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The effect of population pressure on the International Wealth Index within different sub-regions in Nigeria

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Abstract

The fast rising population owing to the persistently high total fertility rates in Nigeria has posed significant challenges on the country, including a notable increase in poverty rates. This thesis examines the correlates of population pressure on the welfare level in Nigeria on sub-national level, allowing for an analysis between urban/rural areas. Data is retrieved from the Global Data Lab (GDL) that collects cross-sectional survey data on health and demographic indicators, which was used to test the interrelatedness by method of multivariate statistical analysis. The measurement of population pressure is based on fertility and population characteristics. The variables that demonstrate a positive and significant correlation with the probability of having a higher welfare are: age at first marriage and age at first birth in both urban and rural areas. The variables that demonstrate a negative and significant correlation with the probability of having a higher welfare are: total fertility rates and urbanisation rate solely in densely populated regions, and total area population in all regions.

1 Introduction

1.1 Problem analysis

Effective population control measures cannot be emphasised enough, particularly in countries such as Nigeria that face immense population pressure. In recent times, the population in Nigeria consisted of 213.4 million, with an average fertility rate of 5.3 children per woman (The World Bank, 2020). In comparison, the total population in 1960 was 46 million; hence, its nickname 'The Giant of Africa'. This dramatic population growth deteriorated socio-economic factors like exhaustion of natural resources, environmental degradation, rising unemployment, and mass poverty. The most important causes of large population expansion in Nigeria include cultural and religious beliefs and the lack of sex and population education (Akanwa et al., 2013). Nigeria has been unable to take advantage of its huge human capital, which could have prospered this country in a productive economy. Instead, Nigeria has grown to be a country of high diversity in poverty and unemployment (Aidi et al., 2016). Even though poverty in Nigeria is largely a rural phenomenon (Anyanwu, 2013), the increased urbanisation does not reflect in the decline in poverty rates as the incidence of poverty rose from 28.1 percent in 1980 to 65.6 percent in 1996 (Odusola, 2018) and 69.0 percent in 2010 (Dapel, 2018).

Various empirical studies have been conducted to examine the relationship between population growth and economic growth. Even though it is believed that a rise in population has positive effects on productivity and therefore economic growth, there are contradictory views and theories of population growth on long and short term economic growth and prosperity (Ogunleye et al., 2018). These theories originated from the Law of Population by Malthus where the population increases faster than the food supply, which would result in exhaustion of natural resources and stunted growth in per capita income (Brue & Grant, 2012). Numerous of studies affirm this paradox; the economic growth and the huge revenues derived from the countries richness in oil and population increment did not yield an improvement in poverty, caused by inter alia jobless growth (Stephen & Simoen, 2013; Oyakhilomen & Zibah, 2014; Dauda, 2017; Aidelunuoghene, 2014). Important findings of Ukpong et al., (2013) indicate a positive relationship between population growth and poverty, but a negative relationship between GDP growth and poverty. Contrastingly, neoclassical growth models like the Solow model depict the necessity for a steady population growth rate to assure stable long-run economic growth

equilibrium. Furthermore, the link between poverty and fertility preferences is broadly missed in literature (Odusola, 2018). The lack of consistent and contradictory results indicates the necessity for complementary research on the effects of the rise in fertility and population characteristics, the poverty level, and its implications and regulations. The distinction between sub-regions is important to determine whether the high fertility rates differ among the regions and to determine the effects of urbanisation on poverty between rural and urban regions.

Most literature acknowledges the positive relationship between population growth and economic growth in the long run. However, the relationship is not so evident or even adverse in the short run as well as per capita income (Alimi et al., 2021). Total population considers a wide variety of aspects, with the central element being the fertility rate. Given that the high fertility levels are the main driver of the increasing population in Nigeria, and is still a relatively unexplored area, conducting further research is crucial to draw any conclusions regarding this potential link to poverty. The long existing debate on whether a lower fertility could raise a countries' welfare remains unanswered: one party claims that higher fertility is necessary for economic development as children justify as a source of wealth and contribute to the labour force; others claim that reduced fertility is necessary for achieving other development goals and argue that the high birth rates result to a large number of children relative to a small productive population; while another party believes fertility does not affect economic prosperity directly (Ashraf et al., 2013; Wusu & Amoo, 2016).

1.2 Research question and methodology

Considering the increasing pressure on Nigeria's population and economy, it is necessary to expand literature on this matter. This study therefore investigates the effect of population pressure in different sub-regions on the poverty level -measured by the International Wealth Index- in Nigeria. The research question *"What is the effect of population pressure on the International Wealth Index within different sub-regions in Nigeria?"* will be based on a multivariate regression model and is investigated empirically. All country-specific data from Nigeria on a sub-national level is retrieved from the Global Data Lab and the model employs fertility, population, and poverty characteristics. To justify the effects of the increased population in the urban areas on the changing poverty level, the effects of urbanisation on the International Wealth Index will also be examined.

1.3 Contribution to existing literature

This study will contribute to the rather general approach of many previous studies. Unlike many studies, this study specifically focuses more on the fertility rate rather than the population growth rate; fertility is the central element of population growth and depends almost entirely on social, economic, political, cultural and psychological frameworks (Ibrahim & Arulogun, 2020). Yet, it is important to note that fertility is just one component of population dynamics. Therefore, to fully understand population pressure, it is necessary to consider and analyse other relevant factors as well. Furthermore, contemporary literature focuses largely on the effects on economic growth, which, of course, is extremely important to analyse the overall welfare of the country itself. Nonetheless, this does not automatically imply that the welfare per capita is improved. On the contrary; poverty rates have increased significantly over time despite the increased economy. Population pressure is not only evident in the country itself, but also manifests in major cities. Although urbanisation commonly is seen as an important driver of economic development, it can also increase poverty, inequality, and create health issues as soon as the country cannot facilitate enough housing or social amenities in and around the cities (Aliyu & Amadu, 2017). For that reason, urbanisation might not be a good development after all. Hence, it is critical to understand the fundamental factors behind the rising poverty levels in Nigeria, considering the significant role that population pressure may play in this regard.

This research aims to give a broader understanding in the causes of population pressure and to induce other researchers to further investigate in this area. A broader understanding can be helpful for policymakers, the Nigerian government, marketers, and financial and economic advisors that seek for a more nuanced picture of the socio-economic problems in Nigeria. Policymakers can develop targeted interventions that address those problems, like effective family planning measures and increased education on contraceptives to reduce the number of births. Society in turn can benefit from the policy changes the government decides to implement.

2 Literature review

2.1 Population history and fertility perspectives

The seriousness of the population pressure in Nigeria is indisputable. Currently, Nigeria is the 7th most populated country in the world and, according to 2050 forecasts, the country will rise with a rapid pace to the 4th most populated country globally (United Nations, 2022). The country has one of the highest fertility rates and is decreasing only slightly over time. People living in the Northern region and rural areas are considered the poorest; particularly, Yobe, Sokoto, Zamfora, Kebbi, Jigiwa, and Bauchi (GDL, 2018). Striking is that those sub-regions also have relatively high fertility rates (Figure 1, right).

As indicated in the introduction, debate remains on whether fertility behaviour has an effect on the wealth status; 1) one party believes there is a positive effect, 2) the other believes there is a negative effect, and 3) the last argues that no significant relationship exists between the two variables. The nature of the correlation between the two is relatively obscure, leading to limited consideration in Nigeria's policy-making endeavours (Wusu & Amoo, 2016). Rather, it is easier to lay the focus on direct micro-determinants of poverty such as healthcare and educational programs (Abdullahi, 2019; Olofin et al., 2015). Despite its practicable effectiveness, experts say economic growth must remain steady and population growth controlled in order to improve long-

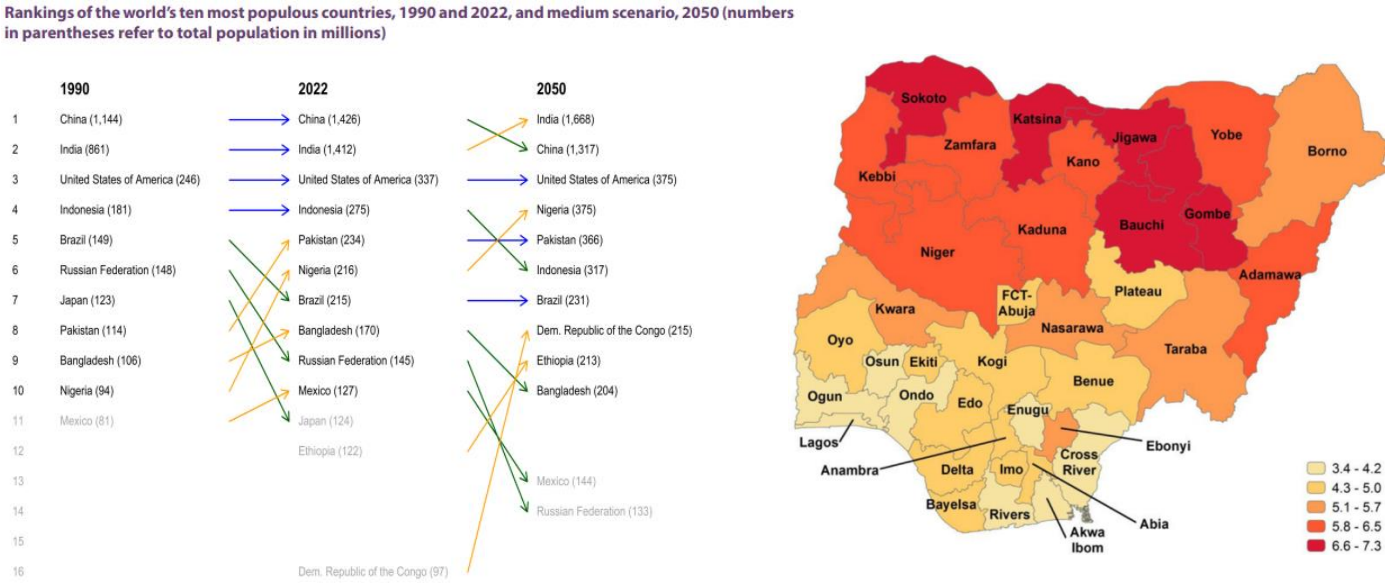


FIGURE 1: *LEFT*: MOST POPULOUS COUNTRIES (UNITED NATIONS, 2022); *RIGHT*: FERTILITY RATE PER SUB-REGION (DHS, 2018)

term wealth conditions (Obiezu, 2019). Even though the underlying theory remains controversial, the predominance of studies support the second proposition that high fertility rates have negative effects on the economic growth and wealth status (Wusu & Amoo, 2016; Dao, 2004; Bongaarts et al., 2012). Ashraf et al. (2013), for example, found a significant rise in output per capita and productivity when lowering fertility rates further compared to its baseline reduction of fertility. This means that, according to their analysis, lowering the population growth, facilitated by a lowering of the fertility rates, would increase income per capita by 5.6 percent. Based on the elasticity of poverty rates with respect to average income, which is around two, they estimated the reduction of the poverty rate by 7.5 percent. The only complication however, they say, is that income per capita is not the single or best welfare criterion. Because of the interrelatedness between socio-economic, political and cultural factors, and fertility and wealth, making inferences becomes more complicated.

