more than they produce, whereas the active age population contributes more to economic output and savings (Bloom et al., 2009; Bloom et al., 2012; Bloom, Canning and Sevilla, 2003). The evolution of the age structure generates an environment in which people are inclined to invest in their personal needs and in their children's well-being and education. This yields significant economic paybacks. Thus, the relationship between GDP and demographic transition can be stated as follows:

Equation (1) states that the growth rate of the gross domestic Product (GDPgr) as a proxy for economic growth depends on population growth rate (POPgr), the dependency ratio (DPr), the life expectancy (Life) death rate (Dtr), the fertility rate (FERtr), the Birth rate (Btr) and the ratio of female to male labour participation (% of the working population (RFml). This can be explicitly stated as:

$$GDPgr_t = \beta_0 + \beta_1 POPgr + \beta_2 DPr + \beta_3 Life + \beta_4 Dtr + \beta_5 FERtr + \beta_6 Btr + \beta_7 RFml + \varepsilon_t \quad --(2)$$

The *a priori* expectations are that $\hat{a}_1$, $\hat{a}_3$, $\hat{a}_5$, $\hat{a}_6$ and $\hat{a}_7$ 0 while, $\hat{a}_2$ and $\hat{a}_4$ 0

3.1 Data and Estimation Technique

The data for the study is a time-series data covering a period of 40 years (1980 – 2019). The data were obtained from the World Bank Data repository. Unit root test was first employed to test the stability of the data using the Augmented Dickey Fuller (ADF) test. Granger causality test was then used for the causality between variables of interest. Table 1 and Table 2 show description of variables and their descriptive statistics.

Table 1: Description of Variables

Variables	Description	Measurement
GDPgr	Gross domestic product growth rate	Annual %
POPgr	Population growth rate	Annual %
FERtr	Fertility rate	(Birth per Woman)
Btr	Birth rate	(Birth per 1,000 people)
Life	Life expectancy rate	Life expectancy at Birth
DPr	Dependency ratio	Dependents as % of total working population
Dtr	Death rate	(Death per 1000 people)
RFml	Ratio Female to Male Labour Participation	% of total working population

Table 2 shows the descriptive statistics of the data. The mean growth rate of GDP between 1980 and 2019 was approximately 3.20. The average growth of birth rate was approximately 0.43, while the average growth of death rate was 0.17. The dependency ratio was averaged 0.89; the population growth rate averaged 0.26, and the fertility rate averaged 0.06

Table 2: Descriptive Statistics of the Variables Used in the Study

	GDPgr	POPgr	FERtr	Btr	Life	DPr	Dtr	RFml
Mean	3.20	0.26	0.06	0.43	3.87	0.89	0.17	0.76
Median	4.21	0.03	0.061	0.43	3.83	0.88	0.18	0.76
Maximum	15.33	0.03	0.07	0.47	3.99	0.93	0.19	0.85
Minimum	-13.13	0.03	0.06	0.38	3.81	0.87	0.12	0.70
Std. Dev.	5.47	0.00	0.00	0.02	0.06	0.02	0.03	0.05
Observations	40	40	40	40	40	40	40	40

Results and Discussion

The result of the unit root test is shown in Table 3. The result indicates that DPr, GDPgr and RFml are non-stationary at level, while other variables

are stationary at level. However, DPr, GDPgr and RFml are stationary at first difference.

Table 3: Result of Unit Root Test

Variable	Variable at Level form		Variable at First Difference		Order of Integration
	ADF Statistics	5% Critical value	ADF Statistics	5% Critical Value	
Btr	-4.052171**	-3.568379	-2.470739	-3.540328	I(0)
DPr	-0.664487	-3.557759	-6.388548**	-3.540328	I(1)
Dtr	-4.106820**	-3.557759	1.653121	-3.544284	I(0)
FERtr	-3.442640**	-3.562882	-2.525903	-3.544284	I(0)
GDPgr	-3.007200	-3.540328	-11.58146	-3.536601	I(1)
POPgr	-6.770966**	-3.568379	-1.857526	-3.574244	I(0)
RFml	-1.651779	-3.536601	-5.705683**	-3.536601	I(1)
Life	-4.106361**	-3.557759	0.009777	-3.536601	I(0)

Table 4 below shows the absence of serial correlation in the data. The null hypothesis of no serial correlation was accepted since the probability value of F-statistics is greater than 0.05.

