

AGEING POPULATION, DOMESTIC INVESTMENT AND ECONOMIC GROWTH IN AFRICA

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Abstract

This study investigates the interaction effect of an ageing population and domestic investment on economic growth using a sample of 28 African economies from 1995 to 2017. The model was estimated using the ordinary least square (OLS) method, panel fixed effects and panel generalized method of moments (GMM). The result shows that the impact of ageing on growth is significantly negative, suggesting that elders' rising population has a declining impact on productivity. However, with the interaction of ageing and investment, the coefficient is positive and significant, indicating that raising domestic investment can help mitigate the adverse effect of ageing on economic

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growth. The study concludes that the government's ageing population poses immense challenges to economic growth in African. African countries can use domestic investment to mitigate the adverse effect of the ageing labour force and thus improve Africa's economic growth. Based on the result, this research recommends that the African Union sustain its regional integration policies to increase Africa's domestic investments.

Keywords: Africa, ageing population, investment, economic growth, labour force participation.

JEL Code: E22; J14; J21; O47;

INTRODUCTION

The world population is experiencing growth in the share and percentage of the elderly due to a combination of rising life expectancy, declining fertility and mortality rates. United Nations (2015) considers a population ageing if the share of those aged 65 and older increases. This implies that countries move towards an older and more stable population structure due to lower fertility rates and longevity. According to the United Nations Department of Economic and Social Affairs (DESA) Population Division (2017), the population of the aged stands at 1 billion, increased from 901 million in 2015 and projected to reach 2.1 billion by 2050; that is more than double its size in 2015. Africa's ageing population expects to accelerate between 2010 and 2030, as more people reach 65. Although Africa currently has the youngest age population of any region, with projections of rapid ageing in the future. Adamchak (1989) posit that African's elderly population expects an increase by 93% from 2000 to 2020, far more than the 76% increase in the region's total population. Hence, societies will have to deal with the effects of a surge in the numbers of the elderly in Africa. One necessary consequence of an ageing population is the shift in the demographic dependency ratio¹. Adamchak (1989) opined that the working-age population's share relative to the non-working age popula-

tion would be shrinking with economic stagnation, increase in health expenditures, and social support problems to this age group. This situation is most worrisome because African countries continuously struggle to raise GDP and become industrialized. Hence, the need to be concerned about the ageing population in developing countries, particularly in Africa.

Population-growth nexus can be better examined by looking into demographic aspects of the population, and this explains why recent studies explore how economic growth is affected by the labour force (Chen, Hsu & Lai, 2016; Maestas, Mullen, & Powell, 2016) and even how it is affected by ageing population (Van Der Gaaj & De Beer, 2015; Ehrlich & Yin, 2013). However, the direction of the effect of growth implications of ageing is still uncertain. Studies have not been able to provide clear-cut evidence on the direction of the effect. For instance, Fougère, Harvey, Mercenier, and Mérette (2009); Bloom, Canning and Fink, (2010) assert that a country with a higher proportion of its population in the old age group tends to be associated with decreasing productivity levels. That, apart from the reduction in savings as a result of the decline in labour force participation, investment and actual output will reduce accompanied by fiscal problems which have profound consequences on economic growth.

Contrary to this view, scholars such as Ismail, Rahman, and Hamid (2015); Acemoglu and Restrepo (2017) offer empirical evidence that robust population growth influences economic growth positively. They argue that the elderly tend to save more in preparation for their retirement and increase economic growth. Heady and Hodge (2009) attribute the lack of consensus in empirical analyses of an ageing population's effect on economic growth to the use of varying methods of analyses, inclusion of control variables, and other factors.

It has been projected that Africa's ageing population will grow at an accelerated rate over the next few decades. The inevitability of these demographic trends calls for prompt applicable policies. Therefore, this paper examines the consequences of an ageing population on economic growth and the ageing-investment interaction effect on economic growth in Af-

rica. This is the gap this study intends to fill and contribute to the literature on the ageing population and economic growth in developing economies. Results from this study will assist governments in designing policies aimed at influencing the economic effects of the ageing population in developing countries.