Even though numerous studies found no significant relationships at all, limited studies are adherent to the first proposition, dismissive to the Malthusian theorem. Notable is that numerous of studies found a positive relationship between population growth and economic wealth, not necessarily fertility rates. Lee (2009) for example, argues that population growth would accelerate technological progress, and would lead to better communication, transportation, and economies of scale, but acknowledges a negative relationship between fertility rates and wealth is the predominant thought in contemporary literature. Furthermore, various studies found that population growth increases economic growth, which is indirectly related to people's welfare (Ogunleye et al., 2018). Still, Ogunleye et al. (2018) found a significant negative relationship of fertility on economic growth. They emphasise on channelling the increasing population towards regions where they can be effectively utilised to generate a significant boost in the country's economic growth.

Across geopolitical regions of the country, there is a pervasive lack of access to health & healthcare, education, and adequate living standards. Sulaimon (2020) discovered significant variations in multidimensional poverty in the sub-regions of Nigeria, especially between the south and the north and between most sub-regions in the north. Results of his study show that these sub-regions experience an enormous rise in this multidimensional poor population as soon as fertility rates increase. This means that possible correlations may differ significantly across sub-regions, calling for a discrete analysis.

2.1.1 Another perspective

Stepping away from per capita income, Nigeria has the largest economy of the African continent, accounting for $440.8 billion (The World Bank, 2021). Solow's representation suggests that the economy's long-term growth rate is contingent on the pace of population growth and technological progress, thereby demonstrating that population growth is a mandatory development. Jones (2020) considers the situation with a negative population growth compelled by low fertility rates, resulting in a so-called 'Empty Planet'. While the population falls at a constant rate, living standards and the stock of knowledge simultaneously stagnate. Considering that this situation is far from the current situation in Nigeria, it is important to acknowledge this alternative standpoint. The Malthusian fear that emerged in the late 90's in countries like Taiwan, Japan, and South Korea has now turned 180 degrees in the opposite direction after fertility rates have declined significantly in the meantime. Fertility rates in these countries have dropped below the required rate to maintain a stable population, creating the danger for a deregulated economy in the long run. Developed countries in Europe and America are also at risk for this development, since fertility rates are gradually declining below this necessary threshold. Urbanisation can further induce the incentive to have viewer children (Schöttli, 2023).

The concept of the quality of children goes beyond the quantity of children (fertility) as the investment made in children will contribute to their future productivity and welfare. Expenditures like education, health and nutrition, but also postponing childbirth and age at first marriage all help to ensure higher quality of children. Those investments in children have a higher return rate in larger cities compared to rural areas, which encourages parents to have fewer children as they substitute away from quantity to quality children (Becker, 1992). These perspectives suggest that fertility is only one element of population dynamics. The population pressure occurring in Nigeria that increases poverty so drastically must therefore be viewed from different angles.

One important but missing element of population dynamics and population pressure is migration. Besides the internal migration in search for employment in the big cities, Nigeria encounters both many migrants and immigrants. After the large immigrant flow in the 1970's owing to the oil boom, net migration rate stayed slightly negative between 2000 and 2021 (Sasu, 2021). Emigrants are moving to non-African countries preferably to escape the consequences of deteriorated socio-economic conditions and political instability. The emigrants are typically more educated –medium to high skill level- and healthier, seeking for better employment opportunities

and education purposes. The majority of the immigrants (74%), however, are from the neighbouring ECOWAS countries. The skill level of incoming migrants are on average low to medium (Ogwo and Ezekoye, 2020). This occurrence of migrant flow results in a relatively unproductive population sensitive to poverty.

2.2 Urbanisation

Besides the population growth, Nigeria is also encountering rapid demographic changes as society is moving en masse to big cities. The ratio between urban and rural is currently equivalent, but urban dwellers are slowly but surely prevailing (O'Neill, 2023). The dense population in turn entails a great deal of social challenges. This pressuring trend of urbanisation and the dilatory reaction of the government to control and expand land and housing, services, and water management, results in forcing part of the Nigerian society to live in slums, bringing about increasing poverty, crime and inequality (Rouhana & Bruce, 2016; Abubakar & Dano, 2018). The lack of effective governance to guarantee equilibrium between the rising population, infrastructure and the urban environment is the reason why Nigeria has been unable to reap positive benefit from urbanisation; to take advantage from the great potential of clustered industries and economy of scale (Jiboye, 2011; Malumfash & Gambo, 2018). The urban growth rate is 5% higher than the population growth rate because of certain push and pull factors. People are under the impression that cities facilitate better employment opportunities and living conditions, which is considered the "pull" factor of urbanisation; while the population pressure on land resources is considered the "push" factor (Aliyu & Amadu, 2017).

Figure 2 presents a clear increasing trend in the incidence of rural and urban poverty. Even though poverty is a rural phenomenon, both geographical areas' poverty is increasing gradually over time (Aliyu & Amandu, 2017). Whether urbanisation leads to increased poverty therefore remains unanswered. Liddle (2017) states that there is a lack of understanding about

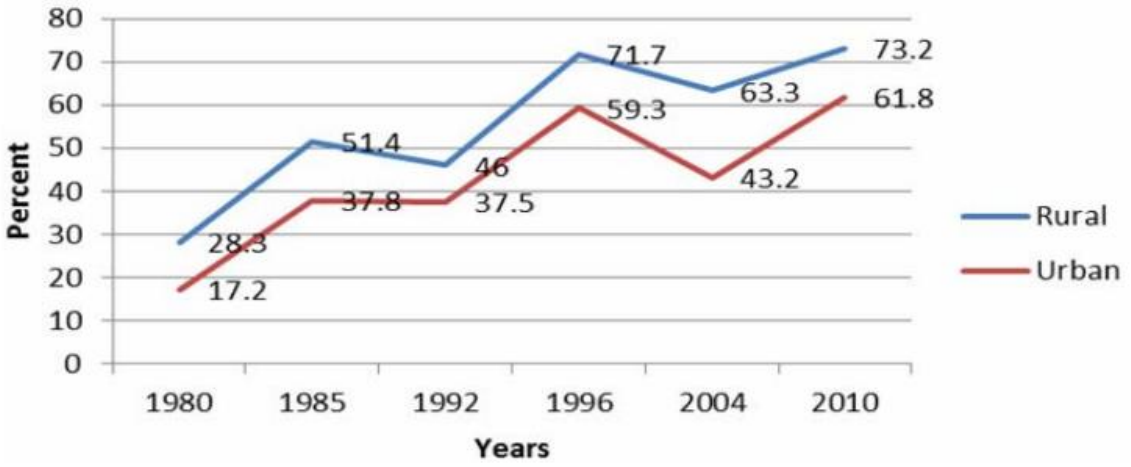


FIGURE 2: POVERTY TREND IN RURAL AND URBAN AREAS (ALIYU & AMADU, 2017)

urbanisation-poverty relationship and other researchers have been struggling to find any significant relationship between the two (Bloom et al., 2008). However, most research has a common consensus that urbanisation is remunerative only when people can be fully utilised, which is obviously not always the case in Nigeria, given that slums are increasing.

Liddle (2017) also states that only rapid and excessive urbanisation can lead to a higher poverty level. Therefore, we must look at the sub-regions that have the highest levels of urban dwellers. Those are situated mostly in the southwest and southeast of Nigeria; particularly, Lagos (97.3%), Anambra (85.3%), Ebonyi (84.2%), Ekiti (81.4%), and Oyo (80.5%), followed by, Enugu (77.8%), Kwara (76.2%), and Osun (75.1%) (Madu, 2009; GDL, 2018). With respect to these sub-regions, only Lagos has had a high urbanisation level from the start of the 21st century. The other sub-regions have made a huge leap forward in the amount of urban dwellers around 2008 and 2013 (GDL, 2018).

2.3 Conceptual framework

For an issue that has been studied for so long, it is remarkable that no consensus in literature of the economic and wealth effect of population pressure has been made. Ashraf et al., (2013) states that the lags of fertility on economic effects are rather long, which makes it difficult to identify the direct effects on poverty levels. Mberu and Reed (2014) claim that despite the fact that the average fertility rate declines slowly over time, some population subgroups still have higher fertility levels, especially Muslim/traditional women living in the northern part of Nigeria with low education levels. The theoretical model established expects a relationship between fertility characteristics and poverty that are both affected by different socio-and economic issues. As fertility preferences between sub-regions in Nigeria are likely to differ among each other, they have to be accounted for.