Table 4: Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.793202	Prob. F(3,22)	0.5080
Obs*R- squared	3.054833	Prob. Chi-Square(3)	0.3832

Table 5 shows the absence of heteroskedasticity. The null hypothesis for the heteroskedasticity test is that homoscedasticity should be rejected when the probability value of F-statistics is less than 0.05. From the result, the probability value is greater than 0.05, hence, homoscedasticity exists.

Table 5: Breusch-Pagan- Godfrey Heteroskesdasticity Test

F-statistic	0.824301	Prob. F(19,25)	0.5749
Obs*R-squared	6.120030	Prob. Chi-Square(19)	0.5258
Scaled explained SS	5.537903	Prob. Chi-Square(19)	0.5946

Figure 1 shows that the plots of CUSUM and CUSUMSQ fall within the upper and lower limits (5% critical bound); therefore, it can be concluded that the model used in the analyses is stable.

Figure 1: Plot of Cumulative Sum of Squares of Recursive Residuals of the Model

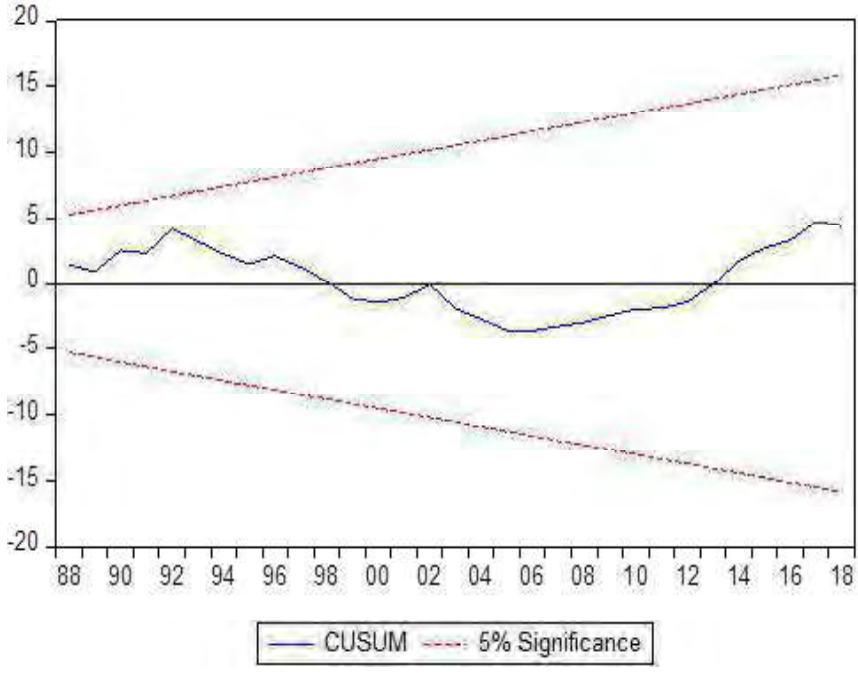

Table 6 shows the results of the effects of demographic variables on the economic growth in Nigeria using the Autoregressive Distribute Lag Model. Population growth rate (POPgr) has a positive but non-significant effect on economic growth in Nigeria. This implied that changes in the total population may not significantly impact economic growth. This may be as a result of the current stage of demographic transition and the nature of labour available in Nigeria. Also, the adverse effect of many infectious diseases ravaging Nigeria may be part of the explanation for this (Fuein, Olayiwola and Aloysius, 2019). Some of these labour are unskilled and are not innovative to generate new ideas. The Fertility rate (FERtr) also

has a positive and non-significant effect on the economic growth in Nigeria. Birth rate (Btr) was positively significant at 1% level. This implies that an increase in the birth rate will increase the growth of the economy. Life expectancy (Life) and the ratio of female to male labour participation (RFml) have a positive and significant effect on economic growth in Nigeria. The dependency ratio (DPr) and death rate both have a negative effect on economic growth, but only the death rate is significant at the 10% level. These results agree with previous studies like Basu and Basu (2014) and Adewole (2012).

