ECONOMICS

THE IMPLICATIONS OF POPULATION AGEING ON SAVINGS RATES

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Abstract. Changes in population structure can have a great impact on savings rates. This study investigated the relationship that exists between the aging population and the savings rate in South Africa. The gross savings of South Africa from 1995 to 2017 was analysed. A fixed effect model and a random effect model were used as baselines for arbitrary correlations between unobserved heterogeneity and independent variables. The Hausman test was utilized to find a more efficient and consistent model that produces consistent results. The argument of the Lice Cycle Hypothesis developed by Modigliani (1970) and those previous research findings in which the rising older population has a tendency to decrease the rates of savings were followed in this paper. The findings revealed that an increase in old-age dependency does not cause the level of savings to decline but will rather lead to an increase in savings. The findings agree with the bequest theory, which states that old people save up their money for their upcoming generation. Due to the findings obtained in this paper, economic policies that aim to increase savings through demographics might not be relevant and are therefore not suggested.

INTRODUCTION

Population aging has become a vital challenge around the world. Curtis et al. (2017) and Yang, Zheng, & Zhao (2021) describe population aging as an increase in life expectancy and a falling birth rate. An increase in the aging population leads to a reduction in the working-age population. As the workforce gets older, their total working hours and labor productivity decrease. A decrease in labour participation might also be a challenge as those elderly people leave the workplace with their skills and experience, and that could also cause a shortage of skilled workers. When the older and more experienced labor force decreases rapidly compared to the younger and better educated labor force, it becomes a challenge to human capital accumulation. As the aging population no longer pays taxes, the working population may have to pay higher taxes. Lee et al. (2022); Adanlawo, Nkomo, & Vezi-Magigaba (2023) aver that with an aging population, the country might be bound to face new demands in health and finance as there will be a rise in demand for health care. meaning government spending on health care and pensions would increase. The

debate around the aging population has since become an important discussion in development economics since it does affect society and may pose challenges to economic development.

Changes in population structure can have a great impact in different spheres: in the economy (Chaka & Adanlawo, 2022), in businesses, finance departments, health, and savings. According to the South African Reserve Bank (SARB, 2018), there has been a decline in the South African gross savings rate, and the aging population is identified as one of the causes. Population estimates indicate that the proportion of elderly people (60 years and older) has grown from 7,6% in 2002 to 9,1% in 2020. Statistics South Africa (Stats SA, 2020) estimates the mid-year population of 2020 at 59,62 million, of which 5,43 million are aged 60 and over. The concern is how the changes in population age structure would impact the savings of South Africans. The study is based on this groundwork to find out the implications that an aging population has on savings rates and identify the correlation between the two.

The main objective of the study is to investigate the relationship that exists between the aging population and the savings rate in South Africa. The study also seeks to analyse the structure of gross savings from 1995 to 2017. For empirical findings, a fixed effect model and a random effect model are used as baselines for arbitrary correlations between unobserved heterogeneity and independent variables. The Hausman test was utilized to find a more efficient and consistent model that produces consistent results. The argument of the Lice Cycle Hypothesis developed by Modigliani (1970) and those previous research findings in which the rising older population has a tendency to decrease the rates of savings are followed in this paper.

The impact of population aging on gross saving rates was investigated using a panel data set spanning 22 years, from 1995 to 2017. The research is structured as follows: A brief theoretical and empirical review is completed after a succinct introduction to the topic that focuses on the relationship between the aging population and the savings rate taken into account in the empirical analysis. The phenomenon of an aging population and the savings rate in the context of the economy are the main focus of this section. The chosen data for the empirical analysis were then presented. The collected results are discussed in detail afterward, and the final remarks provide a conclusion.