Below, the conceptual framework is visualised that represent the measurable variables of this study. The core of this study will focus on the relationship between fertility characteristics and poverty rates. The fertility characteristics are measured by the use of three different variables: total fertility rate, age at first marriage, and age at first birth. The poverty level is measured by the International Wealth Index. As stated by Ibrahim & Arulogun (2020), fertility preferences are almost entirely determined by social, economic, political, cultural and psychological frameworks, but the main determinants are education, religion and geographical location (Mberu & Reed, 2014; Odusola, 2018). Poverty rates are also affected by social-economic factors, among others: education, economic infrastructure, and governance. Lastly and more importantly for this study,

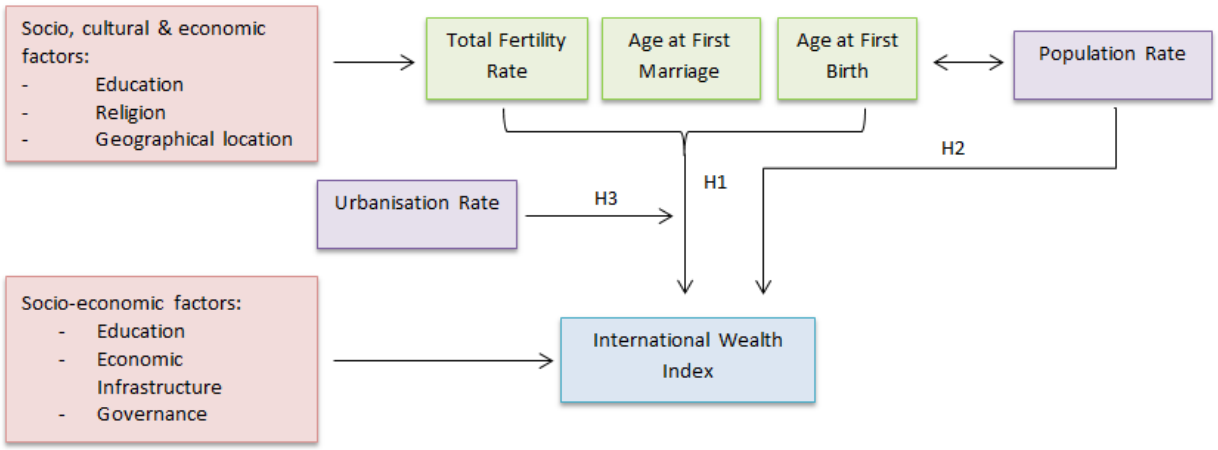


FIGURE 3: CONCEPTUAL FRAMEWORK

population pressure -here measured in fertility, population, and urbanisation rates-, are also important determinants for poverty (Aidelunuoghene, 2014; Nuruddeen & Ibrahim, 2014; Olowa, 2012). These relationships are represented by the arrows pointing to the International Wealth Index. While population rate has a possible effect on the International Wealth Index, it is also interrelated to fertility characteristics. Urbanisation can both affect fertility rates and the International Wealth Index as urban dwellers tend to have fewer children, and can increase poverty rates as housing is put under pressure. Subsequently, cities transform into slums often located on the outskirts of the city and can worsen the distribution of income and equality (Idowu, 2013; Aliyu & Amadu, 2017). Urbanisation rate is presented as a moderating variable.

Based on the above information and existing literature, three hypotheses are formulated:

H1: *Total fertility rates have a negative effect on the International Wealth Index*.

H2: *Total area population has a negative effect on the International Wealth Index.*

H3: *Urbanisation has a negative effect on the International Wealth Index in the densely populated regions of Nigeria*.

To put hypothesis 1 differently, the higher the total fertility rates, the lower the International Wealth Index. Next to that, the higher the age at first marriage and the age at first birth, the higher the International Wealth Index.

To account for other dynamics of population pressure, total area population is also included as a separate possible determinant of poverty and is represented as an extension of the first hypothesis. Hypothesis 2 expects that a higher total area population decreases the International Wealth Index.

Like indicated in the literature review, the relationship between the variables in hypothesis 3 is not so evident. However, urbanisation normally seems like a development with great economic and social advantages, but only with the exclusion of *rapid* and *excessive* urbanisation (Liddle 2017). Regions or cities that are not able to cope with this rapid growth are likely to experience a higher poverty level. Therefore, it is expected that the higher the level of urbanisation in the *densely* populated sub-regions of Nigeria (i.e. Lagos, Anambra, Ebonyi, Ekiti, Oyo), the lower the International Wealth Index. The third hypothesis is represented as an interaction term.

3 Methodology

3.1 Data sources and ethical issues

The panel data is retrieved from the Global Data Lab (GDL) that provides household survey datasets from low- and middle-income countries. For this thesis, data from Nigeria will be used consisting of 37 sub-regions for the years 1996 up until 2021, where all sub-regions are experiencing fertility, population, urbanisation and poverty rates at different levels. As the indicators are based on different survey data on household level, the design, size and structure of the survey itself and the amount of observations differ year to year and even among the variables. Observations are hereafter aggregated on sub-national level. For the reason that this can affect the quality of the indicators and can suffer from random aggregation error, it is appropriate to acknowledge a possible bias (Global Data Lab, n.d.).

All data originated from the Demographic and Health Surveys (DHS) that usually have large sample sizes (in this case ranging from around 8,000 in former years to 40,000 in recent years) and are typically conducted about every five years. Most respondents are women aged 15 to 49; the men are aged 15 to 59 with relatively lesser observations (The DHS Program, n.d). The survey waves include 1999, 2003, 2008, 2013, and 2018; all other years are interpolations between the years and extrapolations at extremes for 3 years. Because the years in between the survey waves are estimations of the values, there is a possibility that these values are not entirely correct. As a result, it may pose problems to the accuracy and credibility of the regression model. To address this concern, a robustness check is carried out for all three hypotheses.

For the reason that DHS is widely known for its high-quality data and its substantial sample sizes, reliable and consistent estimates can be formed. The program has existed for over 50 years and is continuously conducting and improving new surveys, which enables consistent state of the art survey designs and observations. DHS employs stratification at the sub-national level, followed by random selection of allocations within each stratum (DHS, n.d.). This random selection increases external validity. Nonetheless, results are not fully generalizable to the real world as data is constraint to sub-regions in Nigeria which may differ from country-to-country and region-to-region.

The data retrieved is considered balanced panel data: all the cross-sectional data -the 37 sub-regions- have observations in all time dimensions –the 26 years-, in total making up for 37*26 =

962 observations. It is important to note however, that observations are aggregated from household to sub-region level, which makes the panel data not entirely balanced and less reliable. All dependent, independent and control variables that are used in this study are schematically visualised in the table at the end of this section.

3.2 Variables

3.2.1 The Dependent Variable

The dependent variable is the International Wealth Index (IWI), which is an asset-based yardstick that measures the economic performance of societies with regard to wealth, inequality and poverty (Global Data Lab, n.d.). The IWI is meant to account for the poverty levels based on a scale from 0 to 100, where 0 represents households with no assets and poor housing quality and therefore have a high poverty level, and where 100 represents households with all assets and highest housing quality and therefore have a low poverty level. An IWI value under 70 is considered poor, an IWI value under 50 is considered poorer and an IWI value under 35 is considered poorest (Global Data Lab, n.d.).

The International Wealth Index is selected as a poverty/wealth indicator because it is the first simplified scale measurement that is comparable among surveys. Furthermore, the yardstick includes representable consumer durables (e.g. car, tv), public services (i.e. water and electricity) and housing characteristics (i.e. number of rooms, floor quality and toilet facility) with different IWI weights attached. This index therefore reflects the multidimensional characteristics of wealth, which is the reason why only one dependent variable is sufficient.

3.2.2 The Independent Variables

As indicated in the theoretical framework, the independent variables of this study are: the *total fertility rate*, the *age at first marriage*, and the *age at first birth* to measure fertility characteristics, *total area population*, and the *urbanisation rate* to measure other dynamics of population pressure. The total fertility rate is measured in three years before the survey in the sub-regions per woman. The variable 'age at first marriage' –the mean age at first marriage of women- is used as an alternative to the total fertility rates, as it indicates how women develop and make decisions over time. Namely, it is widely known that women who marry relatively early in life also tend to have a substantial higher fertility rate (Sagalova et al., 2021). Moreover, Walker

(2012) states that, countries where women marry at an early age, also encounter high poverty rates and high population growth rates. Lastly, the variable 'age at first birth'-the mean age at first birth of women- is also used as an alternative to measure fertility in Nigeria. There is a consensus that the more youthful a woman is at the time of her first childbirth, the more children she will have. Among others, Tomkinson (2019) and Marini (1981) found a strong negative relationship between the age of first birth and fertility rates.

This study focuses mostly on the fertility characteristics rather than population in general by reason that fertility is the major driver of population growth (Ibrahim & Arulogun, 2020). Fertility only accounts for the birth rate per woman, whereas population growth also includes mortality rates, migrations and ageing. Total area population (in millions) is included to compare and analyse the results of the two independent variables in relation to the IWI. This evaluation aims to determine whether birth rates are directly affecting poverty levels, or if there are more complex interactions at play. Urbanisation rate is considered another aspect of population pressure. It is selected as an independent variable to test the third hypothesis. Urbanisation rate in this study accounts for the population living in urban areas in the region in percentage. Attention will be focused solely on densely populated sub-regions to assess the potential for increased poverty levels. Urbanisation rate is often used in various studies as the general proxy for understanding the percentage of the population living in urban areas in a given region. The variable is considered a moderating variable between the fertility level and the International Wealth Index as it can strengthen or weaken its relationship. Therefore, this variable has to be included as a control variable in the regression for the first and second hypothesis.

3.2.3 Control variables

There are certain factors that can affect the dependent variable IWI, which can cause correlation issues and irregularities in the results. Therefore, there are several variables that have to be controlled for in this study, which include: *female education 20+*, *education attendance of teens between 18-20 years*, *youth dependency rate* and *infant mortality*. Poverty and fertility preferences are almost entirely determined by social, economic, political, cultural and psychological frameworks (Ibrahim & Arulogun, 2020). To mitigate omitted variable bias and ensure a more accurate analysis, it is crucial to incorporate the key socio-cultural and economic frameworks in the regression model. By doing so, the focus can be specifically on examining the effects of fertility and urbanisation on the International Wealth Index while holding the socio-

economic frameworks constant. Nevertheless, it is important to note that I do not possess all observations of these indicators and are therefore more prone to a bias. The control variables included in this study:

- Urbanisation: Urbanisation is a demographic factor and is related both to poverty and fertility rates. For hypothesis 1 and 2, urbanisation is included as a control variable.
- Female education: Better education has found to be negatively correlated with fertility and poverty rates and is considered a socio-economic factor.
- Education attendance of teens: A better education for teens often indicates greater economic opportunities and therefore a lower poverty rate.
- Youth dependency rate: A high youth dependency rate would mean a higher economic burden for the working-age population, which in turn could influence poverty levels.
- Infant mortality: Because of the lack of healthcare services, infant mortality is often higher in poorer areas (Jahan, 2007). In addition, infant mortality is also related to socio-economic factors.