Table 6: ARDL Result of Demographic Transition and Economic Growth

DEPENDENT VARIABLE: GDPgr			
Variables	Coefficient	Standard Error	Prob
C	2.27*	6.39	0.004
POPgr	3.80	9.92	0.850
FERtr	9.01	4.16	0.111
Btr	-8.43*	5.99	0.002
Life	-3.82*	9.82	0.001
DPr	-0.41	1.64	0.804
Dtr	-0.05***	1.59	0.006
RFml	0.53	1.33	0.695
R-squared = 0.6272		Adjusted R -squared = 0.5402	
Durbin-Watson stat = 1.9721		F -statistic = 7.21	
Prob Value = 0.0000		Number o fobs = 40	

*, **, *** indicates 1%, 5% and 10% significance levels

The main focus of this study is on the causal relationship between Birth rate (Btr) and economic growth, death rate (Dtr) and economic growth, and fertility rate and economic growth. The null hypothesis of the causality test states that Btr does not Granger-cause GDPgr, and GDPgr does not Granger-cause Btr; also that Dtr does not granger-cause GDPgr, and GDPgr does not granger cause Dtr; finally FERtr does not granger-cause GDPgr, and GDPgr does not granger cause FERtr. The probability of the F-statistic must be less than 0.05 to show any causal relationship. From Table 7, the probabilities for the tested variables, the growth rate of gross domestic product (GDPgr) and birth rate are 0.2150 and 0.4720 which show the absence of any causal relationship between the growth rate of Gross Domestic Product (GDPgr) and birth rate. Also, the probabilities

for the growth rate of gross domestic product and death rate are 0.2333 and 0.4449, which show absence of bi-directional relationship between the growth rate of gross domestic product and death rate. The probabilities of the growth rate of gross domestic product and fertility rate are 0.1977 and 0.3160, which also indicates the absence of any bi-directional relationship between the growth rate of gross domestic product and fertility rate. The results show clear indications of the absence of any causal relationship between economic growth, birth rate and fertility rate. The explanation for this may be found in the low level of investment in human capacity development given inadequate government commitment to education and health sectors in Nigeria.

Table 7: Causality Among Birth rate, Death rate, Fertility rate and Economic growth in Nigeria

Pairwise Granger Causality Tests
Sample: 1980 2019 Lags: 3

Null Hypothesis	Obs	F-Statistic	Prob.
DPr does not Granger Cause Btr		4.60636	0.0094
Btr does not Granger Cause DPr	37	5.37719	0.0046
POPgr does not Granger Cause Btr		1.29365	0.2953
Btr does not Granger Cause POPgr	37	6.68027	0.0014
GDPgr does not Granger Cause Btr		1.58218	0.2150
Btr does not Granger Cause GDPgr	37	0.86179	0.4720
FERtr does not Granger Cause DPr		4.42144	0.0112
DPr does not Granger Cause FERtr	37	2.82751	0.0559
GDPgr does not Granger Cause Dpr		1.48707	0.2387
DPr does not Granger Cause GDPgr	37	0.92835	0.4395
Life does not Granger Cause DPr		1.86857	0.1570
DPr does not Granger Cause Life	37	0.26877	0.8474
POPgr does not Granger Cause DPr		1.00973	0.4026
DPr does not Granger Cause POPgr	37	7.97725	0.0005
GDPgr does not Granger Cause Dtr		1.50815	0.2333
Dtr does not Granger Cause GDPgr	37	0.91692	0.4449
Life does not Granger Cause Dtr		6.22421	0.0021
Dtr does not Granger Cause Life	37	6.20366	0.0022
Life does not Granger Cause Dtr		6.22421	0.0021
Dtr does not Granger Cause Life	37	6.20366	0.0022
POPgr does not Granger Cause Dtr		1.18300	0.3334
Dtr does not Granger Cause POPgr	37	11.9461	0.0003
GDPgr does not Granger Cause FERtr		1.65862	0.1977
FERtr does not Granger Cause GDPgr	37	1.23177	0.3160
Life does not Granger Cause FERtr		0.10513	0.9564
FERtr does not Granger Cause Life	37	0.53694	0.6607
POPgr does not Granger Cause FERtr		1.04647	0.3869
FERtr does not Granger Cause POPgr	37	9.61652	0.0001
POPgr does not Granger Cause Life		1.33943	0.2808
Life does not Granger Cause POPgr	37	11.6271	0.0004

Conclusion

This study examined the effects of changes in demographic variables termed demographic transition on economic growth in Nigeria. It is found that demographic transition indicators, such as birth rate and death rate, have significant positive and negative effects on economic growth respectively. The fertility rate has a non-significant positive effect on economic growth. The absence of causal effects between fertility rate, birth rate, death rate and economic growth was further found. This is the important finding of this study, and this requires a deliberate positive response from the policymakers. Therefore, the government needs to focus on the key challenges of investing in basic public infrastructure, including health and education, to boost human capacity development for demographic transition to be favourable to Nigeria's economic growth and development. Demographic transition will impact positively on growth given adequate investment in human capital development.

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