LITERATURE REVIEW

Life Cycle Hypothesis by Modigliani (1970), which states that people save more at their working age as their income is high to sooth their lifetime consumption, and they have negative savings at the later stages of life (Adanlawo & Vezi-Magigaba 2022), Because they are consuming their savings. This means that when the age dependency ratio is high, savings rates are expected to be low as older people do not contribute to savings. Studies by Harioka (2010), Salma and Zaib (2012), Razzaq and Ahmad (2015), and others found that there is a negative relationship between saving rates and population aging, as suggested by the LCH. While Deb (2016), Hu (2015), Jorgensen (2011), Zhu (2015), and Nduku & Simo-Kengne (2017) results contradict the LCH,

Other theories that explain people's savings behaviour are bequest theory and the precautionary motive. As the LCH states, the precautionary motive theory is also of the view that people save more when they are still part of the workforce because of uncertainty about the future. It implies that people do not know what the future holds and that life expectancy is high. With a high life expectancy, the chances of health problems are higher; hence, they keep their savings high for unforeseen care and health expenditures. Therefore, savings for elderly people are expected to decrease because they will be spending their money on health services.

In contrast to both, the bequest theory, according to Hu (2015), specifies that older members of the family have the desire to bequeath wealth to their children. This means that they have a strong motive to keep their wealth and even their personal savings for the upcoming generation after them. Therefore, according to this theory, older people would be expected to save more than

younger people, and therefore, the older the people, the higher the rates of savings. Meaning that there is a positive relationship between the old-age dependency ratio and the level of savings.

Empirical review

Savings rates are said to be the most researched aggregate at the macroeconomic level, as they help policymakers maintain the stability of economic growth through investments (Nduku & Simo-Kengne, 2017). Empirical studies have also looked at people's attitudes towards savings and how demographics affect the rates of savings, particularly the age structure of the population. Harioka (2010) presented evidence from his study that examines the impact that population aging has on savings in Asia. The study is cross-country evidence using cross-country data. The result indicates that an increase in the aging population will cause all savings rates to go down and also decrease investment rates. The study concluded that the decline in savings caused by population aging will not cause much damage as countries can opt to borrow from abroad.

The study of Apergis & Christou (2012) examines the effects of the aging population on domestic savings rates using annual panel data from 16 African countries. Sample size period: 1960–2005 Empirical analysis was conducted using panel cointegration tests, and the results from the causality test show a negative impact of the old dependency rate on the rates of savings. An increase in the age dependency ratio decreases savings rates in the long run. These results show that the size of the population that is not working is important to determine the trends of future domestic savings rates in African countries. Thannoon's (2013) study examined the life cycle hypothesis in Asia for the period between 1970 and 2009 using dynamic panel analysis. The data that was obtained from key indicators of developing Asia and Pacific countries. Upon the application of the dynamic generalized least squares (DGLS), a negative influence of dependency ratio on savings ratio was found, suggesting that a higher dependency ratio will lead to lower savings rates.

Razzaq & Ahmad (2015) investigated the impact of macroeconomic factors on private savings in China. The authors made use of time series data for the period 1991–2011 from the World Development Indicators. The OLS technique was applied, and the results revealed that the old-age dependency ratio has a significant negative effect on private savings behavior. Tekin (2016) examined the economic and demographic determinants of private savings in East Asia. The author employed the GMM system approach using data from the World Bank and International Monetary Fund for the period 1997–2014. The results from the estimation revealed that the age dependency ratio has a significant impact on savings. Thus, it indicates that when the age dependency ratio increases, private savings decrease.

In contrast to the above studies, Zhu's (2015) study measured the relationship between aging and savings in China using annual time series data between 1980 and 2012. The cointegration model suggests that elderly and youth dependency ratios have a positive relationship with household saving rates. The study concluded that population aging in China would not cause household savings to go down, and hence, economic growth would not be negatively affected. Deb (2016) tests the aging-savings relationship using Chinese provincial data across different provinces. The regression was undertaken using cross-sectional data, and Cochrane-Oratt estimation revealed that coefficients of old-age dependency in different provinces remain statistically significant. Similarly, the results of Hyung (2013) revealed a weak negative relationship between old age dependency and per capita saving rates, suggesting that household savings in China's provinces did not decline as the aged population increased.

Hu (2015) studied the correlation between demographics and savings in three countries: China, Japan, and Korea. The study employed the panel Granger causality test to investigate the correlation between demographics and savings and the macro aggregate saving data to run the causality test. The results of the study revealed that the relationship between the aged population, gross savings, and household savings is statistically insignificant. Nduku & Simo-Kengne (2017) investigated the relationship between the age dependency ratio and the saving rates in South Africa for the period 1970–2014 to explore the extent to which the life cycle hypothesis holds. Using the Autoregressive Distributed Lag Model (ADRL), bounds testing, and Granger causality test, the

study concluded that the relationship between age dependency ratio and the savings rate is positive in both the short and long run, thereby rejecting the applicability of the Life Cycle Hypothesis in the South African context. The study concluded that demographic factors are irrelevant in determining savings in South Africa.