TABLE 1: VARIABLES DESCRIPTION

Variable	Type	Equation abbreviation	Explanation	Measurement Level
IWI score	dependent	IWI_{it}	Mean International Wealth Index (IWI) score of region (ratio from 0 to 100)	Ratio
Total fertility rate	independent	fer_{it}	Total fertility rate in three years before survey in region (per women)	Ratio
Age at first marriage	independent	mar_{it}	Mean age at first marriage of women aged 20-50 in region	Ratio
Age at first birth	independent	$birth_{it}$	Mean age at first birth of women aged 20-50 in region	Ratio
Total area population	independent	pop_{it}	Total area population (in millions)	Ratio
Urbanisation rate	independent/ control	urb_{it}	Population living in urban areas in region (in percentage)	Ratio
Mean years female education	control		Mean years education of females aged 20+ in region	Ratio
Education attendance teens	control		Percentage of children aged 18-20 that currently attends, or in the current school year attended, school	Ratio
Youth dependency ratio	control		Youth dependency ratio, the young (<15) compared to the working age population (15-64)	Ratio
Infant mortality	control		Number of deaths of children less than one year of age, per 1000 live births in a given year	Ratio

3.2.4 Regression equation

Based on the above information, the following regression equation can be specified. The conditional mean of the International Wealth Index is defined for every sub-region, *i*, at time, *t*:

$$IWI_{it} = \alpha - \beta_1 fer_{it} + \beta_2 mar_{it} + \beta_3 birth_{it} - \beta_4 urb_{it} + \mathrm{X}_{it} + \lambda_i + t_t + \varepsilon_{it}$$

Table 1 indicates the definitions of the equation abbreviations. X_{it} denotes all control variables, λ_i are the region-specific effects, and t_t are the survey-year specific effects that are controlled for. For the second hypothesis, the total fertility rate will be replaced by total area population. Due to the inclusion of an interaction term in the third hypothesis, a distinct dataset will be used. The error term is clustered at a sub-regional level in order to prevent potential correlation and heteroscedasticity within sub-regions. Clustering standard errors on unit level ensures accurate inferences and prevents naïve estimations.

3.3 Design

The *two-way fixed effects model* or the unit and time fixed effects model is used throughout this study and includes fixed effects for both unit and time periods, and is used to control for characteristics that are both time-invariant (unit-specific) and time-varying (time-specific). Time dummies are included to control for unobserved time-specific factors; likewise, sub-region dummies are included to control for unobserved sub-region specific factors. This model is able to deal with unobservable omitted variables due to unobservable heterogeneity and will eliminate the bias having the effect that all explanatory variables are uncorrelated with the error term. A Lagrange Multiplier test has been conducted to determine the need for unit and time specific effects. For hypothesis 3, the fixed effects (within) estimator for each sub-region is used (unit fixed effects). The models will be estimated by the use of the Ordinary Least Square estimator.

After reviewing relevant literature and conducting multiple regression analyses and viewing various plots, it can be concluded that the linear functional form is appropriate for all regressions. Despite the questionable plot of total area population (Appendix 2), the alternative right-side semi-log function yields less conclusive plots and regressions with lower significance and a lower R-squared. For that reason, a linear analysis will be applied for all regressions.

Ashraf et al. (2013) indicate that the lags of fertility on economic effects are rather long. However, as I am not analysing an economic effect, lagged functions will be excluded from the analysis. In fact, including delays of one or two years on fertility rates does not alter the level of significance and even leads to a slight decrease in the R-squared value.

The possibility that an increased wealth situation can lead to a decline in total fertility rates is far from inconceivable (Wusu & Amoo, 2015). According to the Granger Causality test there is bidirectional Granger causality between the two variables, but never a reverse Granger causality. Bidirectional Granger causality was found for total fertility rates, total area population, age at first marriage and age at first birth between the variable International Wealth Index. It should be noted however, that the Granger causation is more evident in the X's on Y than in the Y on the X's. The urbanisation rate only Granger causes the International Wealth Index, and not contrariwise.

4 Results

This section presents the results of the thesis, which aims to analyse the relationship between population pressure and poverty and to identify distinctive attributes or traits associated with these relationships.

4.1 Data inspection

In Table 2 on the left panel, the summary statistic of the total dataset is visualised, including the number of observations -962-, the minimum, the maximum, the mean and standard deviation of all variables used in this study. Notable is that there are some large variations between the minimum and maximum of the variables. This could be a logical consequence of the estimations with respect to the base years 1999, 2003, 2008, 2013, and 2018, where the estimated values could slightly deviate from the actual values. Hence, it needs to be considered that the results are more prone to bias due to the extreme outliers, especially the years before the base year 1999 and after the base year 2018. When looking at the complete dataset, however, there seem no inconsistencies, missing values or further irregularities. The right panel of table 2 presents the mean values of the characteristics with respect to five time frames. Those values indicate an increasing rate in most characteristics that measure welfare, but show decreasing rates in the education attendance of teens as from the year 2012-2021. Furthermore, the data shows increasing levels in total area population and in urbanisation rate. The increasing means of the youth dependency ratio reflect the decrease in the number of people in the workforce.

To put things into perspective, results are compared to developed countries like the Netherlands and the United States. While lacking observations in the DHS or GDL dataset, both the Netherlands and the United States are expected to have an IWI of between 80 and 100; relatively poorer countries in Europe have an IWI mostly higher than 85 (GDL, 2018). However, gini coefficients are not so archetypal; with The Netherlands having an index of 26.0, Nigeria of 35.1, and the United States of 39.7 (The World Bank, 2022). This means that the United States has a relatively higher inequality level. Moreover, The Netherlands and the United States have a fertility rate of 1.55 and 1.67, respectively. Referring back to the paper of Jones (2020), this is below the threshold of 2.1 to compensate for mortality, subsequently risking a stable long run economic growth (OECD, 2023). These low fertility rates and the high fertility rate of 5.15 in

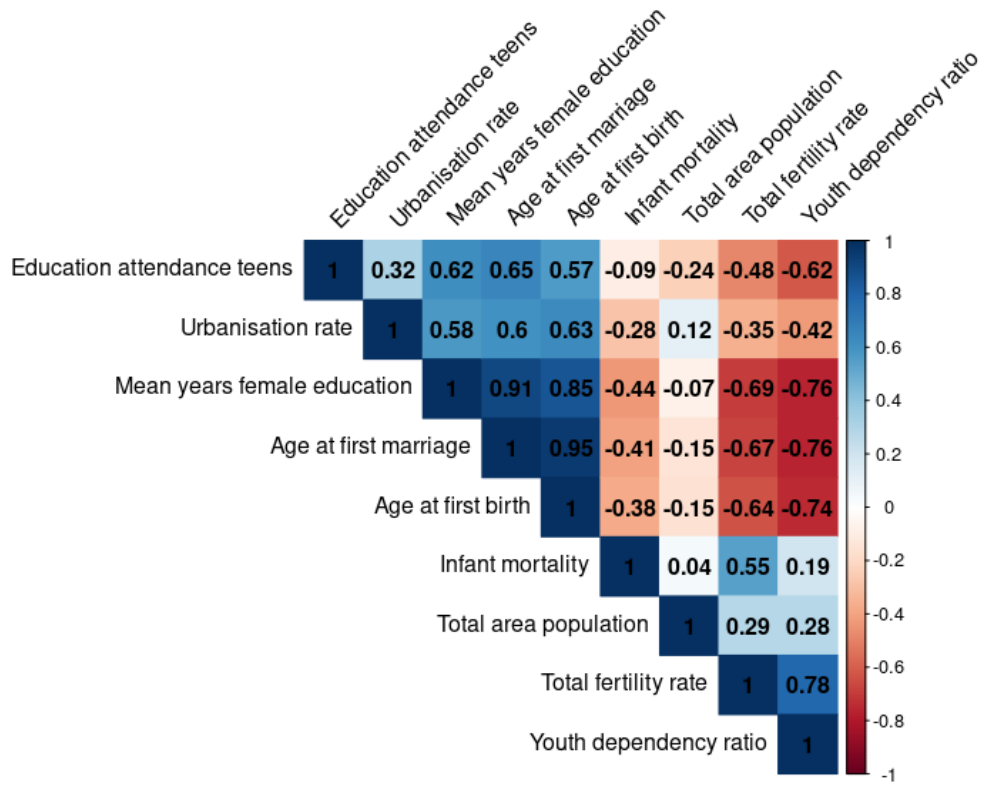
Nigeria are therefore two extremes, both posing consequences on economic and health developments. Mean age at first marriage and mean age at first birth for both The Netherlands and United States were between 30 and 31 years old in recent years. On the one hand, Gündoğdu & Bulut (2022), claim that late marriage enhances economic comfortability and mental health. On the other hand, they emphasise the close relationship between age at first marriage and age at first childbirth; the decrease in their fertile years can cause a decline in the world's population. Urbanisation rate in the Netherlands was 92.9% and in the United States 83.1% in 2022 (World Population Review, 2023). These numbers are very large compared to the mean of 44.27% during the recent years in Nigeria. Despite the fact that The Netherlands and the United States exhibit considerably higher rates of urbanisation, it is noteworthy that Nigeria, among the countries mentioned, is the sole one facing challenges in providing adequate housing and services to its urban residents. Furthermore, it is worth noting that the process of urbanisation has been occurring over an extended period in these developed countries, allowing for adaptability and efficient utilisation of resources. In contrast, Nigeria has experienced rapid urbanisation only in recent years. In comparison, the developed countries have had a yearly urbanisation change of no more than 2% since 1960, whereas Nigeria is experiencing a large annual increase of 4-6% since 1970 (Macro Trends, 2023).

TABLE 2: DESCRIPTIVE STATISTICS

	Overall				1996-2001	2002-2006	2007-2011	2012-2016	2017-2021
	Min	Mean	Max	SD	Mean	Mean	Mean	Mean	Mean
IWI score	1.49	36.46	64.90	11.69	28.89	33.43	35.88	41.55	44.04
Total fertility rate	0.010	5.279	8.670	1.33	4.68	5.63	5.67	5.39	5.15
Age at first marriage	11.70	18.33	29.90	2.39	17.54	17.76	18.35	18.78	19.39
Age at first birth	17.00	19.61	24.90	1.63	19.14	19.18	19.68	19.95	20.20
Urbanisation rate	0.00	35.62	100.00	22.49	26.90	34.03	33.80	40.85	44.27
Total area population	0.01	4.21	15.10	2.42	3.18	3.67	4.18	4.78	5.42
Mean years female education	0.010	5.023	11.700	2.78	4.04	4.25	4.92	5.68	6.43
Education attendance teens	0.00	37.07	81.80	17.12	34.28	41.83	41.18	35.75	32.85
Youth dependency ratio	35.60	86.86	127.00	17.82	87.45	82.93	87.61	87.60	88.60
Infant mortality	0.00	74.36	191.00	32.20	65.29	97.62	82.55	69.67	58.50
Observations			962		222	185	185	185	185

The correlations in the table below indicate the strength of the relationship between the independent and control variables. To prevent the problem of multicollinearity, the independent variables must not correlate significantly with each other. Using the Rule Of Thumb of an absolute value of 0.8, variables that exceed this absolute value are highly correlated and should be prudently handled in the regressions. This is the case for the variables: *age at first marriage*, *age at first birth* and *mean years of female education*.

