

The Shifting Distribution of the Global Population in the Twenty-First Century: An Econometric Analysis of the Projected Fortunes of Nigeria and Japan, with Policy Recommendations for Sustainable Development

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Research Questions

My research explored the opportunities and challenges of demographic change facing Nigeria and Japan, addressing the research questions:

- RQ1: To what extent can population growth be harnessed to achieve sustainable economic development? An examination of Nigeria's prospects this century.
 - RQ1a: Which factors are the most significant drivers for Nigeria's population growth?
 - RQ1b: What will be the effects of rapid population growth on the Nigerian economy?
 - RQ1c: What policy recommendations should be adopted in Nigeria to fulfil sustainable economic development objectives?
- RQ2: To what extent is rapid population decline a cause for concern? A time-series forecast of Japan's fate
 - RQ2a: What are the core causal factors for Japan's anticipated population decline?
 - RQ2b: What will be the effect of Japan's population decrease?
 - RQ2c: What policy recommendations should be adopted in Japan to fulfil sustainable economic development objectives?

Introduction

Changes in the size and structure of populations affect virtually all development objectives, including the UN Sustainable Development Goals (SDGs), that are at the top of national and international development agendas. This incorporates, but is not limited to, the impacts on migration patterns (both international and intranational), resource management, labour markets and public policy.

Nigeria (218.5 million) and Japan (125.9 million) are the world's sixth and eleventh most populous countries. However, the two are at opposite stages in their demographic transition. Nigeria is experiencing a 'population explosion' with high fertility rates, whereas Japan has very low birth rates and low, but rising, death rates.

Nigeria needs to harness the 'demographic dividend' of its young population, whilst Japan must limit the many challenges of its ageing population.

The findings from this research have profound policy implications which will apply to other countries. Moreover, the primacy of this research is elevated by the fact that the world is at an unprecedented stage in demographic transition. After many years of exponential population growth, global population growth is predicted to stagnate by 2100.

Nigeria

It is widely expected that Nigeria will become the second most populous country by the end of the century. There are a plethora of factors that may drive this population growth, including: fertility rates, mortality rates, the initial age profile of population, migration, and religion.

Nigeria currently has a young population, with a median age of just 18.1 and 41.7% of the population are below the age of 14. This large proportion of child dependents will transition into working age in the next few decades. Just 3.3% are over 65.

There are significant differences in health outcomes between rural and urban areas (Sofo, Akpajiak, & Pyke, 2003), with an overall average life expectancy under current mortality conditions of 55.

Demographic transition drives urbanisation, and in 2018, for the first time, over half of the population lived in urban area. By 2050, the Nigerian urban population is expected to reach 300 million. Urbanisation in Nigeria, and rural-urban migration in particular, is the culmination of many 'pull' and 'push' factors

Nigeria is a rapidly growing economy, one of the MINT countries identified as the successors to the BRICs, with 3.6% GDP growth in 2021. Growth will continue to be very strong if Nigeria capitalises on the demographic dividend.

In econometric notation, population growth in Nigeria may be modelled in relation to its determinants:

$$\frac{\Delta P_N}{\Delta T} = \beta_0 + P_0(\alpha F - \gamma M) + \theta I + \varepsilon_i$$

$\frac{\Delta P_N}{\Delta T}$ is the population growth rate, P_0 is the initial population, F is the total fertility rate, M is the mortality rate, I is net international migration, β_0 is the intercept parameter and ε_i is the error term. It is possible to find estimates for the values of the intercept and slope parameters, α , γ , and θ , using multivariate regression analysis.

$$F = f(C, Mat_1, D)$$

Fertility rates are influenced by the prevalence of contraception use (C), maternal age at childbearing (Mat_1), and desired family size (D). The economic concept of rationality may be applied to the decision of building a family.

$$U_{Ci} = U_{Ci}[U_C, U_W, U_S]$$

The benefits of an additional child depend on the consumption utility (U_C), the work utility (U_W) and the security utility (U_S).