The rest of the paper is structured as follows. Following the Introduction is Section 2, which discusses a review of selected literature. Section 3 contains model estimation, theoretical underpinnings and sources of data used for the analysis. Section 4 reports the statistical results and discussions, while Section 5 concludes the paper and provides some policy recommendations.

REVIEW OF SELECTED LITERATURE

The debate on the effect of an ageing population on economic growth 'has been a controversial subject in economic development discourse. Young (2018) opined that there are two main views in explaining whether the ageing population enhances economic growth or not. First is the optimists' view (see Figure 1), which argued that both economic growth and the ageing population have a positive relationship. According to this body of literature, older individuals tend to save more because longer life leads to higher savings in preparation for retirement. Consequently, the increase in longevity will bring about more savings as well as more resources for investment. Investments, particularly in Research and Development (R&D), is unanimously acknowledged as the engine of economic growth in an economy (Young, 2018).

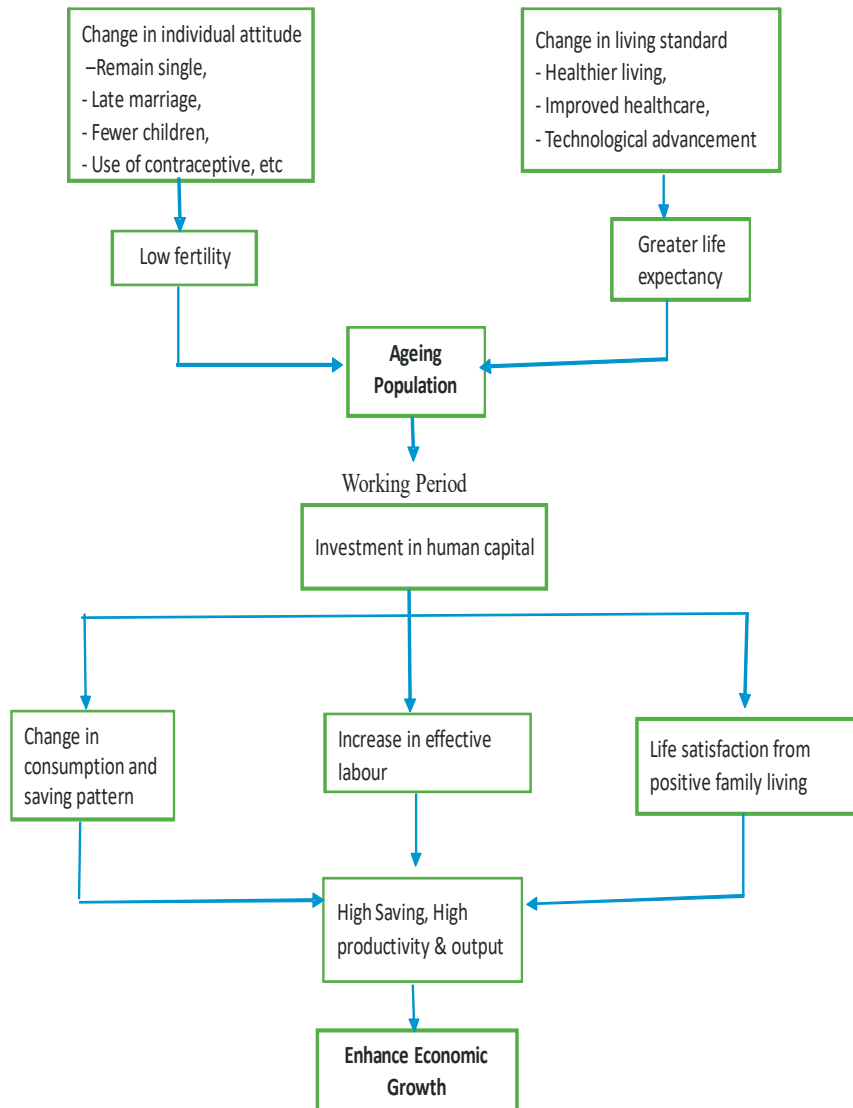


Figure 1: The optimists view of the impact of an ageing population on economic growth