The nexus between aging populations and savings shows mixed results. Some research is supportive of the life cycle hypothesis, and some rejects it. There is limited use of the fixed effects and random effects models in examining the relationship between the aging population and savings. Even though some studies have used panel data, they rarely examine the provincial level of one country but rather focus on the analysis across countries.

METHODOLOGY

This section revealed the model and the methods used in this study. The details of the data set are also specified. A secondary data source, Quantec, is used for this study. This paper examines the provincial-level data set that observed all nine provinces of South Africa for the period of 22 years from 1995 to 2017 to investigate the correlation between age dependency and savings rates. Gross fixed capital formation (GFCF) is used as a proxy for saving rates, the old age dependency ratio (OADR) as a proxy for population aging, the unemployment rate (UEMR), and gross domestic product (GDP) at market prices.

Model Specification

The panel data constitutes of the time series and cross-sectional dimensions and the cross-sectional units of this study are the 9 provinces of South Africa. In regressing for saving rates, the fixed effects and random effects were used to explore the effects of population aging and other factors that might affects savings.

The general panel data model is as follows:

$$y_{it} = \beta x_{it} + u_{it}$$

Where $i = 1, 2, …,$ T, denotes cities, individuals, firms etc. and $t = 1, 2, ..., $ I, stands for time. Y_{it} is the dependent variable, X_{it} are explanatory variables and u_{it} shows the residuals of the model.

In this study the savings rates are set out as a function of ageing population, GDP and unemployment rate.

SR = f (OADR, UEMR, GDP,)

The fixed effects model estimated is:

$$Y_{it} = a_i + \beta_x X_{it} + u_{it}$$

$$SR_{it} = a_i + \beta_x OADR_{it} + \beta_x UEMR_{it} + \beta_x GDP_{it} + u_{it}$$

Where SR = Savings rates, OADR = Old age dependency ratio, UEMR = Unemployment rate and GDP = Gross Domestic Product.

Where $i = 1, 2, …, 9$, which denotes provinces, and $t = 1995, 1996, ..., 2017$, which indicates the respective time periods. a_i is the unobserved time-invariant variable, which in this case denotes the provincial specific effects and u_{it} is the error term.

The random effects model is estimated as following:

$$Y_{it} = a_i + \beta_x X_{it} + u_{it}$$
$$Y_{it} = \beta_x X_{it} + \varepsilon_{it}$$
$$SR_{it} = \beta_x OADR_{it} + \beta_x UEMR_{it} + \beta_x GDP_{it} + \varepsilon_{it}$$

Where ε_{it} denotes the error term in which a_i is assumed to be part of the residual because the random effects model considers a_i uncorrelated with the independent variables X_{it}. Contrary, the fixed effects assume that there is correlation between the explanatory variable and a_i.

To determine which model to implement between the fixed effects and the random effects model, we run the Hausman test. Hausman tests chooses random effects for null hypothesis because it is more efficient (Wooldridge, 2019). At the rejection of the null hypothesis, the fixed effects are chosen as the model that produce the most consistent results. In the use of panel data, cross sectional dependence can be an issue and ignoring the interdependence between units could lead to estimation results that are biased and inefficient. There are unobserved common factors that may be correlated with independent variables in the model between the cross-sectional units (Han, 2016). To ensure that statistical inference is not compromised and that we account for spatial independence of the residuals, this paper runs the Perasan's test of cross-sectional dependence with the null hypothesis that the residuals are cross-sectional independent. The alternative hypothesis will therefore be that there is a presence of spatial dependence. Upon the rejection of null hypothesis, the Driscoll-Kraay regression was estimated as it produces standard errors that are heteroscedasticity consistent and robust to cross sectional dependence (Han, 2016). STATA, a data analysis software was used to run the regression on our panel data and to obtain the results from the statistical tests that are presented in this paper.