TABLE 3: CORRELATION TABLE



Pointed out by Studenmund (2016), a treatment of multicollinearity is not preferable, but should only be considered when the consequences cause insignificant t-scores or unreliable estimated coefficients. While running the regressions, the variable mean years of female education caused exactly that. Therefore, the decision has been made to exclude this variable from the regressions that caused the estimated coefficients to change dramatically. The education effect will be captured by the variable education attendance teens. It should be noted however, that excluding this important variable could cause a specification bias. To account for the high correlation between the independent variables age at first marriage and age at first birth, separate analyses have been conducted and compared.

4.2 Regression Models

A naïve simple linear regression model -while not accounting for unit and time specific effects- gives a clear indication of the direction of the independent variables on the International Wealth Index. Taking the independent variables separately into account, *total fertility rate* gives a significant negative effect. Both the independent variables *age at first birth* and *age at first marriage* give a significant positive effect, all including very strong coefficients. To analyse the independent variable *urbanisation rate*, a dataset with only the densely urbanised sub-regions Lagos, Anambra, Ebonyi, Ekiti, and Oyo is used. Subsequently, this leads to a positive significant effect in the simple regression. Plots of the observations of the separate regressions can be found in the appendix.

TABLE 4: SIMPLE LINEAR REGRESSION

	International Wealth Index			
Total fertility rate	-3.990***			
	(0.000)			
Age at first marriage		3.720***		
		(-0.000)		
Age at first birth			5.380***	
			(-0.000)	
Urbanisation rate				0.395***
				(-0.000)
Observations	962	962	962	962
Adjusted R squared	0.204	0.576	0.561	0.500

Notes: *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level. *Source:* Author calculations.

Even though the naïve simple regression model is useful for the ease and simplicity of interpreting the model, it is ingenuous. Furthermore, the standard errors of 0.000 also indicate an identification problem implying that this model is not the correct model to use. The Lagrange Multiplier Test is therefore applied, and concludes the need for both unit and time fixed effects. Throughout the thesis, the benchmark of a P-value of <0.05 (**) is applied to examine the level of significance. As all hypotheses need to be treated as one-sided hypothesis tests, the P-values can be divided by two before making any inferences.

4.2.1 Hypothesis 1

The main results for the first hypothesis are presented in Table 5. For the first and second hypothesis, urbanisation rate is included as a control variable. All estimations in this table are based on the two-way fixed effects model. The left panel (1) considers the estimated coefficients by using the interpolated and extrapolated dataset. As indicated before, the mean year of female education has been left out of the regressions as it resulted in unreliable estimated coefficients. It should also be noted that removing the control variable mean years female education from the regression significantly lowers the adjusted R^2, most likely because education is considered an important socio-economic determinant of poverty. Still, the control variable education attendance of teens is included to capture the education effect.

The correlation of total fertility rate that seemed so evident in the simple regression model is not the case in this model. The unit and time specific fixed effects take away a significant level of this relationship between this independent variable and IWI, the dependent variable. In fact, it is now positive, though insignificant. However, age at first marriage in fact does give a significant positive coefficient, indicating that a rise of one unit in age at first marriage increases the International Wealth Index by 0.752 units. In other words, a woman marrying one year later in comparison to other women, has on average an International Wealth Index that is 0.752 higher, and thus, a higher welfare. Next to that, age at first birth also gives a significant positive effect; indicating that a woman receiving her first child one year later compared to other women, on average, her International Wealth Index is 1.210 units higher. Because age at first marriage and age at first birth are also highly correlated with each other, separate regressions have been made excluding one of them at a time. Noteworthy is the change in the strength of the coefficient estimates of the remaining independent variables (not shown in the table). Age at first marriage hereby changes to a remarkably stronger coefficient (1.460***) with a standard error (0.079), whereas age at first birth also changes to a strong positive coefficient (1.770***) with a standard error (0.045). The high standard errors of the total fertility rate do not show any significant effect regardless of the removed multicollinear variables. Like indicated by Walker (2012) and Otoo-Oyortey & Pobi (2003) countries where women marry at an early age, also encounter high poverty rates. With these strong results, we can confirm this concord in existing literature. In fact, increasing age at first marriage by two standard deviations increases the IWI by 8.556 units.

Likewise, a two standard deviation increase of age at first birth implies an increase of IWI by 5.77 units.

It needs to be considered that a possible bias in the estimates of the interpolated and extrapolated dataset used throughout this thesis is present. Therefore, separate regressions of a dataset only including the survey waves 1999, 2003, 2008, 2013 and 2018 are included and analysed. Because both unit-specific and time-specific effects are needed (in response to the Lagrange Multiplier test), the two-way fixed effects model is applied. The right panel (2) of Table 5 gives the results on the robustness dataset. However, including only 5 out of the 26 years, many observations are eliminated (from 962 to 185), resulting in a shrinking sample size. This causes the adjusted R^2 subsequently dropping downwards. Removing age at first marriage and age at first birth separately from the regression to prevent multicollinearity (not shown in the table), age at first marriage gives a coefficient (1.320***) with a standard error (0.084), and age at first birth gives a coefficient (1.330***) with a standard error (0.193). Results compared to the extended dataset do not differ much; only the coefficients change slightly. Yet, the total fertility rate is now significantly and positively related to the IWI score, contradicting the first hypothesis. Namely, the estimated coefficient indicates that an increase in one unit of total fertility rates increases the International Wealth Index by 1.300 units.

Based on the below coefficient estimations, the null hypothesis H_0: $\beta \geq 0$ of hypothesis 1: "*Total fertility rates have a negative effect on the International Wealth Index*" cannot be rejected. Yet, the null hypotheses of the correlation on age at first marriage and age at first marriage on the IWI can successfully be rejected. The positive sign of the total fertility rate could be the cause of an increasing human capital of the young population that is relatively more productive compared to the older generations. Yet, shown in the descriptive statistics[22], the youth dependency ratio is increasing over time. This means that there are less people in the workforce that can support the dependent population. A logical consequence would be a reduction in per capita income and a higher poverty rate. As there is limited literature available in favour of the positive effects of high fertility rate on the IWI, inferences cannot be made, and a more discrete analysis is needed.

TABLE 5: TWO-WAY FIXED EFFECTS HYPOTHESIS 1

	International Wealth Index	
	(1) Inter & Extrapolated	(2) Robustness
Total fertility rate	0.842	1.300**
	(0.826)	(0.678)
Age at first marriage	0.752***	1.000***
	(0.136)	(0.008)
Age at first birth	1.210***	0.504***
	(0.113)	(0.154)
Urbanisation rate	0.095***	0.095***
	(0.006)	(0.004)
Education attendance teens	0.087***	0.035***
	(0.013)	(0.011)
Youth dependency ratio	-0.042	-0.068***
	(0.032)	(0.020)
Infant mortality	-0.050***	-0.050***
	(0.010)	(0.006)
Observations	962	185
Adjusted R squared	0.215	-0.041
F Statistic	47.300*** (df = 7; 893)	5.690*** (df = 7; 137)

Notes: *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level. *Source:* Author calculations.

4.2.2 Hypothesis 2

Remarkable is when replacing total fertility rate with total area population, the coefficient direction changes negative. This effect is presented in Table 6. Age at first marriage and age at first birth stay relatively the same compared to the previous regressions of hypothesis 1. Again, excluding the highly correlated independent variables once at a time gives stronger coefficients; age at first marriage changes has a coefficient (1.500***) with a standard error (0.002) and age at first birth has a coefficient (1.720***) with a standard error (0.015). Additionally, the remaining values do not change significantly. The coefficient of the total area population of -0.365*** indicates that a one unit increase in total area population (in millions) decreases the International Wealth Index on average by 0.365 units. Or put differently, an increase of two standard deviations of total area population implies a decrease of an average of 1.767 units. The difference between the positive coefficient in total fertility rate and total area population can be the cause of the multidimensional concept of total population. Total population provides an overall demographic picture, encompassing all individuals residing in an area. It takes extra issues like

immigration, emigration, and mortality of *all* individuals into account. As indicated in the literature review, the majority of immigrants from Nigeria predominantly comprise individuals of ECOWAS countries, who tend to have lower skill levels, whereas emigrants are often more educated and highly skilled (Ogwo and Ezekoye, 2020). This occurrence of migrant flow results in a relatively unproductive population sensitive to poverty and could be the reason why the coefficients between total area population and total fertility rates differ so significantly.

The coefficients do not change significantly compared to the robustness dataset including only the survey years, visualised in the second panel (2) of Table 6.

TABLE 6: TWO-WAY FIXED EFFECTS HYPOTHESIS 2

	International Wealth Index	
	(1) Inter & Extrapolated	(2) Robustness
Total area population	-0.365***	-0.251**
	(0.088)	(0.097)
Age at first marriage	0.916***	1.170***
	(0.015)	(0.037)
Age at first birth	1.010***	0.371***
	(0.030)	(0.037)
Urbanisation rate	0.097***	0.097***
	(0.0004)	(0.0004)
Education attendance teens	0.098***	0.040***
	(0.003)	(0.003)
Youth dependency ratio	0.008***	0.008***
	(0.003)	(0.002)
Infant mortality	-0.038***	-0.034***
	(0.0003)	(0.0001)
Observations	962	185
Adjusted R squared	0.214	-0.063
F Statistic	47.100*** (df = 7; 893)	5.170*** (df = 7; 137)

Notes: *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level. *Source:* Author calculations.

To foresee if the results are stronger in densely populated areas, I analysed the regressions comparing the conditional means based on urban regions and rural regions in Table 7. The urban regions are based on the latest survey year 2018, which at least has an urbanisation rate of 75% or higher. These regions include: Lagos, Anambra, Ebonyi, Ekiti, Oyo, Enugu, Kwara, and Osun.

The remaining 29 regions encompass rural areas. Again, based on the Lagrange Multiplier Test, both unit and time fixed effects are needed.