Source: Adapted, with some modification, from Sukpaboonwat, Plyngam and Jaroensathapornkul, (2014), as cited in Young (2018)

The second view is that of the pessimistic theory (see Figure 2), which argued that the inequality in a country’s population age structure, significantly, the share of the elderly population, depresses the productivity level. That means, in an ageing society, aside from the sharp drop in savings rate and labour force participation, which lessens investments and actual output, fiscal problems that will affect the economy are likely to emerge (Young, 2018). A rising old-age dependency ratio will translate into growing health care issues and pension expenditures, which will crowd out public investment and capital accumulation with its attendant productivity growth.

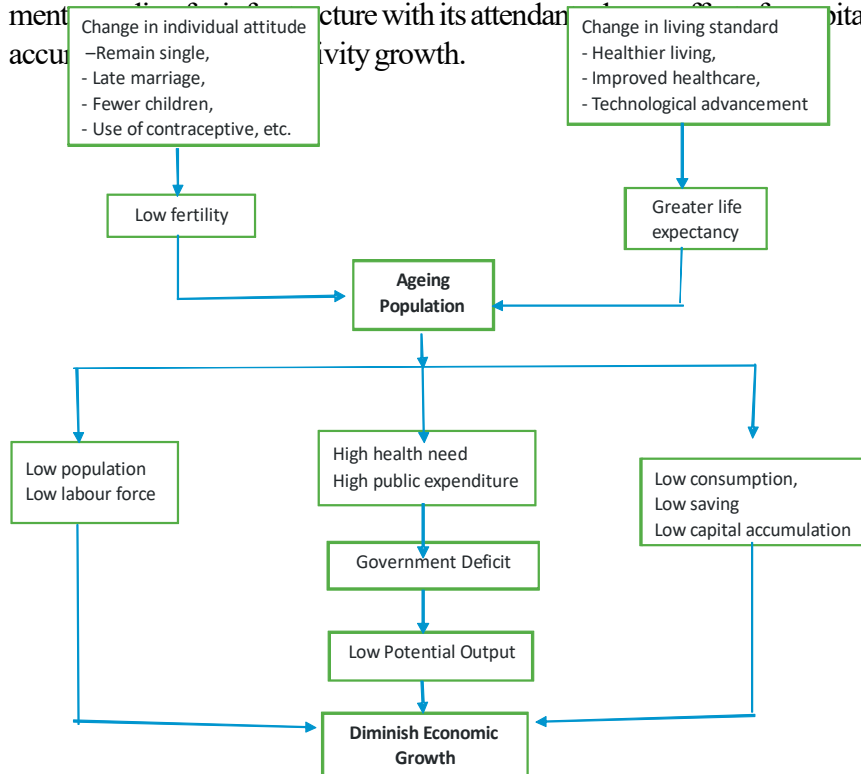


Figure 2: The pessimists view of the impact of an ageing population on economic growth

Source: Adapted, with some modification, from Sukpaboonwat, Plyngam and Jaroensathapornkul, (2014), as cited in Young (2018)

This section also presents the trend profile of the ageing population in Africa compared to other regions of the world from 2000 – 2017. The trend reveals a continuous increase in the population of the elderly over the years across different regions (see Figure 3). For instance, in sub-Saharan Africa, the aged population rose from 16.8% in 2000 to more than 17% in 2017 and is projected to rise even faster in the future. The trend shows that Africa stands when compared with other regions by having lower trends of population ageing. Nevertheless, it would be misleading to assume that ageing is not a substantial issue in Africa. There is a need for research that will provide information to plan for the future more extensively.