In Nigeria, mortality rates have fallen by 131% between 1960 and 2020, and infant mortality rates fell by 132% between 1980 and 2000.

As Nigeria's population has grown, education levels have risen. However, chronic poverty rates have been exacerbated in the short-run, along with food insecurity and hunger.

Population growth initially has negative aspects on the environment, before a country progresses along the Environmental Kuznets Curve.

Japan

Japan is the typical example for an ageing society, with a median age of 48.4 today. Following the Second World War, birth rates began to fall much more rapidly, resulting in Japan having the lowest childbearing levels in the world for the time. TFR fell below replacement levels in the late 1950s, falling to 1.5 in the 1990s and falling further to 1.30 in 2005.

Life expectancy, under current mortality conditions, is 80 for men and 86 for women. Yet, Japan's ageing population will only become more intense in the future. The median age of death for Japanese babies born in 2007 is expected to be 107.

Table IV - Oldest age at which at least 50% of a birth cohort is still alive in Japan

Year	Median Age of Death
2000	104
2001	105
2002	105
2003	105
2004	106
2005	106
2006	106
2007	107

Some demographers are concerned that due to demographic inertia, very low fertility rates (*Shoshika*) could be irreversible. Technological advances catalyse changes in the labour market and alter the costs and benefits of marriage and childbearing. This is termed the 'low fertility trap'. In Japan, the effect can be self-fulfilling as there will be both fewer mothers in the future and sociologically the ideal family size for younger generations is declining.

It is generally accepted that as countries become more developed, their TFR falls. (Lesthaeghe, 2010) Yet, there is evidence that the long-standing negative relationship between fertility and development might turn positive at high levels of development. (Fox, Klüsener, & Myrskylä, 2019) The opportunity cost of having children – income from a would-be mother's work – increases when a country becomes more developed. This can lead to the postponement, rather than abstention, of childbearing – 'the income/development-fertility reversal'.

In contrast to Nigeria, intergenerational gaps are larger, with the average Japanese woman having their first child at the age of 30.9. Furthermore, people are getting married at an older age, or not at all. Parents also face increased economic burden and issues with childcare provision. Contraception is also widely used.

Crude death rates have been consistently on the rise since 1979 (11.1 per 1000 people in 2021). With death rates exceeding birth rates, Japan needs migration to maintain the size of its labour force. However in 2020, just 2.76 million (2.29%) of Japan's population were foreign-born. Japan has adopted an isolationist stance on immigration historically, with roots in *Sakoku*.

Public policy and the government's fiscal policy must adapt in response to the rapidly shrinking population. 'Abenomics' involves flexible fiscal policy, monetary easing and structural – particularly labour market – reforms. The challenge is to balance short-term fiscal stimuli with long-term fiscal sustainability. In attempt to boost birth rates, the Japanese government started paying parents the equivalent of \$3400 per year per child they have.

The population decline in Japan has exacerbated inter-generational equity and put pressure on social care schemes and pensions, with some pensioners committing petty crimes to go to prison.

Conclusion

This research has considered the causes of Nigeria's rapid population growth and Japan's opposing fate. Comprehension of these underlying causes helps to analyse the effects of demographic change and identify the manifold problems that need to be addressed, as well as the benefits to capitalise on.

For Nigeria, it has been seen that high fertility rates are the main cause for population growth, driven by very short intergenerational gaps and large families to compensate for high levels of child mortality, as well as the low prevalence of contraceptive use and other social and religious factors. Rapid population growth has exacerbated poverty levels in Nigeria in the short run, as well as harming the environment and making it difficult for Nigeria to meet many of its social foundations.

Conversely for Japan, it has been seen that large intergenerational gaps, on account of high levels of female labour force participation and low desired family sizes, are the main causes of low fertility rates and, by extension, population decline. This has primarily affected labour markets and public policy, with the government pursuing an 'Abenomics' approach to fiscal and monetary policy.



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