Empirical results

Variables	OLS	Fixed effects	Random effects
Old age dependency	-.0478401**	.27432***	-.0333752
	(0.029)	(0.000)	(0.236)
Unemployment	.06438428***	-.0277085***	.0709744***
	(0.000)	(0.000)	(0.000)
Gross Domestic products	.1352021***	.3787979***	.1475354***
	(0.000)	(0.000)	(0.000)
Constant	-6200.931	-122839.5	-16645.87
	(0.092)	(0.000)	(0.001)
Obs.	207	207	207
R-Squared			
Within		0.9479	0.8445
Between		0.9392	0.9799
Overall	0.7959	0.7443	0.7979

Note: *** denotes the significance level of 1%, ** 5% level of significance and * 10% significance level.

Table 1 above shows the results of the regression estimated using panel data, and the first column is the simple OLS, where the results show a significant negative relationship between savings rate and old age dependency. This indicates that as old-age dependency increases, the savings rate is likely to go down. Unemployment and GDP also show a significant correlation with

savings rates, and the relationship between both controlled variables and savings is positive. The overall R-squared is high, and this indicates that a variation in savings rate is explained by the model.

We estimated the fixed effect and the random effect models, and the results of both models are also shown in Table 1 above. For the fixed effects model regression, old age dependency is found to have a significant correlation with the saving rate, and the sign of the coefficient tells us that the relationship between these variables is positive. These results denote that an increase in old-age dependency will lead to an increase in savings rates in South Africa. GDP has a significant positive correlation with savings, with unemployment having a negative correlation with the savings rate, showing that as unemployment increases, savings are likely to decrease. A 0.7443 overall r-squared explains that 74.43% of the variation in the savings rate is explained by the independent variables.

For the random effects model, results for old age dependency are insignificant, with a negative relationship being shown between old age dependency and the savings rate. Other controlled variables have a significant correlation, and the relationship between savings rate and unemployment is positive for both unemployment and GDP. 79.79% of the variation in the savings rate is explained by the model, and this is shown by the overall r-squared.

Table 1

Hausman test

| . | —— Coefficients —— | | | |
	(b) b_random	(B) b_fixed	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
OAD	-.0333752	.27432	-.3076952	.
UEMR	.0709744	-.0277085	.098683	.0119144
GDP	.1475354	.3787979	-.2312625	.

We ran a Hausman test to determine the model that provides the most consistent and efficient results. The null hypothesis supports the conditions of orthogonality in the random effect model as valid. The random effect is the most efficient estimator due to the assumption that the explanatory variable with the error term, and the fixed effect is considered inefficient, yet the most consistent estimator. The results from the Hausman test reveal that Prob>chi2 = 0.0000, which is significant. The null hypothesis is rejected because of the significant Hausman coefficient, meaning that random effects are biased and inefficient.

Cross-sectional dependency test

As mentioned in the methodology section, to avoid bias in the results, we use Pesaran's cross-sectional dependence test to test if there is any correlation between the residuals of the cross-sectional units. The null hypothesis is that there is no correlation within the residuals. The p-value is 0.0000; therefore, the null hypothesis is rejected, and cross-sectional dependence is present. On average, the absolute value of the correlation is 0.596.

Due to the results obtained in the Perasan's test of cross sectional dependence, we estimate the regression with Driscoll-Kraay standard error as they are heteroskedasticity consistent and robust to cross sectional dependence (Akinlo & Dada, 2022).

Table 2

Driscoll-Kraay: Fixed effects regression

Variables	Driscoll-Kraay: Fixed effects
Old age dependency	.27432 0.0000***
Unemployment	-.0277085 0.095*
Gross domestic product	.3787979 0.000***
Constant	-122839.5 0.000***
Obs.	207
R-Squared **Within**	 0.9479

*Note: *** denotes 1% level of significance, ** 5% level of significance and * 10% level of significance.*

According to the fixed effects regression with Driscoll-Kraay standard errors, the old age dependency, which is our variable of interest, has a positive relationship and a statistically significant correlation at the 1% level of significance on the savings rate in South Africa. The results show that when old age dependency goes up, the level of savings also goes up. Findings reveal that a 1% increase in old age dependency will lead to a 0.27% increase in savings, with other variables remaining constant.

Our results are in line with the findings by Zhu (2015), Jorgensen (2011), Deb (2016), Hu (2015), Hyung (2013), Nduku & Simo-Kengne (2017), and De Vos et al. (2020). The findings revealed that an increase in old-age dependency does not cause the level of savings to decline but will rather lead to an increase in savings. The findings agree with the bequest theory, which states that old people save up their money for their upcoming generation. Also, a precautionary saving motive could explain these results because old people save their money for health expenditures and other unexpected expenses. These results do not validate the expectation of the life cycle hypothesis by Madigliani (1970) that there is a negative relationship between savings and population aging, which is represented by old-age dependency in this model.

Results for unemployment are statistically significant at the 10% level of significance. The results show that there is an inverse relationship in relation to savings. This makes economic sense; people can only save if they are employed and are able to earn income (Sykes et al., 2016). A 1% increase in unemployment will lead to a 0.028% decrease in savings. Moreover, the findings for the GDP have a positive impact on the savings rate of South Africa, with a 1% statistical significance. The results show that when GDP at market prices increases by 1%, the savings rate increases by 0.38%.

CONCLUSION

We examined the impact of population aging on the savings rate in South Africa using panel data from 1995 to 2017. The study used panel data, which allows for control of unobserved variables. We used a fixed effect and a random effect model to estimate the relationship, and we applied the Hausman test to choose the baseline model between the fixed and random effects. The study finds an unexpected positive relationship between the aging population and the savings rate in South Africa, implying that the life cycle hypothesis does not hold. This suggests that an increase in old-age dependency does not cause the level of savings to decline. According to the findings of this

paper, unemployment is negatively correlated with the savings rate, and GDP at market price has a positive relationship with savings.

Due to the findings obtained in this paper, economic policies that aim to increase savings through demographics might not be relevant and are therefore not suggested. The data that was used might not have been the perfect one, as gross savings were not available at the provincial level, which led to the use of gross fixed capital formation as a proxy for savings rate. This paper investigated the relationship between savings rate and old-age dependency using three variables. For further studies, other factors that have an impact on the level of savings could be investigated, and adding other demographic factors such as the young dependency ratio as a variable could provide a better explanation of the relationship between savings and demographics.

REFERENCES

Adanlawo, E. F., & Vezi-Magigaba, M. (2022). Exploring the impact of tax policies on small and medium scale enterprises'(SMEs) performance in Nigerian Economy. *The Business & Management Review*, *13*(1), 7-15.

Adanlawo, E. F., Nkomo, N. Y., & Vezi-Magigaba, M. (2023). Compensation as a motivating factor of job satisfaction and performance. *International Journal of Research in Business and Social Science*, 12(3).

Akinlo, T., & Dada, J. T. (2022). Information technology, real sector and economic growth in sub-Saharan Africa: a cross-sectional dependence approach. *Quality & Quantity*, *56*(6), 4241-4267.

Apergis, N. & Christou, C. (2012). Dependency rate and savings: The African evidence with panel data. *International Journal of Business and make all the Management*, *7*(4), 84.

Chaka, M., & Adanlawo, E. F. (2022). Role of Public Relations (PR) in Nation-building: A Case Study of South Africa. *Journal of Nation-building & Policy Studies*, *6*(3), 5-21.

Curtis, C.C., Lugauer, S. & Mark, N.C. (2017). Demographics and aggregate household saving in Japan, China, and India. *Journal of Macroeconomics*, *51*, 175-191.

De Vos, C., Obokoh, L. O., & Abiola, B. A. (2020). Determinants of savings among nonRicardian households in South Africa. *International Journal of Social Economics*, 47 (11), 1329-1343.

Deb, S. (2016). The Provincial Pattern of Population Ageing and Household Saving in China.

Goodrick, W.F. (2013). Policy implications and challenges of populations ageing in South Africa.

Han, J. (2016). *Essays on treatments of cross-section dependence in panel data models* (Doctoral dissertation, Rice University).

Horioka, C. Y. (2010). Aging and saving in Asia. *Pacific Economic Review*, *15*(1), 46-55.

Hu, Y. (2015). Population Ageing and Saving Rates in China, Japan and Korea: A Panel Granger Causality Analysis. *Global Economic Review*, *44*(1), 64-73.

Hyung, J. (2013). *An Analysis on the Effect of Old Age Dependency Ratio on Domestic Saving Rate* (Doctoral dissertation, Thesis, Deptartment of Economics, University of California, Berkely).

Jorgensen, O.H. (2011). *Macroeconomic and policy implications of population aging in brazil.*

Modigliani, F. (1970). The life cycle hypothesis of saving and intercountry differences in the saving ratio. *Induction, growth and trade*, 197-225.

Nduku, P.M. & Simo-Kengne, B.D. (2017). *Population age structure and savings behaviour in South Africa: the relevance of the life-cycle hypothesis* (Doctoral dissertation, University of Johannesburg).

Razzaq, A.A. & Ahmad, F. (2015). Estimating Private Savings Behaviour in China. *International Journal of Economics and Business Administration*, *1*(1), 1-5.

Salman, A. & Zaib, R. (2012). Effect of Age Dependency on Saving Rates. *International Journal of Organizational Innovation*, *5*(1), 163-175.

South African Reserve Bank. (2018). Full Quarterly Bulletin – No 288 – June 2018. Available online at: https://www.resbank.co.za/en/home/publications/publication-detail-pages/quarterly-bulletins/quarterly-bulletin-publications/2018/8593

Stats SA (2020). Protecting South Africa's elderly. Available onlie at: https://www.statssa.gov.za/?p=13445

Sykes, J., Križ, K., Edin, K., & Halpern-Meekin, S. (2015). Dignity and dreams: What the Earned Income Tax Credit (EITC) means to low-income families. *American Sociological Review*, *80*(2), 243-267.

Tekin, I. (2016). The economic and demographic determinants of savings in east asia: GMM-system approach. *Eurasian econometrics, statistics and empirical economics journal,* 542-59.

Thannoon, M.A.M (2013). Life-Cycle Hypothesis in Asia: What Went Right. *TANMIAT AL-RAFIDAIN*, *35*(114), 33-47.

Wooldridge, J. M. (2019). Correlated random effects models with unbalanced panels. *Journal of Econometrics*, *211*(1), 137-150. Wooldridge, J. M. (2019). Correlated random effects models with unbalanced panels. *Journal of Econometrics*, *211*(1), 137-150.

Yang, Y., Zheng, R., & Zhao, L. (2021). Population aging, health investment and economic growth: Based on a cross-country panel data analysis. *International Journal of Environmental Research and Public Health*, *18*(4), 1801.

Zhu, X. (2015). Population Aging and Economic Growth: Will the population aging reduce household saving in China?.

Zwane, T. (2016). The determinants of household savings in south Africa. *International business and economics research journal,* 15(4):209-218.

ВПЛИВ СТАРІННЯ НАСЕЛЕННЯ НА РІВЕНЬ ЗАОЩАДЖЕНЬ

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Зміни в структурі населення можуть мати великий вплив на рівень заощаджень. У цьому дослідженні вивчався зв'язок, який існує між старінням населення та рівнем заощаджень у Південній Африці. Проаналізовано валові заощадження Південної Африки з 1995 по 2017 рік. Модель фіксованого ефекту та модель випадкового ефекту використовувалися як базові лінії для довільних кореляцій між неспостережуваною неоднорідністю та незалежними змінними. Тест Хаусмана було використано для пошуку більш ефективної та узгодженої моделі, яка дає узгоджені результати. Аргумент гіпотези Lice Cycle, розроблений Модільяні (1970), і результати попередніх досліджень, згідно з якими зростання населення має тенденцію до зниження норми заощаджень, було використано в цій статті. Висновки показали, що збільшення залежності у літньому віці не призводить до зниження рівня заощаджень, а швидше призведе до збільшення заощаджень. Отримані дані узгоджуються з теорією спадщини, яка стверджує, що люди похилого віку відкладають свої гроші для майбутнього покоління. Через висновки, отримані в цьому документі, економічна політика, спрямована на збільшення заощаджень через демографічні показники, може бути нерелевантною, тому не пропонується.

Ключові слова: старіння населення, робоча сила, теорія життєвого циклу, норми заощаджень.