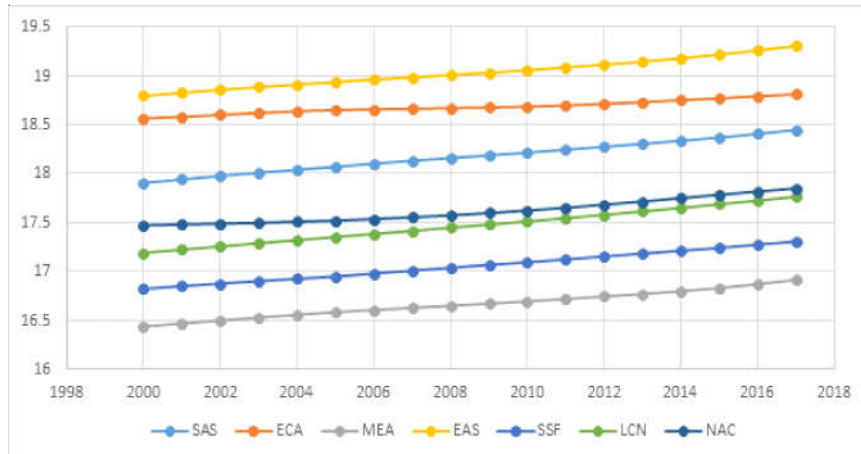


Figure 3: World ageing population (2000 - 2017).

Source: World Bank, (2019).

SAS is South Asia, ECA is Europe and Central Asia, MEA is the Middle East, and North Africa, EAS is East Asia and Pacific, SSF is sub-Sahara Africa, LCN is Latin America and the Caribbean, and NAC is North America.

The literature shows an abundance of studies investigating the ageing population and economic growth across different regions. For instance, Fougere and Merette (1999) used computable overlapping generation (OLG) models to examine population ageing’s impact on economic growth in 7 industrialized countries. They assert that a generation invests primarily in physical capital at the middle-aged but invest in human capital when young.

The results suggest that population ageing could create more opportunities for future generations to invest in human capital formation by featuring an endogenous growth model. The whole idea is to stimulate economic growth and reduce the negative impact of ageing on output per capita in a significant way.

The study by Bloom, Canning and Fink (2008) constructed a panel dataset. It showed in a first-difference model that the rate of ageing has a negative and insignificant effect on growth in the short and long term periods. By contrast, Huh, Lee, and Lee (2007) used a partial adjustment model on 1993 data of 77 countries for 2 years. The results indicate that a relatively large population of elderly harms economic growth. Groezen, Meijdam, and Verbon (2005); Prettnner (2013) showed evidence that an increase in the population of the elderly increases economic growth in the long run. Groezen et al. (2005) argued that the direction of the impact of ageing on economic growth depends on the transmission mechanism, which is the accumulated experience of the elderly population. This brings to light the fact that older people have gathered a great deal of knowledge, which boosts productivity. However, this positive effect does not continue indefinitely; beyond a certain age, they become incapable of contributing to output. However, old age raises capital accumulation through an increase in saving so that the aftermath is increased growth. They also reveal that falling mortality and fertility rates positively and negatively explain economic growth in the long run, respectively. The positive effect of ageing on growth depends on how fertility rates compare with changes in mortality.

Zhang, Zhang, and Lee (2003) addressed mortality by examining the impact of a decline in adult mortality on growth in an overlapping generations model. With public education, a decline in mortality affects growth by raising the savings rate and increasing physical capital accumulation. Also, it reduces accidental inheritances, lowers investment as well as the rate of physical capital accumulation. In developing countries associated with a high mortality rate, a decline in mortality raises economic growth; but reduces economic growth in industrialized nations with a low mortality rate.

Bloom, Canning and Fink (2008) note that behavioural responses to population ageing can occur in higher savings for retirement, greater labour force participation rate, and increased immigration of workers from developing countries. They also note that appropriate policy responses can also mitigate the adverse consequences of population changes. Cuaresma et al. (2014) examined how well they can explain economic growth in Europe using different indicators of an ageing population. Their study provides evidence that these indicators negatively and significantly explain economic growth in the region. They also find that the effect of ageing is more pronounced for poorer European countries. Van Der Gaag and De Beer (2015) find that the increasing population of elderly in Europe reduces economic growth, but raising the employment level helps to improve the declining effect, which is in line with the study by Bloom et al. (2010). This only suggests that introducing a policy that raises the retirement age will bolstering productivity. However, this is at variance with the study by Futagami and Nakajima (2001), which asserts that introducing a policy of postponing retirement age slows down economic growth.