Striking about the results in Table 7 is that total fertility rate comprehends a significant negative sign in the specific urban areas in contrast to the insignificant or positive results of the total dataset. Also, when comparing the urban results with the results from rural areas, although the findings may not be statistically significant, it provides a clear indication of the difference in effects between the two. The negative sign indicates that a higher total fertility rate leads to a lower International Wealth Index in highly urbanised regions. For this urban subsample, when considering the mean fertility rate (4.45), the IWI experiences a decrease of 3.83 units on average. Therefore, it is in line with the first hypothesis, but solely when including the interaction effect of the urbanised regions. Simultaneously, the rural areas give the opposite result. Nonetheless, the latter has a very high standard error resulting in an insignificant estimation. The interrelated nature of population pressure, especially in big cities caused by urbanisation, consequently pressuring infrastructure and social facilities, can justify the clear cut difference between the effects of total fertility rates on poverty levels between urban and rural areas. According to Schöttli, (2023), urbanisation can induce the incentive to have viewer children, most probably because investments in children have a higher return rate in larger cities compared to rural areas (Becker, 1992). Likewise, urban dwellers have better access to birth control contraceptives and residence is likely to increase the costs of raising children, allowing the desire to reduce childbearing (White et al., 2008). Hence, individuals who have a higher number of children often live in slums and experience relatively higher levels of poverty. On the other hand, rural residents have an incentive to have many children because of low residence costs, religious purposes and lack of education (Mberu & Reed, 2014; Odusola, 2018). It is plausible that the decrease in poverty is attributed to the limited high-skilled opportunities available in rural areas, while low-skilled working opportunities are here the main source of wealth. As a result, having more children may generate additional income and contribute to welfare within families and in future perspectives.

The adjusted R^2 is much higher in the regression of the urban areas compared to the rural or total area dataset, meaning that the model in urban areas is a more suited regression to the observed data. Therefore, a larger proportion of the variance in the dependent variable is

explained by the independent variables in the regression model of the urban areas in contrast to the regression model in the rural areas.

Looking at the total area population, the coefficient of urban areas is slightly stronger in the negative direction than the rural areas. However, both are still negative as concluded in Table 6 for the whole dataset. It should also be noted that the negative sign of age at first birth in urban areas changes positively when removing the multicollinear variable age at first marriage from the equation, like established in regressions above. Furthermore, a robustness check is not possible here as it lowers the sample size dramatically.

Referring back to the null hypothesis, H_0: $\beta \geq 0$ of hypothesis 2: "*Total area population has a negative effect on the International Wealth Index*" can successfully be rejected, therefore confirming the significant negative relationship between total area population -in both rural and urban areas- on the International Wealth Index.

TABLE 7: TWO-WAY FIXED EFFECTS URBAN VS RURAL

	International Wealth Index			
	(1) Urban areas		(2) Rural areas	
Total fertility rate	-0.867**		1.150	
	(0.390)		(0.939)	
Total area population		-0.430***		-0.398***
		(0.032)		(0.122)
Age at first marriage	4.290	3.970***	0.309	0.480***
	(3.970)	(0.686)	(0.193)	(0.017)
Age at first birth	-2.020	-1.920**	1.390***	1.170***
	(3.790)	(0.804)	(0.207)	(0.004)
Urbanisation rate	0.117	0.106***	0.151***	0.148***
	(0.077)	(0.006)	(0.003)	(0.001)
Education attendance teens	0.192***	0.198***	0.041***	0.062***
	(0.045)	(0.016)	(0.014)	(0.011)
Youth dependency ratio	0.181	0.133***	-0.067*	-0.002
	(0.128)	(0.031)	(0.053)	(0.005)
Infant mortality	-0.080***	-0.086***	-0.045***	-0.027***
	(0.002)	(0.001)	(0.013)	(0.001)
Observations	208	208	754	754
Adjusted R squared	0.417	0.467	0.215	0.207
F Statistic	31.900*** (df = 7; 168)	31.400*** (df = 7; 168)	38.100*** (df = 7; 693)	36.600*** (df = 7; 693)

Notes: *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level. *Source:* Author calculations.

4.2.3 Hypothesis 3

The third hypothesis: *"Urbanisation has a negative effect on the International Wealth Index in the densely populated regions of Nigeria*", is analysed as an interaction effect by use of a dataset including only the most densely populated sub-regions of Nigeria. The densely populated are specified as sub-regions with an urbanisation rate of 80% and higher in the year 2018, namely: Lagos, Anambra, Ebonyi, Ekiti, and Oyo. These specific regions are the main source of the large annual urbanisation increase of 4-6% (Macro Trends, 2023). This subsample is somewhat smaller than the subsample of urban areas in the previous regression table. The conditional mean is only changed slightly; urbanisation rate now accounts as an independent variable. Furthermore, the control variable mean years of female education is added to the regression as it only affected the multicollineair variables, and not the urbanisation rate. While a P-value of less than 0.05 is the benchmark, the Lagrange Multiplier test concluded a P-value of 0.1 for the need of time fixed effects. Therefore, only unit fixed effects are included in the model.

Table 8 presents the fixed effects (within) estimator for each individual constraint to the five highly urbanised sub-regions. The estimated coefficients in the model capture the average impact of the independent variables on the dependent variable, differencing the unit-specific effects out. The model takes into account individual-specific heterogeneity. The negative sign of the estimated coefficient of urbanisation rate is confirming the second hypothesis, however the coefficient is minor. Considering the mean of an urbanisation rate of 66.8% over the time span of 26 years, there is a reduction of 0.468% in the IWI due to urbanisation. At the average of an urbanisation rate of 86.2% in the time span of the last 5 years (2017 to 2021) in this highly densely populated subsample, there is a reduction in IWI of 0.603% due to urbanisation. Yet, when comparing this model with all regressions above -thus based on the dataset including all sub-regions-, the coefficient is consistently positive and significant. The latter is in line with the universal but unilateral view of urbanisation, that urbanisation reaps positive benefits in economic and social progress. Division of labour and economies of scale enable gains of productivity and innovation (Turok & McGranahan, 2013). Yet, these regressions indicate the effects of too much urbanisation pressure can also cause a decrease in welfare.

Comparing the results of with and without the interaction effect, it can be concluded that there is a significant difference in the effect on the poverty level. Therefore, the null hypothesis H_0: $\beta \geq 0$ of hypothesis 3: "*Urbanisation has a negative effect on the International Wealth Index*

in the dense populated regions of Nigeria" can successfully be rejected. We can therefore confirm that substantial growth of urbanisation can indeed exert pressure on the environment and health and well-being of urban residents (Boadi et al., 2004). Hence, coupled with inadequate infrastructure and suboptimal utilisation of resources (Lidde, 2017), rapid urbanisation can trigger problems such as urban poverty.

TABLE 8: UNIT FIXED EFFECTS HYPOTHESIS 3

	International Wealth Index
Urbanisation rate	-0.007***
	(0.001)
Total fertility rate	0.548***
	(0.008)
Age at first marriage	-11.500***
	(0.022)
Age at first birth	13.400***
	(0.041)
Mean years female education	5.930***
	(0.004)
Education attendance teens	-0.081***
	(0.001)
Youth dependency ratio	-0.106***
	(0.0002)
Infant mortality	0.014***
	(0.0002)
Observations	130
Adjusted R squared	0.962
F Statistic	405.000*** (df = 8; 117)

Notes: *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level. *Source:* Author calculations.

4.3 Limitations

This thesis has potential limitations. First of all, it is important to note that the sample utilised in this study holds sufficient significance for drawing inferences. However, the inclusion of smaller sample sizes that focus solely on specific regions, such as rural or urban areas or the robustness dataset, may compromise the representativeness of the findings. As a result, the coefficients and results cannot be generalised to the entire population. Furthermore, the number of observations on household level and its demographic characteristics, like the man-woman ratio, differs significantly from survey-to-survey year. Even though they were later aggregated to sub-national level, the inconsistencies that persist over the years can introduce potential limitations to the reliability of the estimates. Moreover, it is possible that observations on sub-national level are not evenly distributed; one sub-region may have fewer observations on household level than others.

Besides the limitations regarding the sample size, the conditional means can also be subject to biases. The low R squared from the regressions are results from the incomplete composition of the control variables. The absence of observations about for example healthcare, government policies that are important socio-economic determinants of the IWI can cause specification bias. In addition, the inclusion of the control variable representing the average years of female education has been omitted from the majority of the regression analyses due to the problem of multicollinearity. Incorporating the variable would noticeably increase the R-squared value (indicating a better overall fit), but it would primarily disrupt the outcomes of other highly correlated variables, specifically age at first marriage and age at first birth.

Limited access to information regarding the relationship between fertility and poverty resulted in a relatively unilateral perspective and formation of the first hypothesis. In this case, a two-tailed alternative hypothesis would have been more appropriate.

5 Conclusion

Economists and demographers have engaged in a continuous debate regarding the extent to which decreasing fertility rates in a developing nation would lead to a higher welfare level. The lack of consensus on the matter brings about the questionable relationships between population pressure dynamics like total fertility, population rates and urbanisation rates on poverty levels in Nigeria. Results from this study confirm a negative relationship between total fertility rates on the IWI in urban areas with an urbanisation rate of over 75%. However, these findings do not hold true for rural areas or the country as a whole. The higher costs of living and higher return rate of quality-children offer plausible explanations of this negative relationship in urban areas. Consequently, a high fertility rate contributes to the expansion of slums and higher poverty rates. Consistent with this position, the findings of this study suggest that uncontrolled and excessive urbanisation, as observed in Nigeria, can lead to higher levels of poverty. Conversely, women who choose to marry at a later stage in life and delay childbirth experience higher levels of well-being. Although the implications of fertility rates in a general perspective still remain unclear, this study consistently observed a negative relationship between the overall area population and the IWI, raising questions about the underlying reasons for this divergence from the patterns observed in fertility rates. Future research should therefore prioritise examining the underlying causes of this disparity and explore whether it is a contributing factor to the influx of unproductive migrants, or if this divergence is caused by other socio-economic factors. Increasing sample sizes together with examining countries who are exhibiting similar phenomena could grasp a better understanding on the interrelatedness of population pressure.

Policy interventions aiming to reduce fertility rates are therefore maybe not the right way to improve welfare among Nigerian residents. Instead, the Nigerian government should concentrate on addressing educational issues due to their strong correlation with poverty. Efforts should be made to reduce the age at first marriage and age at first birth, as well as to alleviate the strain on infrastructure in major cities. It can be inferred that population growth is not inherently detrimental, but has to be controlled in regions where the population cannot effectively be utilised.

REFERENCES

Abdullahi, M. S. (2019). Three things Nigeria must do to end extreme poverty. Online available at: https://www.weforum.org/agenda/2019/03/90-million-nigerians-live-in-extreme-poverty-here-are-3-ways-to-bring-them-out/

Abubakar, I. R., & Dano, U. L. (2018). Socioeconomic challenges and opportunities of urbanisation in Nigeria. Urbanisation and its impact on socio-economic growth in developing regions, 219-240.

Aidelunuoghene, O. S. (2014). The paradox of poverty in Nigeria: What an irony. *Research journal of Finance and Accounting*, 5(4), 116-122.

Aidi, H. O., Emecheta, C., & Ngwudiobu, I. M. (2016). Population dynamics and economic growth in Nigeria. *Journal of Economics and Sustainable Development*, 7(15).

Akanwa, P. C., Anyanwu, E. U., & Ossai-Onah, O. V. (2013). Population control in Nigeria: Implications for librarians. *POPULATION*, *9*, 30-2013.

Alimi, O. Y., Fagbohun, A. C., & Abubakar, M. (2021). Is population an asset or a liability to Nigeria's economic growth? Evidence from FM-OLS and ARDL approach to cointegration. *Future Business Journal*, 7(1), 1-12.

Aliyu, A. A., & Amadu, L. (2017). Urbanisation, cities, and health: the challenges to Nigeria–a review. Annals of African medicine, 16(4), 149.

Anyanwu, J. C. (2013). The correlates of poverty in Nigeria and policy implications. *African Journal of Economic and Sustainable Development*, 2(1), 23-52.

Ashraf, Q. H., Weil, D. N., & Wilde, J. (2013). The effect of fertility reduction on economic growth. *Population and development review*, 39(1), 97-130.

Becker, G. S. (1992). Fertility and the economy. Journal of Population Economics, 5(3), 185-201.

Bloom, D. E., Canning, D., & Fink, G. (2008). Urbanisation and the wealth of nations. Science, 319(5864), 772-775.

Boadi, K., Kuitunen, M., Raheem, K., & Hanninen, K. (2005). Urbanisation without development: environmental and health implications in African cities. Environment, Development and Sustainability, 7, 465-500.

Bongaarts, J., Cleland, J. C., Townsend, J., Bertrand, J. T., & Gupta, M. D. (2012). Family planning programs for the 21st century: rationale and design.

Brue, S., & Grant, R. G. (2012). *The evolution of economic thought*. Cengage learning.

Dao, M. Q. (2004). Rural poverty in developing countries: an empirical analysis. Journal of Economic Studies, 31(6), 500-508.

Dapel, Z. (2018). Poverty in Nigeria: Understanding and Bridging the Divide between North and South. Online available at: https://www.cgdev.org/blog/poverty-nigeria-understanding-and-bridging-divide-between-north-and-south

Dauda, R. S. (2017). Poverty and economic growth in Nigeria: Issues and policies. *Journal of Poverty*, 21(1), 61-79.

Gündoğdu, A. and Bulut, S. (2022) The Positive and Negative Effects of Late Marriage. Open Journal of Depression, 11, 63-71.

Ibrahim, F. M., & Arulogun, O. S. (2020). Posterity and population growth: fertility intention among a cohort of Nigerian adolescents. *Journal of Population Research*, 37, 25-52.

Idowu, O. O. (2013). Challenges of urbanisation and urban growth in Nigeria. *American Journal of Sustainable Cities and Society*, 2(1), 79-94.

Jahan, S. (2008). Poverty and infant mortality in the Eastern Mediterranean region: a meta-analysis. Journal of Epidemiology & Community Health, 62(8), 745-751.

Jiboye, A. D. (2011). Urbanisation challenges and housing delivery in Nigeria: The need for an effective Policy framework for Sustainable Development. *International Review of Social Sciences and Humanities*, 2(1), 176-185.

Jones, C. I. (2022). The end of economic growth? Unintended consequences of a declining population. American Economic Review, 112(11), 3489-3527.

Lee, R. (2009). New perspectives on population growth and economic development. Paper presented at the IUSSP 2009 conference in Marrakech, September 27–October 2, 2009.

Liddle, B. (2017). Urbanisation and inequality/poverty. Urban Science, 1(4), 35.

Macro Trends (2023). Nigeria Urban Population 1960-2023. Available at: https://www.macrotrends.net/countries/NGA/nigeria/urban-population

Madu, I. A. (2009). The environmental impacts of regional disparity in population and wealth distribution in Nigeria. Environment, development and sustainability, 11, 265-276.

Malumfash, A. H., & Gambo, S. L. (2018). Urbanisation and Economic Growth in Nigeria: An Application of ARDL Bounds Testing Approach. *UMYUK Journal of Economics and Development*, 1(1), 37-46.

Marini, M. M. (1981). Effects of the Timing of Marriage and First Birth on Fertility. Journal of

Marriage and Family, 43(1), 27–46.

Mberu, B. U., & Reed, H. E. (2014). Understanding subgroup fertility differentials in Nigeria. *Population review*, 53(2), 23-46.

Nuruddeen, T., & Ibrahim, S. S. (2014). An empirical study on the relationship between poverty, inequality and economic growth in Nigeria. *Journal of Economics and Sustainable Development*, 5(26), 20-24.

O'Neill, A. (2023). Nigeria: Urbanization from 2011 to 2021. Available at: Nigeria - urbanization 2011-2021 | Statista

Obiezu, T. (2019). Nigerian Authorities to Alleviate Millions From Extreme Poverty. Online available at: https://www.voanews.com/a/africa_nigerian-authorities-alleviate-millions-extreme-poverty/6177764.html

Odusola, A. (2018). Poverty and fertility dynamics in Nigeria: a micro evidence. *SSRN Electronic Journal*.

OECD (2023). Fertility rates (indicator). Available at: Demography - Fertility rates - OECD Data

Ogunleye, O. O., Owolabi, O. A., & Mubarak, M. (2018). Population growth and economic growth in Nigeria: An appraisal. *International Journal of Management, Accounting and Economics*, 5(5), 282-299.

Ogwo, B., & Ezekoye, B. (2020). Country study Potential for skills partnerships on migration in Nigeria.

Olofin, O. P., Adejumo, A. V., & Sanusi, K. A. (2015). Determinants of poverty level in Nigeria. *Journal of Sustainable Development*, 8(1), 235.

Olowa, O. W. (2012). Concept, measurement and causes of poverty: Nigeria in perspective. *American Journal of Economics*, 2(1), 25-36.

Otoo-Oyortey, N., & Pobi, S. (2003). Early marriage and poverty: exploring links and key policy issues. Gender & Development, 11(2), 42-51.

Oyakhilomen, O., & Zibah, R. G. (2014). Agricultural production and economic growth in Nigeria: Implication for rural poverty alleviation. *Quarterly Journal of International Agriculture*, 53(3), 207-223.

Rouhana, S. & Bruce, I. (2016). Urbanisation in Nigeria: Planning for the Unplanned. Online available at: https://blogs.worldbank.org/africacan/urbanisation-in-nigeria-planning-for-the-unplanned#:~:text=Rapid%20urbanisation%20that%20is%20largely,waste%20water%20mana

gement%2C%20among%20others.

Sagalova, V., Nanama, S., Zagre, N. M., & Vollmer, S. (2021). Long-term consequences of early marriage and maternity in West and Central Africa: Wealth, education, and fertility. Journal of Global Health, 11(13004).

Sasu, D. D. (2023) Immigration in Nigeria - statistics & facts. Online available at: https://www.statista.com/topics/7865/immigration-in-nigeria/#topicOverview

Schöttli, U. (2023). The implications of a shrinking Asia. Online available at: https://www.gisreportsonline.com/r/asian-demographic-decline/

Stephen, B. A., & Simoen, I. A. (2013). Does economic growth reduce poverty in Nigeria. *Developing Country Studies*, 3(9), 62-68.

Studenmund, A. H. (2016). *Using Econometrics: A Practical Guide* (7th ed.). Pearson.

Sulaimon, M. D. (2020). Multidimensional poverty and its determinants: Empirical evidence from Nigeria. Munich Personal RePEc Archive, 101842.

The DHS program (n.d.). Survey Summary. Online available at: https://dhsprogram.com/methodology/survey/survey-display-528.cfm

The Global Data Lab (n.d.). International Wealth Index. Online available at: International Wealth Index - Global Data Lab.

The World Bank (2020). DataBank: World Development Indicators. Online Available at: World Development Indicators | DataBank (worldbank.org).

The World Bank (2021). GDP (current US$) - Sub-Saharan Africa. Online available at: GDP (current US$) - Sub-Saharan Africa | Data (worldbank.org)

The World Bank (2022). Gini index. Available at: https://data.worldbank.org/indicator/SI.POV.GINI.

Tomkinson, J. (2019). Age at first birth and subsequent fertility: The case of adolescent mothers in France and England and Wales. Demographic Research, 40(27), 761-798.

Turok, I., & McGranahan, G. (2013). Urbanization and economic growth: the arguments and evidence for Africa and Asia. Environment and urbanization, 25(2), 465-482.

Ukpong, I. G., Ekpebu, I. D., & Ofem, N. I. (2013). Cointegration inferences on issues of poverty and population growth in Nigeria. *Journal of Development and Agricultural Economics*, 5(7), 277-283.

United Nations (2022). World Population Prospects 2022: Summary of Results. UN

DESA/POP/2022/TR/NO. 3.

Walker, J. A. (2012). Early marriage in Africa-trends, harmful effects and interventions. *African journal of reproductive health*, 16(2), 231-240.

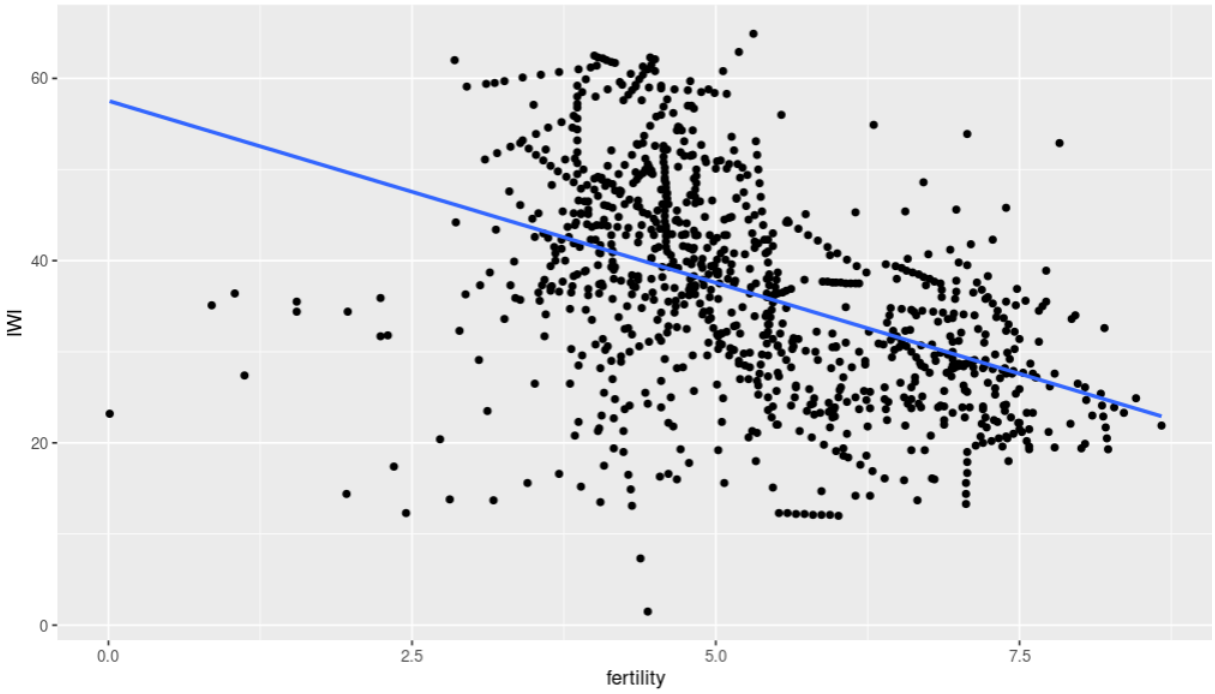
White, M. J., Muhidin, S., Andrzejewski, C., Tagoe, E., Knight, R., & Reed, H. (2008). Urbanization and fertility: An event-history analysis of coastal Ghana. Demography, 45(4), 803-816.