Acemoglu and Restrepo (2017) provided evidence and theoretical underpinnings to argue whether there is a positive or negative relationship between the ageing population and economic growth. This is either because of the lower labour force participation and productivity of older workers or because ageing will create an excess of savings over desired investment. Their study showed no adverse effects of an ageing population on economic growth despite some other scholars showing otherwise. If anything, countries experiencing more rapid ageing have grown more in recent decades. They suggest that countries undergoing more pronounced demographic changes may resort to the adoption of automation technologies.

Davies and Reed III (2006) examined the role of an ageing population on foreign direct investment (FDI) in the US using regression analysis. They suggest that the financial market implications of ageing differ from the labour market aspect. The estimates between the US and other developed countries conform pretty closely to the predictions of the theory. Davies and Reed III argued that labour taxes generally fund old-age transfer programs in light of older populations' fiscal burden. That a country with an ageing population may not attract foreign investments because of the scarcity

of the working-age population; hence, the country's capability to produce wealth is seriously affected. Adams (2009), in a panel study, examined the impact of foreign direct investment and domestic investment on economic growth in sub-Saharan Africa for the period 1990 to 2003. The result showed that domestic investment is positive and significantly related to economic growth using the OLS and fixed effect estimation method. Roberts and Mehlman (2018) posit that global population ageing is expected to result in slower economic growth, lower interest rates, as well as shifts in consumption and housing patterns. These will have important implications for investment as countries with a significant proportion of capital investment in GDP have high economic growth rates.

Evidence from the empirical literature reviewed shows no clear consensus on the nexus between the ageing population and economic growth; in other words, the empirical findings on the nexus have been inconclusive. Therefore, more research needs to predict the consequences of an ageing population on economic growth, specifically in Africa; this is the gap in literature this study intends to fill.

MODEL SPECIFICATION AND METHOD OF DATA ANALYSIS

THEORETICAL MODEL

The demographic pattern is closely associated with labour supply which is higher among working-age adults than among the elderly. Bloom et al. (2008) argue that behavioural responses to population ageing can take the form of higher savings for retirement or an increase in labour force participation, which eventually affect economic growth. They note that with the proper policy responses, population changes' adverse consequences can be mitigated, hence the need for the present study's investment interaction effect. To examine the effect of age structure and investment on economic growth, this study adopts the work of Lee, Huh, Lee, and Lim (2013) with some modifications. Hence, the theoretical framework is based on the neoclassical growth model, which assumes a Cobb-Douglas production function of the form:

$$Y = A^{\acute{a}} K^{\ddot{o}} H L^{1-\acute{a}-\ddot{o}} \tag{1}$$

Where Y is a gross domestic product, K is physical capital, H is human capital, L is labour force, and A is the productivity level.

Dividing both sides by population, P , yields Equation (2),

$$y = A^{\acute{a}} K^{\ddot{o}} H (L/P)^{1-\acute{a}-\ddot{o}} P^{-\acute{a}-\ddot{o}} \tag{2}$$

Where, $y = Y/P$, income per capita.

Taking the natural logarithm of both sides gives:

$$\ln y = \ln A + \acute{a} \ln K + \ddot{o} \ln H + (1-\acute{a}-\ddot{o}) \ln(L/P) - (\acute{a} + \ddot{o}) \ln P \tag{3}$$

An implication of Equation (3) is that the coefficient of the labour force is positive. Thus, a country with a large share of working-age people is likely to experience faster economic growth than the elderly. On the other hand, a country with a sizeable old-age share is likely to grow slower than one with a sizeable working-age share. This is likely to happen on the assumption of unchanged age-specific behaviour. However, if changes in population structure and investment are undertaken, our empirical analysis may show that the ageing population may have different effects on economic growth. Thus to what extent this effect will mitigate the negative effect of the ageing population is our concern in this study. Hence, to empirically examine the consequences of ageing population and investment on economic growth in Africa, our basic model includes other control variables and is specified thus:

$$Z_{i,t} = S_1 + S_2 \ln(\text{ageing}_{i,t}) + S_3 \ln(\text{ageing}_{i,t} \times \text{inv}_{i,t}) + S_4 X_{i,t} + w_i + \theta_t + \mu_{i,t} \tag{4}$$

Where Z is the dependent variable, and it represents the actual growth rate of GDP ($gdpr$); ageing (agn) is the measure of an ageing population of ages 65 years and above (% of GDP), ageing \times inv captures the inter-

action effect of an ageing population and domestic investment, X is a vector of country characteristics, the symbols \hat{u} and \hat{e} are controls for country and year fixed effects respectively, μ is the disturbance term. In contrast, i and t represent country and time, respectively. The vector of control variables which are country characteristic used in this study, includes inflation rate (*inf*) (annual consumer prices), trade openness (*opn*) (import-export divided by GDP), foreign direct investment (*fdi*) (% of GDP), labour force participation rate (*lbf*) (%), democracy (*dem*) and exchange rate (*exr*) (official exchange rate US\$). Hence, to empirically examine the economic growth consequences of population ageing in Africa, the basic model is specified in econometric form as:

$$\begin{aligned} Sgdpg_{i,t} = & S_1 + S_2 1n(agn_{i,t}) + S_3(agn_{i,t} \times inv_{i,t}) + S_4(inf_{i,t}) + S5(opn_{i,t}) \\ & + S6(fdi_{i,t}) + S_7(lbf_{i,t}) + S_8(dem_{i,t}) + S_9(exr_{i,t}) + w_i + \theta_t + \mu_{i,t} \end{aligned} \quad (5)$$

Following the literature, the real GDP growth rate (annual %) was used to measure economic growth (Williams, Baek, Park & Zhao, 2017). Ageing was captured using population ages of 65 years and above (% of GDP). Interaction of the ageing population and domestic investment was added to the model because capital accumulation is one channel through which economic growth can occur (Ahuja, 2016, as cited in Metu, 2017). If the coefficient estimates turn out to be positive, raising investment can reduce the adverse impact of the growing elderly population on economic growth. To check for our result's robustness, we estimated an alternative model using real GDP per capita to capture economic growth.

METHOD OF DATA ANALYSIS

Estimating our model starting with the ordinary least squares (OLS) method, but the analysis is not based just on OLS result because it does not control for country-specific factors that are time-invariant. This leads us to consider estimating the model with either random or fixed effects method. The study by Hausman (1978) was followed to determine that the panel fixed effects model will perform better than a random-effects model. The

fixed effect is superior to the random-effects procedure because the random effect imposes strict exogeneity and orthogonality between explanatory variables and the error term. Since our empirical literature has not shown whether economic growth influences people's age directly, it means there is the absence of reverse causality in the model. However, one can argue that a reduction in economic growth increases poverty and death due to malnutrition, thereby influencing the number of persons that fall within the ageing population. Thus, the model is further estimated using the Generalized Method of Moments (GMM) method. The GMM is preferred to instrumental variable (IV) regressions because it is always difficult to obtain solid and exogenous instruments (Bazzi & Clemens, 2013). We restrict our study to countries where the time series of interest are available from 1995 to 2017, and hence, our estimation was based on a panel of 28 African countries¹. Countries and years with missing observations were omitted from the sample. The data used for the study were primarily taken from the World Bank's WDI online database, except for data on democracy and exchange rate, which are from Our World in Data (2017). The data estimation was carried out using E-Views 10 econometric software.

EMPIRICAL RESULTS AND DISCUSSIONS

The empirical analysis started with the summary statistics of the variables that report the sample mean, minimum and maximum values, and the standard deviation. Table 4.1 shows that the average annual GDP growth rate was 5% in the 28 African countries studied. Also, from the study, the minimum domestic investment (as a percentage of GDP) was about 2.7%, while the maximum was 115% within the study period. The variables' standard deviation shows that the least volatile variable in the series was trade openness followed by ageing.

Table 4.1: Summary of Descriptive Statistics

Variable	Obs.	Min.	Mean.	Max.	S.D.
GDPGR	644	-60.41389	5.001876	149.9730	8.990756
AGN	644	2.159958	3.621392	10.40704	1.336167
INV	644	2.663000	21.99743	115.1020	11.18340
INF	644	-35.83668	7.475236	83.32577	9.578599
OPN	644	0.131813	0.701471	5.317374	0.460500
FDI	644	-8.589432	3.874069	161.8238	9.316511
LBF	644	176750.0	8217590	58740629	9562853
DEM	644	-7.000000	2.038820	10.00000	5.259669
EXR	644	0.00000	547.8144	5768.173	784.5824
AGN*INV	644	6.902031	81.74426	464.3347	54.02007

Sources: Authors' Computation using E-views

Having known the variables' characteristics, we proceeded with the regression estimation, and the results are presented in Table 4.2. The regression estimation started with the Ordinary Least Square (OLS) model.

Table 4.2: Ageing Population, Investment and Economic Growth in Africa

Variable	OLS	FE _C	FE _Y	FE _{CY}	GMM
Ageing	-1.789** (0.0000)	-0.947 (0.2621)	-1.813** (0.0000)	-0.591 (0.5669)	-0.947 (0.2926)
Ageing × Investment	0.0251* (0.0402)	0.034* (0.0376)	0.032* (0.0112)	0.036* (0.0285)	0.034* (0.0327)
Inflation	0.0126 (0.7022)	-0.022 (0.5443)	-0.004 (0.9067)	-0.024 (0.5367)	-0.022 (0.6159)
Openness	9.795** (0.0000)	13.293** (0.0000)	9.594** (0.0000)	13.364** (0.0000)	13.29** (0.0000)
FDI	-0.038 (0.4564)	-0.133* (0.0150)	-0.042 (0.4143)	-0.143* (0.0101)	-0.133 (0.1631)
Labour Force	0.983** (0.0005)	-4.677** (0.0094)	1.129** (0.0001)	-1.515 (0.7965)	-4.677* (0.0337)
Democracy	-0.13 (0.0264)	0.254* (0.0420)	-0.079 (0.1902)	0.263* (0.0436)	0.254 (0.0667)
Exchange Rate	0.0011** (0.0079)	-0.004** (0.0000)	-0.001 (0.0610)	-0.003** (0.0002)	-0.0037 (0.0772)
Intercept	-11.215* (0.0195)	69.861* (0.0115)	-14.17** (0.0036)	19.986 (0.8279)	
Adjusted R ²	0.280803	0.375942	0.313950	0.396874	
AR (2) p-value	-	-	-	-	0.341
Hansen p-value	-	-	-	-	0.219

Note: The first column presents the OLS results, column 2 includes the only country fixed effects, column 3 includes only year fixed effects, and column 4 includes both country and year fixed effects. * and ** represent significance at 5% and 1%, respectively. P-values are in parenthesis.

The result in Column One shows that ageing harms economic growth, and the coefficient is highly significant. This confirms that the rising ageing population reduces economic growth in Africa. This result contrasts the study by Bloom, Canning and Finlay (2008), which found that old-age share is not negatively associated with economic growth in the long run. The interaction between ageing and investment has a positive coefficient and also significant. However, this estimation is likely biased because it does not control the country and time-invariant characteristics. This is why we control for country fixed effects in Column Two, year fixed effects in column three, and both country and year fixed effects in Column Four. The magnitude and significance of the coefficient of ageing, which is the first coefficient of interest, seem to be fluctuating. Though it is consistently negative across different estimations, the magnitude is smaller in Columns Two, Four and Five.

The result in column Four is the best among the first four columns since it controls both country and year fixed effects. The result shows an increase in the ageing population by 1% is associated with an insignificant decrease of 0.59% in economic growth. This result is in line with the previous studies (Choi & Shin, 2015; Teixeira, Renuga & Silva, 2016; Loser, Fajgenbaum, Kohli, & Vilkelyte, 2017). Also, the coefficient of interaction is positive and significant at the 5% level. This means that conditional on domestic investment, an increasingly ageing population will raise economic growth. As pointed out before, economic growth does not influence age directly, but it can determine the number of persons that fall within a given age bracket. This shows that economic growth and an ageing population are jointly determined; hence the model was re-estimated using GMM, and the results are shown in Column Five of Table 4.2. Interestingly, the two key variables (ageing and ageing-investment interaction) still maintain their signs and significance.

Inflation is negative in columns two to five, suggesting that higher fluctuation in general price level reduces economic growth. The coefficient of

trade openness remains consistent regarding sign and significance across all estimations. This suggests that there are tremendous benefits associated with opening up to international trade. These benefits can only be realized if exports are always more than imports. Foreign direct investment is expected to boost economic growth if the inflows are effectively channelled to productive use. However, from our result, foreign direct investment's coefficient remains negative across different estimations but significant when estimated using country and year effect. The negative effect could be the result of the argument that FDI takes advantage of the host country's market imperfections, thereby negatively affecting the economy. Foreign direct investment was found to be insignificant when estimated using the GMM model; this result is in line with the result obtained by Adelegun (2000). That FDI is insignificant could be attributed to the fact that most FDI flowing into Africa from developed countries is not adequately channelled to productive activities, affecting economic growth.

The coefficient of labour force changes sign across different estimations and statistically significant except in Column Four. Democracy is positive in columns two, four and five; and statistically significant only in columns two and four. This suggests that economic growth increases as African countries become more democratic (Gerring, Bond, Barndt, & Moreno, 2005; Doucouliagos & Ulubasoglu, 2008; Siroufy & Inkeles, 2017). Hence the promotion of an effective democratic system will help design policies that will promote and sustain economic growth. Democracy requires good governance, inclusiveness and the political will to implement designed policies.

Our GMM result suggests that the exchange rate effect is negative though statistically insignificant at 5%. This means that a decrease in the exchange rate is associated with an increase in economic growth. This makes sense because a decline in the exchange rate, also known as devaluation, increases export volume. And since GDP is a function of net export, the overall effect will increase economic growth. Our findings show that the exchange rate is not significant in influencing Africa's economic growth due to over-reliance on import.

CONCLUSION AND RECOMMENDATIONS

The study estimated an ageing population and domestic investment in economic growth in Africa between 1995 and 2017. The study also examined if domestic investment can influence an ageing population's economic growth by adding an interaction variable. The estimation methods adopted for the study are OLS, panel fixed effects, and GMM methods. The results generally suggest that the ageing population has a negative and insignificant effect on Africa's economic growth within the study period. Also, it shows that increasing domestic investment could help alleviate the adverse effect of the growing ageing population in Africa. The results have some policy implications for Africa. The rising population of people that fall within retirement age is a serious issue that needs immediate attention in Africa. Not only does this reduce productivity through the adverse effect on labour force participation, but it also leads to overdependence on the working population. The issue of an ageing population is not something that is within human control. Though the most rapid increase in the ageing population is yet to occur in Africa, these findings will give policymakers an excellent opportunity to prepare for the change. Taking early preventive measures can get the economies better positioned to deal with a changing population structure's economic and social effects in the future. One way of achieving that, which we have identified in this study, is increasing domestic investment, both private and public. Since investment creates employment opportunities, the government should boost support institutions to encourage private investment in productive activities and public investment in basic infrastructures, including human capital development. Investment in improving the health of the elderly is recommended as a policy option. This will reduce the burden on the health care and social security system and enable people to work for longer by compressing morbidity into fewer years later in life. African Union should sustain its regional integration policies as a means of increasing domestic investment in Africa.

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