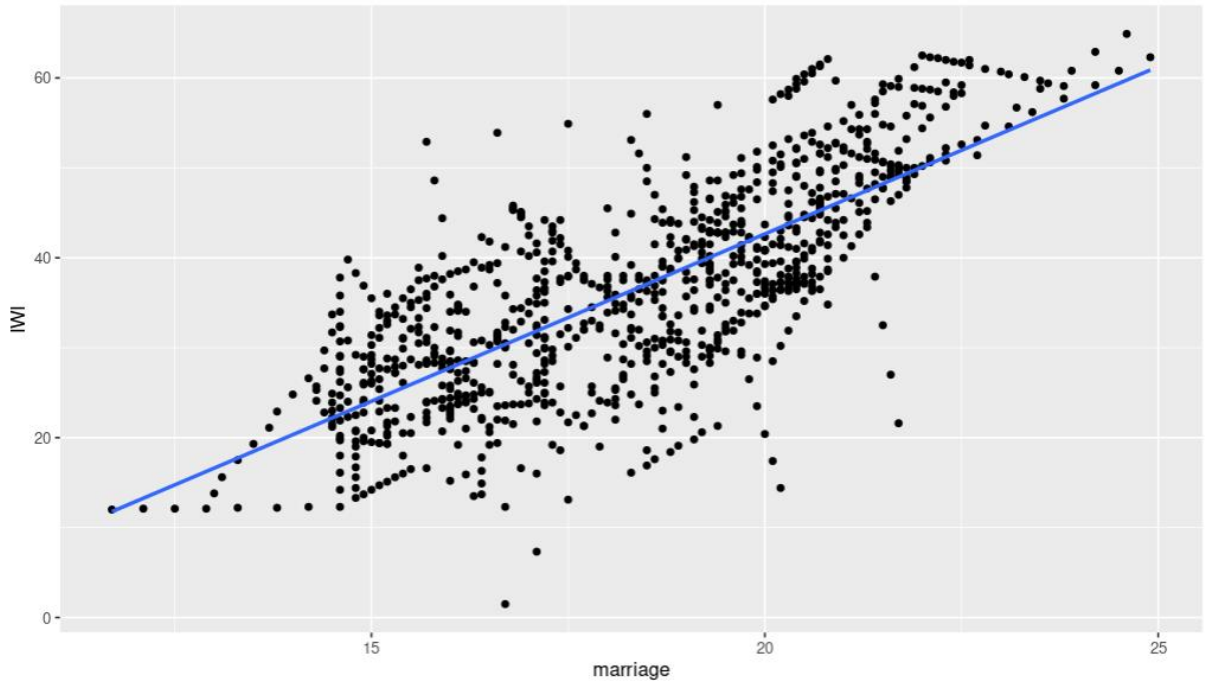
World Population Review (2023) Most Urbanised Countries 2023. Available at: Most Urbanized Countries 2023 (worldpopulationreview.com)

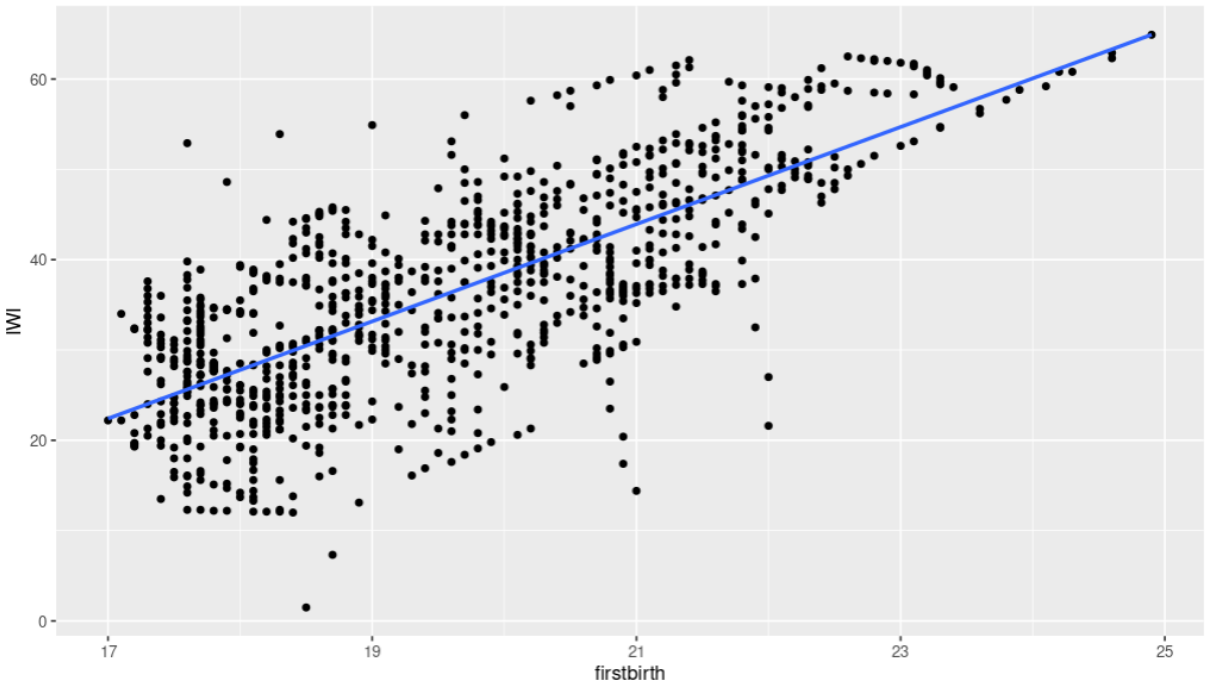
Wusu, O., & Amoo, E. O. (2016). Fertility behaviour and wealth situation in Nigeria: Evidence from 2013 demographic and health survey. Social Indicators Research, 128, 1-14.

APPENDIX

Appendix 1:



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60
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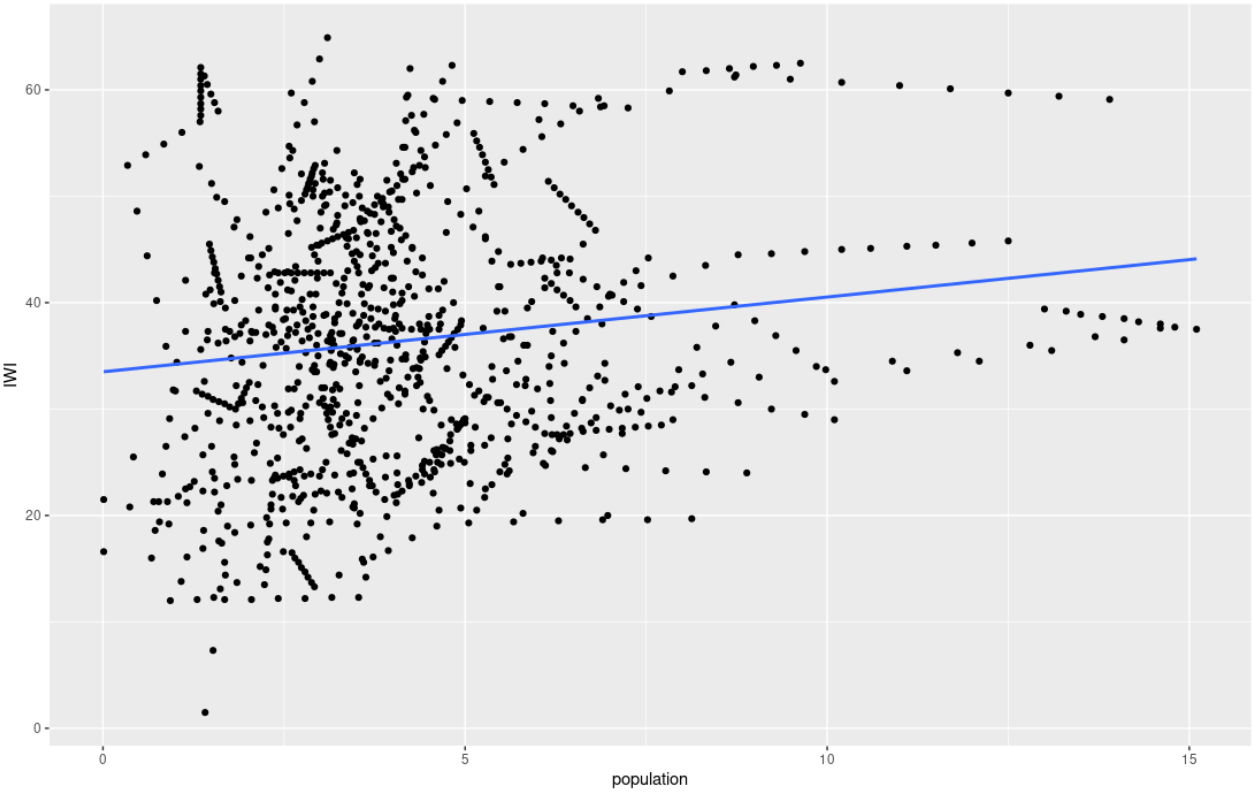
25
firstbirth

Appendix 2:


IWI
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population

Appendix 3: