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Household retirement savings in South Africa: an analysis of pre- and post-global financial crisis determinants

Abstract:

This study investigates Life Cycle Hypothesis savings behaviour among South African households. The mobility matrix methodology as well as a multivariate regression analysis was employed to assess the implications of a permanent increase and a temporary decrease in household incomes based on the impacts of the global financial crisis. Using the General Household Survey data from 2002 – 2010, the study concludes that life cycle savings were greater during the period of 2002 – 2004 ('pre-financial crisis') compared with the period of 2008 – 2010 ('post-financial crisis'). Overall, the global financial crisis significantly negatively impacted household retirement savings.

Keywords: household savings, savings mobility, life cycle

DECLARATION

I, LING-HSUAN TING, declare that this research report is my own unaided work. It is submitted in partial fulfillment of the requirements for the degree of M.COM. ECON. SCI. at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

(LING-HSUAN TING)
NAME

16/09/2013
DATE

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1. Introduction

The level of household savings is an important factor contributing to the future economic well-being of a household and a country (Harris, Loundes & Webster 2002). At the household level, wealth generation and asset accumulation during the working years safeguards the desired consumption lifestyle of the household over the household's entire lifetime without having to work until death (Modigliani 2005a, 2005b; Deaton 2005). While at the country level the aggregated economic benefits of household savings are lower social costs to government and the working population to provide for the old. Furthermore, household savings can additionally augment the wealth of a country (Modigliani 2005a 2005b; Deaton 2005; Belke, Dreger & Ochmann 2012).

Various models have been hypothesised to explain the link between the microeconomic benefits of household savings and the aggregation of these impacts for the macroeconomic level (Attanasio & Szekely 2001; Harris *et al.* 2002). The initial step of this process is typically in the identification of the motive for savings to occur, which is diverse yet overlapping (Browning & Lusardi 1996). One type of model that has been perceived as successful and clear at linking the microeconomic and macroeconomic impacts of household savings is that of the 'life cycle' model (Browning & Crossley 2001). This type of model includes various models that incorporate aspects of the life cycle that is that household savings behaviour is influenced by the life time or age of the household head. A representative model of the life cycle model type is Modigliani and Brumberg (Modigliani 2005b), and Ando and Modigliani's (1963) Life Cycle Hypothesis [LCH] (Attanasio & Browning 1994; Browning & Crossley 2001; Modigliani 2005a, 2005b; Deaton 2005; Harris *et al.* 2002).

Although the LCH has been acknowledged as requiring strict assumptions in order to explain the macroeconomic implications of the microeconomic model, it is based on these assumptions that the empirically tested data can have any solid conclusions drawn (Modigliani 2005a, 2005b; Deaton 2005). Nevertheless, many empirical debates on the usefulness of the LCH model continue to be expressed in the literature with many alternative models created in the process (Carroll 1997, 2011; Deaton 1991; Constantinides 1990; Rhee 2004; Zeldes 1989). The overall consensus of the LCH, however, is that it still remains valuable in confirming or rejecting the applicability of the LCH in a country (Deaton & Paxson 1994).

The LCH model highlights the importance of saving for retirement, otherwise known as the 'life cycle motive' (Keynes 1936a, 1936b).

Retirement savings impact discretionary savings, private pension contributions and, more importantly, the social pension system provided by the government (Modigliani 2005a, 2005b; Harris *et al.* 2002; van der Berg, Sieberts & Lekezwa 2010; Attanasio & Szekely 2001).

One example of potential distortions in retirement savings by the social pension system can be found in the developing country of South Africa where social pensions are financed entirely by the government (Case & Deaton 1998). South Africa's unique social pension and grant system on the one hand results in concerns on the degree of dependence of households on government assistance (Nhabinde & Schoeman 2008), while on the other hand, the potential impacts on the financial and savings situation of a household can be positive (Economic Policy Research Institute 2002).

The dependency of a household on government pension and grant receipts can potentially disincentivise household savings resulting in poor household savings behaviour (Nhabinde & Schoeman 2008). Poor household savings behaviour may hinder current and future household finances due to little motivation to increase household incomes, and savings, through job seeking (van der Berg *et al.* 2010; Betrand, Mullainathan & Miller 2003). Additionally, these households may also attract household members that choose not to work thereby increasing the financial burden on the household. The latter was especially observed in households with female pensioners as well as among the majority population group of African/Black-headed households (van der Berg *et al.* 2010; Betrand *et al.* 2003).

On the other hand, positive aspects of the social pension and grant system may also arise where poorer households find themselves in a better financial situation due to government assistance (EPRI 2002). [The social pension and grant system in South Africa was observed to reach poorer households effectively (Case & Deaton 1998).] The benefits of social pensions and grants, however, may be population specific as observed in Betrand *et al.* (2003) and van der Berg *et al.* (2010). This was mainly attributed to the legacy of Apartheid where the majority population group suffered more shortfalls in terms of income and earning potential.

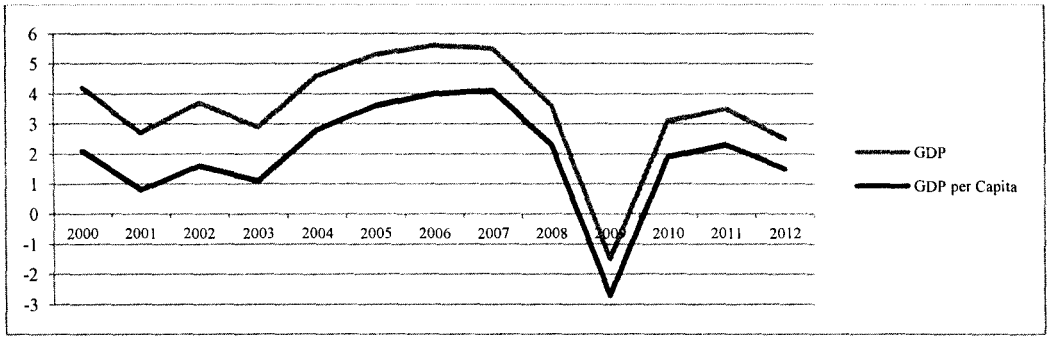
The concern for South Africa is the long-run implications for the country's already low household savings, asset accumulation and wealth generation, which could potentially lead to increased social burdens for government and society [through taxes] (EPRI 2002). Labour force and labour supply distortions from households receiving government assistance may also impact future household savings behaviour. Another, and even greater, concern is the potential effects on South Africa's poverty rate if households, particularly poorer households, continued to lack savings, assets and wealth (Woolard & Klasen 2004).

Finally, the impact on the country due to a lack of domestic savings could lead to an increased reliance on foreign investments (Nga 2007; du Plessis 2008).

In light of the recent global financial crisis (GFC) of 2007/2008, the reliance on foreign portfolio flows is precarious (National Treasury 2012d, 2012e). The impact of the GFC had additionally harmed households employed in both the formal and informal sectors as incomes and potential incomes declined (Verick 2010). The decrease in household incomes had also impacted household consumption (Figure 2). These income declines were somewhat temporary for those formally employed, due to lay-off packages, but were more permanent for the informally employed (Verick 2010). Aggregate variables of gross domestic product (GDP) growth and per capita GDP similarly reflected this negative shock caused by the GFC (Figure 1).

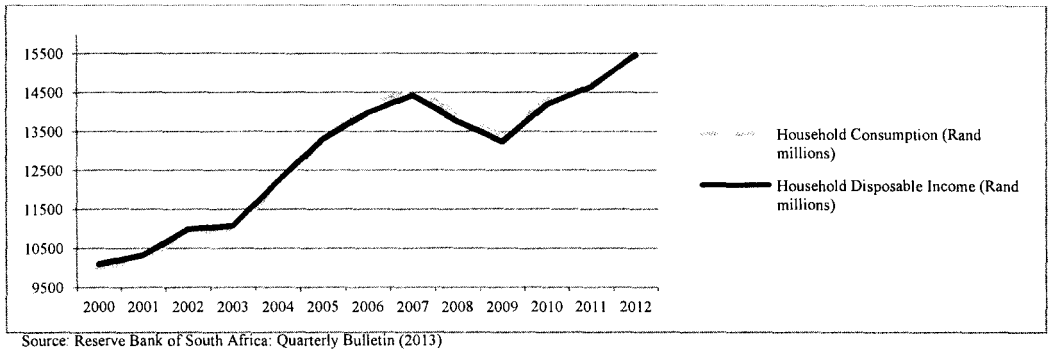
Household savings rates in South Africa during the time of the GFC event also displayed dips (Figure 3). A change in direction for savings from 2008 onwards was, however, observed implying a slow improvement in household savings, especially towards a household's retirement.

Figure 1: Annual GDP & GDP Per Capita Growth (%)



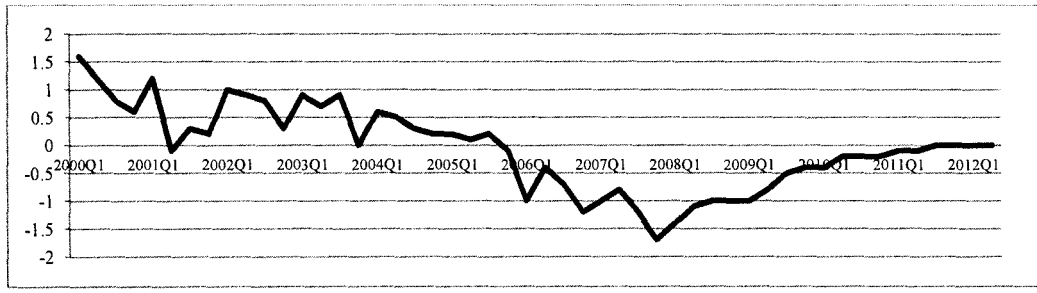
Source: Reserve Bank of South Africa: Quarterly Bulletin (2013)

Figure 2: Annual Household Income and Consumption (R Millions – Constant 2008 Prices), and Savings Rate (%) of South Africa



Source: Reserve Bank of South Africa: Quarterly Bulletin (2013)

Figure 3: Quarterly Household Savings Rates in South Africa (%)



Source: Reserve Bank of South Africa: Quarterly Bulletin (2013)

Government policies tabled by the South African National Treasury have been encouraging towards households increasing their savings, especially for retirement (National Treasury 2012d, 2012e). Although these policies focus on tax incentives–where higher tax incentives are provided during the working years of the household – the assumption of these incentives is based on South African households following the LCH framework. The LCH framework assumes that savings increase during the working years and decrease during the years before and after work.

While some studies have found aspects of the LCH evident in South African households (Mahlo 2011), most studies on South African household savings behaviour have focused on the health impacts of HIV/AIDS (Freire 2004a, 2004b) and the savings behaviour of specific population groups (Esson 2003; Chauke 2011). Few studies – especially microeconomic studies – have tested the LCH framework with a representative household sample in South Africa. Moreover, in light of the impacts of the GFC on household incomes, consumption and savings, an assessment of the changes in household savings pre- and post-GFC could potentially result in some stimulating outcomes. This is especially seen, and potentially implied, in the directional changes in household savings rates around the time of the GFC event (Figure 3).

The objective of this study is to therefore fill the gap in the literature by testing the LCH framework using a representative household sample in South Africa. Additionally, the impacts of the GFC on household savings in South Africa can also be tested. The study also aims to analyse whether certain household variables such as population groups and social pension receipts can assist in the explanation of the low household savings trends observed in South Africa. The study begins by first establishing the LCH theoretical framework followed by the literature review. The methodology and data are then described wherefrom the results of the study are analysed and discussed. Conclusions are then drawn in the final section.

2. Theoretical Framework

The study employs the Life Cycle Hypothesis (LCH) of Modigliani and Brumberg (Modigliani 2005a). This model was chosen, among other variations of the life cycle type, due to the model's direct test of the retirement savings motive in addition to its clear microeconomic implications for household savings behaviour in cross-sectional data (Modigliani 2005a; Attanasio & Browning 1994). Furthermore, the non-stationary assumption for households (households do not expect to receive the same income level throughout their working life, nor are their income expectations always met in the subsequent periods) ensures the practicality of the model's results (Modigliani 2005a; Deaton & Paxson 1994). Additionally, the LCH provides clear implications for household retirement savings patterns pre- and post-GFC in South Africa.

The LCH model can be seen in Equation 1 where a household's savings rate (henceforth referred to as savings) is dependent on a household's current income, future income in terms of the income expectations, and assets accumulated during the working years of the household's lifetime [For step-by-step derivations of the model as well as all assumptions made, the study refers the reader to Modigliani and Brumberg (Modigliani 2005a).]. The model is represented in equation form as follows:

$$\mathbf{s}=\frac{M}{L}+\frac{N(L-t)-M}{LL_t}\frac{(y-y^e)}{y}-\frac{1}{yL_t}[a-a(y^e,t)] \qquad (1)$$

where s is savings rate, M is the working years and N is the retirement years of a household, L is the life cycle or life expectancy of the household and LL_t is the life expectancy multiplied by the life expectancy at age 't', y and y^erepresent income and income expectations of a household respectively, a is the assets of the household and t refers to the current specific age of the household head.

Two implications arise from this equation, as postulated by Modigliani and Brumberg (Modigliani 2005a), that are crucial for the construction of the variables for use in the econometric model. The two implications are: 1) savings is represented by the age of the household head over the household head's life cycle primarily from working age until retirement or the end of one's life expectancy, 2) a permanent or temporary increase or decrease in incomes will have different implications for the household's life cycle savings.

Under a permanent increase/decrease in incomes from implication two, household savings over the life cycle will adjust to include this impact. If the impact is positive asset accumulation occurs, while if the impact is negative asset de-accumulation occurs. Based on implication two a household's assets require re-adjustment during the working years in order to ensure that enough assets exist to finance the retirement years.

The savings path is the residual of the augmented/diminished hump-shaped income path less the consistent (flatter) consumption path. Hence, the savings path is expected to exhibit a hump shape albeit with a smaller hump than the income path. Households with greater asset accumulation, such as the ownership of a house or a car, also raise the hump-shape of the savings path although this increase only raises the path slightly higher than the initial assets savings path.

A temporary increase/decrease in incomes on the other hand results in a larger increase/decrease in the hump-shaped savings path compared to the initial savings path. However, the temporary savings path returns to the initial savings path once income has stabilised. Furthermore, no asset accumulation or reduction takes place.

Whilst implication two provides the expectations of a permanent or temporary increase or decrease in incomes on savings, implication one of the LCH model gives rise to a more practical consideration of how to represent the LCH model within cross-sectional household data. More importantly, the issue of the construction of the various household demographic factors such as income, consumption, savings rate and the gender of many households is crucial. Based on these constructions, the household factors would need to be able to represent a typical household and its characteristics across the different ages of the household head. The outcomes drawn from these constructed variables should hold across different time periods, different ages, and should capture any generational effects.

The empirical technique, otherwise known as the age cohort technique, was described in Deaton and Paxson (1994) and derived from Deaton (1985). The steps according to the study were as follows: each household demographic factor in the cross-section for each survey year was grouped according to the age of the household head. The mean of each household demographic for that particular age was then taken to represent the impact of that household demographic factor at that age over the household's life cycle. Therefore, the demographic factors of a household are expected to display the hump-shape of the LCH.

For example, when plotting the gender, income and savings against the age of the household head it is expected that all three variables show hump-shapes.

In this study, the pre-GFC period is assumed to experience a permanent increase in income with the implications of an increase in asset accumulation and a higher hump-shaped savings path displayed over the life cycle of the household. This increase in hump-shaped savings is expected to be shown by all household heads across the working ages of 15 – 65 years of age, as defined in the survey. Households with assets such as the ownership of a car or a house are also expected to have higher savings paths compared to those with no assets.

During the post-GFC period the decline in income is assumed to be temporary, implying a vertical drop in the life cycle savings path compared to the initial savings path of the post-GFC period, and when compared to the pre-GFC savings path. This vertical drop is implied for all ages of the household head due to the economy-wide shock of the GFC in South Africa (Verick 2010). The difference between the pre- and post-GFC expectations display the negative impact of the GFC on the retirement savings paths of South African households under the LCH framework.

Country-specific factors such as the legacy of Apartheid and the social pension system, also potentially influence household savings patterns in South Africa (Betrand *et al.* 2003; van der Berg *et al.* 2010). Although the implications remain similar to the above, where the hump-shape of the LCH is displayed, the different population groups may show different sensitivities to the GFC shock. These factors can thus capture specific country impacts on household savings behaviour and any deviations thereof.

A final factor to consider in cross-sectional data is the differences in the sample composition. Although the LCH framework includes these population changes into the model, albeit at the macroeconomic level only (Ando & Modigliani 1963), household savings may differ due to particular changes in household demographics. These impacts may be negligible depending on the survey data's descriptive statistics.

Therefore, further discussions on this point are continued in the data section where descriptive data can guide the expectations of the two sample periods' outcomes following the LCH framework.

3. Literature Review

Vast amounts of literature testing the implications of the LCH provide a wealth of conclusions and insights into the potential usefulness and apparent explanatory powers of the model (Browning & Crossley 2001; Pistaferri 2009). Empirical tests performed in both developed and developing countries that specifically analyse cross-sectional household data using age and age group cohort techniques are drawn upon for comparison in this section. These papers offer useful insights into the implications of LCH savings behaviour for South African households.

Among developed nations such as the United States (US), United Kingdom (UK), Germany, Australia, and Italy a mixture of support for the hump-shaped savings path was observed (Belke *et al.* 2012; Pistaferri 2009; Attanasio & Browning 1994; Modigliani 2005b; Harris *et al.* 2002). In Australian households, savings appeared to be highest for the youngest working age population of 18 – 24, unlike the expectations of the LCH. The wealth (home ownership) and dependency ratio implications of the LCH were, however, still realised. Dependence on government-provided pensions was also a concern in Australia, although households over the age of 65 saved much more of their incomes relative to the other age groups under the LCH framework. This observation suggested that the perception for government pension dependence was high among young working Australian households, which resulted in lower savings during the younger working years as observed in the results (Harris *et al.* 2002).

The study on Australian household savings behaviour had tested many different savings hypotheses and concluded that the LCH model was useful up until a certain age when the income effect of the Keynesian model dominated the life cycle savings effect of the LCH. This typically occurred around the age of 35 years old leading to the conclusion that the old-age retired population of over 65 years, which saved greater relative to the other age groups, may lower social burdens than is implied by the LCH model (Harris *et al.* 2002).

In Germany the LCH hump-shape was traced quite well until retired household heads at 75 years of age had increased their savings to 2% after their retirement decline of negative 5% at age 65 years (Belke *et al.* 2012). The increase in savings during the retirement phase among German households implied that the LCH model including the bequest motive was important to explain retirement savings behaviour (Browning & Lusardi 1996; Belke *et al.* 2012).

The findings of this study further revealed that housing as a wealth component had a greater impact on German households compared to the other wealth components of equity ownership and savings deposits in banks (Belke *et al.* 2012). Their findings concluded that German household home-owners had a sufficient amount of assets to support their retirement consumption and therefore did not need to accumulate more types of assets. The savings peaks of German households occurred when the household head was between the years of 30 and his/her mid-40s, and constituted 9% saved from disposable incomes

In Italy household saving profiles illustrated precisely the hump-shape of the LCH savings and income paths where a flatter consumption path implicated by the LCH framework was also displayed (Modigliani 2005b). The paper additionally highlighted the importance of defining household savings rates. If household savings is defined by the total household income including contributions to private and social pensions less total household consumption including all expenses divided by household income, then the LCH framework would be useful at explaining the savings behaviour of a household. If household savings, however, was not defined as this then it is expected that the LCH model is not helpful in understanding household savings rate behaviour. This was one of the reasons suggested for why studies had not concluded the LCH model (Modigliani 2005b).

Among UK and US households the hump-shaped income and flattened consumption paths were similarly observed. This was, however, only seen after household demographics such as education levels, population groups, the number of adults and children, and household labour supply were controlled (Attanasio & Browning 1994). Additional factors that were also found to potentially explain the deviations in the hump-shaped savings and income paths of American households were the gender, financial literacy, main financial-decision maker and marital status of the household head (Lusardi 2007; Attanasio & Browning 1994).

In a study by Lusardi (2007) it was observed that, in US households, women, African-Americans, Hispanics and single-headed households illustrated much lower retirement savings relative to other demographic groups. Also, the main financial-decision maker of the household was typically a man.

These findings were similarly shared in the developing countries of Ghana and Zimbabwe where women were observed to save less and where men dominated the financial-decision making process (Chowa 2006; Ersado, Alwang & Alderman 2000).

The years of analysis for the household survey studies of developed countries appeared to be calm with no specific year or country policy effect creating distortions in the income, consumption, or savings paths. Although some unobservable generational or cohort impacts were considered necessary to include into the model, the procedure to do this was uncertain (Harris *et al.* 2002; Deaton & Paxson 1994). Nevertheless, the age and age group cohort categorisation crystalised the LCH implications for household savings, income, and consumption paths in developed countries.

Household savings behaviour in developing countries in contrast resulted in slight deviations in savings and consumption paths from the LCH expectations. In Taiwan the savings paths were much flatter while the consumption paths illustrated 'tracking' of household incomes (Deaton & Paxson 1994). The findings of the study suggested that the possible differences could be due to the sample composition of the different age groups. For example, Taiwanese males dominating the ages of 40 – 65 years old were of a military background, single, and received government pensions. This savings profile implied vastly different savings characteristics compared with the other age groups in the sample. In spite of the differences in the age cohorts, Taiwanese savings behaviour suggested a more Keynesian-like income-savings relationship (Deaton & Paxson 1994).

In another study on Taiwanese household savings behaviour, the outcomes were found to be more favourable toward LCH savings once the household demographic factor of education levels had been included (Attanasio & Szekely 2001). The hump-shape of the savings path was more pronounced the higher the education level of the household head. These results were similarly found in the household savings of Peru, Mexico and Thailand, although compared to Taiwanese savings, these countries' household savings were lower (Attanasio & Szekely 2001).

Another important explanatory variable in these four countries was the female participation rate in the labour force, which was observed to increase household savings rates (Attanasio & Szekely 2001). This was partially because of the increases in total household income and the temporary increase in incomes of females.

Additional contributions to the high savings observed in Taiwan and then followed by Thailand compared to Peru and Mexico, were the country-specific factors of high economic growth in East Asia compared to the volatile growth of Peru and Mexico at the time of the 1970s to the late 1990s (Attanasio & Szekely 2001).

Household savings patterns in Morocco and Poland similarly found evidence in favour of the hump-shape of the LCH, although an additional variable that contributed to this explanation was the residential locality (urban or rural) of the household (Abdelkhalek, Arestoff, Mage-Bertomeu & Mekkaoui 2009; Liberda & Peczkowski 2005). In Morocco, especially, urban households were observed to save four times more than their rural counterparts (Abdelkhalek *et al.* 2009). This was due to the availability of greater job opportunities, and therefore higher incomes, in urban areas compared with the rural areas; this was observed in Australia (Abdelkhalek *et al.* 2009; Harris *et al.* 2002). Interestingly, in Poland farmers (residing in the rural areas) saved the most; however, their savings motive was primarily explained by the precautionary motive (Liberda & Peczkowski 2005).

In the study of Polish household savings an interesting and alternative methodology was utilised in the analysis of household savings behaviour (Liberda & Peczkowski 2005). Unlike traditional econometric regression models, the authors assessed the mobility of a household's savings potential by using a technique known as the mobility matrix (Formby, Smith & Zheng 2004). This methodology provided stimulating results by giving long-run probabilities of household savings rates based on current household savings rate distributions (Schluter 1998; Shorrock 1978a). The technique was able to clearly reveal strong polarisation of household savings rates in Poland (Liberda & Peczkowski 2005). Moreover, the long term probability of household savings could be observed where more than 30% of Polish households were seen to consistently save over 20% (the highest savings rate class) of their incomes for the sample period of 1997 – 2000.

The availability of the datasets from developing countries also played a pertinent role in testing frameworks such as the LCH (Bureau for Research and Economic Analysis of Development 2003; Fields & Ok 1999; Fields, Hernandez, Rodriguez & Puerta 2006). This does not imply that data measurement issues were not prominent in developed countries; however, because of the accuracy, length and reliability of the developed countries' datasets, testing the LCH was more easily concluded (Pistaferri 2009; Browning & Lusardi 1996).

The quality of the datasets employed, as well as the definition of the household demographic factors, again raised concerns for testing the LCH in both developed and developing countries (Modigliani 2005b).

Currently in the developing country of South Africa, the savings theories tested have been a mixture of the LCH, the overlapping generation models, the PIH, and some calibration models.

Household savings behaviour has also been better understood in the contexts of the savings interactions between corporate and household savings components, the health costs of HIV/AIDS, and the savings behaviour of the majority population group as well as poor households (Mba 2007; Freire 2004a, 2004b; Aron & Muelbauer 2000; Nga 2007; Chauke 2011; du Plessis 2008).

In Aron and Muelbauer (2000), the interaction and link between corporate and household savings was investigated. The link between household savings and corporate savings was through the ownership of corporate financial assets by the household (not previously examined by the Reserve Bank due to the volatility in asset prices according to the authors' data analysis). They found significant results when household savings had included the financial assets of stocks and could therefore decompose the household wealth into liquid (stocks) and illiquid assets.

From this investigation the authors were led to their next research topic: the composition of household wealth – illiquid, particularly housing, and liquid (financial stocks) assets in the importance of the households' balance sheet and savings in South Africa (Aron & Muelbauer 2006). Both the Aron & Muelbauer studies highlighted the significance of wealth and asset accumulation of the household, illustrating the LCH implication that increases in asset and wealth accumulation increase savings, especially for retirement.

At the microeconomic level impacts of the health factors of HIV/AIDS and malaria on household savings behaviour were analysed. The findings revealed that household savings severely declined in both the immediate future and in the long-term (Freire 2004a, 2004b; Mba 2007; Sachs & Malaney 2002). This was due to losses in labour productivity, income, human capital building, increasing medical expenses, social costs, a decline in life expectancy, and funeral costs (Freire 2004a, 2004b; Mba 2007; Sachs & Malaney 2002).

Links between the health factors and the LCH savings model have not been focused on in South Africa because of the intergenerational impact that HIV/AIDS has on the infected and non-infected members of a household (Freire 2004a).

Hence, the savings models used to explain the HIV/AIDS impact were the infinite-horizon model such as Gali's (1990), which was employed in the study by Freire (2004a). It would therefore be interesting to test this impact under the LCH framework where health impacts would be expected to impact on population growth, household dependency ratio, and life expectancy.

The impact on life expectancy would be of particular interest under the (microeconomic) LCH model as the number of earning years for an individual and a household would be expected to decline, thereby influencing the age-savings path (Freire 2004b).

Other household savings literature at the microeconomic level assessed in South Africa primarily focused on qualitative (surveys and interviews) research of targeted population groups such as the urban poor and the Black middle-class (Mba 2007; Nga 2007; Chauke 2011; Shangase 2007). These studies illustrated the importance of examining the impacts of ethnicity and residential locality, as well as the interaction of ethnicity and incomes/savings (caused by the consequences of Apartheid) in South Africa.

In a study by Case (1998), it was observed that the differences in the income and expenditure trends between the majority population group of African/Black households and the minority population group of White households was rather contrasting. The income and consumption patterns illustrated an inequality in the distribution of income and consumption that favoured the minority population group. Therefore the results displayed were very polarising. The divide in population groups may contribute to the understanding of South African household savings behaviour.

In addition to this legacy of Apartheid, South Africa's unique social pension and grant system also suggests non-random household compositions that could potentially distort household savings behaviour under the LCH framework (Case & Deaton 1998; Betrand *et al.* 2001; van der Berg *et al.* 2010). Although social pensions and grants were perceived as regular income by elderly pensioners heading the household (Esson 2003; Case & Deaton 1998), among younger grant receivers savings and consumption paths may potentially deviate from the LCH. Some studies have argued against social grants because of a heavy dependence on government funding (Nhabinde & Schoeman 2008; van der Berg *et al.* 2010), while other studies have suggested that there are positive impacts on households in terms of financial and food security (EPRI 2002).

Among the urban poor who may not rely entirely on social pensions or grants, the concern of the accessibility of households to savings services and instruments (Nga 2007; Moyo, Musona, Mbhele & Coetzee 2002) was considered the potential factor to improving savings. These studies suggested that a higher access to savings services from a retail bank such as *Postbank* would induce a culture of savings in South Africa. These studies also alluded to the levels of financial literacy in households, which could potentially lower household savings rates (du Plessis 2008), such as in the US (Lusardi 2007).

The importance of having savings instruments, particularly burial societies or funeral savings plans, was concurred in a study on the urban poor communities of Mitchell's Plain and Khayelitsha using data from DataFirst (Esson 2003). The findings of this study concluded that females saved more than males, although males were also observed to save higher than females when other household factors had been removed, unlike the findings in Ghana and Zimbabwe (Chowa 2006; Ersado *et al.* 2000). Also, the educated saved more than the less-educated because of their ability to understand the meaning of savings; larger households saved less, and African/Blacks saved more than non-African/Blacks. The last finding is interesting in light of the differences in income and spending habits of the various population groups (Case 1998).

Although Esson (2003) had set out to find LCH savings behaviour, the results of the study had not supported the implications of this hypothesis. The reason was due to poorer households' inability to finance the funeral costs of their elderly household members; elderly household members were therefore observed to have comparatively higher savings than their younger household members. This implied that the younger working age displayed low savings compared with the elderly retired age group (Esson 2003).

The remaining studies focused on the population group of the Black middle class (Chauke 2011; du Plessis 2008) where they were found to dis-save. The study pinpointed the behavioural aspects of savings: a lack of self-control and the mentality of consumerism due to financial liberalisation (easier access to credit) as contributors to low savings rates (Chauke 2011; du Plessis 2008).

Overall, household savings studies on South African households were highly targeted, where conclusions for specific population groups could only be established.

Moreover many variables had been suggested as having an impact on South African household savings behaviour. The choice of variables in consideration for the empirical analysis of this study is therefore guided by the parameters of the LCH framework detailed in the theoretical framework section (see Equation one). The impacts of additional household demographic variables are, however, also included in the empirical analysis albeit in the first methodology. In the second methodology, however, only the variables of particular interest to the study; population group and the social grants and pensions, are further assessed. These variables are further assessed because of their potential distortions on the income distribution of South Africans. Thus it is of interest in testing whether these factors, which are also country-specific as they represent South Africa's unique history and social welfare system, influences the household savings behaviour of the country.

Current household surveys with a representative sample of the South African population have been made readily available through the various research and government institutions' websites: Statistics South Africa (Statistics SA 2002, 2004, 2008, 2010), the Income and Expenditure Survey 2005/6, 2010/11 (IES), and the National Income Dynamics Survey of 2005/6, 2010/11 [NIDS] (Southern Africa Labour and Development Research Unit 2008). The employment of these datasets could therefore establish a comprehensive microeconomic study of South African household savings behaviour. This objective could thus fill the gap in the literature for a representative and formal analysis of South African household savings behaviour. Furthermore this research could also contribute to the scarce literature that has already tested the implications of the LCH model in South Africa.

4. Methodology

The study employs two methodologies in the analysis of South African household savings behaviour pre- and post-GFC within the framework of the LCH. The first methodology of the Absolute Transition Mobility Matrix (TMM) tracks the changes in the savings rate of households over the two years in each of the two periods pre- and post-GFC to assess the overall mobility of household savings. This bi-variate analysis is further complemented by the second methodology of a multivariate regression analysis that utilises Ordinary Least Squares (OLS) regression.

In the first methodology, the implications of the LCH are clearly observed in the mobility or changes in the savings rate. Pre-GFC changes in the household savings rate are expected to have upward mobility in contrast to the downward mobility of post-GFC household savings. This is due to the expected declines in household incomes in the post-GFC period compared with the pre-GFC period. One of the advantages of utilising TMM is that different sets of time periods can be compared as long as the lengths of time (years) in the different sets of time periods coincide.

For example, due to the collection of survey data some households are tracked in certain years – that is in 2002 and again the same household was interviewed in 2004. While in other years a different set of households were tracked – that is in the years of 2008 and again in 2010. The TMM is able to compare these two completely different sets of households across the two different sample periods provided that all the households for both the different sample periods were interviewed with the same length of time between the first and the last interview (without having been interviewed in the in-between years). In this example, and for this study, the length of time is the same for the two periods of pre- and post-GFC (Chen 2009; Formby *et al.* 2004).

An additional requirement for the employment of the TMM is that the two sets of data are compared on the same categories, which are typically taken as the categories of the dependent variable (Chen 2009). For example, household savings rates can be divided into: the over 50% savings rate, or the less than 50% savings rate. These two categories are used to compare household savings rates across the two sample periods. The end benefit of applying this technique is that the initial distribution can have a varying number of households falling into the different boundaries, hence comparing the absolute distance the household has travelled over time from its starting position (Formby *et al.* 2004; Fields & Ok 1999).

The Mobility Matrix methodology was originally utilised in poverty analysis due to its ability to capture household movements into and out of poverty based on a particular characteristic such as the gender of the household head (Woolard & Klasen 2004). Moreover, households falling on the border of either remaining in the lowest or moving into the second lowest poverty group could also be analysed (Woolard & Klasen 2004). This last observation was particularly important for poverty analysis as policies could be assessed (Woolard & Klasen 2004; Fields & Ok 1999). For example whether financial aid would push households out of poverty and into the next income level or whether the financial aid would simply be lost due to the position of the household (Woolard & Klasen 2004; Fields & Ok 1999). The technique could additionally extend to various policy reforms or natural disasters, as well as shocks to an economy (Villanger 2003; Liberda & Peczkowski 2005).

It is from this application that the study aims to draw in analysing the impacts of household savings behaviour before and after a (GFC) shock. Additionally, specific household demographic factors could also be analysed to further understand savings mobility in South African households to further aid policy makers. The use of the TMM on household savings behaviour has only been found in Liberda and Peczkowski (2005) on Polish household savings mobility thus far. Other studies applying the TMM have been specifically towards income and consumption mobility (Jappelli & Pistaferri 2000; Bhattacharya & Mazumder 2011; Mazumder 2012; Biewen 2002; Villanger 2003; Burkhauser, Holt-Eakin & Rhody *et al.* 1997). This study therefore brings an additional perspective to the household savings literature by applying the methodology to South African households.

Below follows a brief description of the methodology.

The TMM methodology transforms an overall matrix such as Y, in this instance the household savings rate mobility matrix, into its smallest form, known as the Transition Mobility Matrix (TMM) 'X' (Formby *et al.* 2004; Fields & Ok 1999; Schluter 1998). In this study, the TMM would be the household savings rate mobility matrix under each household characteristic. The interpretations of both the household savings rate matrix and the specified matrices are similar as both outcomes describe the movements, also known as the transition probabilities, of a household's savings rate. The distinction is so that the appropriate Mobility Matrix technique can be employed (Formby *et al.* 2004).

A simple illustration of this technique is found in Table 1.

Table 1: A Simple (Absolute) TMM

		t + 2		
		Pass	**Fail**	**Total**
t	**Pass**	2 (40%)	3 (60%)	5 (36%)
	Fail	4 (44%)	5 (56%)	9 (64%)
	Total	6 (43%)	8 (57%)	14 (100%)

Source: Author's own illustration

It can be seen that the number of 'Passes' and 'Fails' are different from the initial period 't' to the final period 't + 2'. These absolute numbers are translated into percentages that denote the proportion of individuals in each category at each time. The percentages show the transition probability of an individual passing or failing in the final period given their initial starting position. For example, an individual starting in the pass category at time 't' has a 40% chance of passing in the final period, whereas an individual starting in the fail category has a 44% chance of passing in the final period. The likelihood of an individual falling into the pass or fail category is found under the 'Total' column where 64% fall into 'Fail' in the initial period, but decline to 57% two years later. This is known as the long-term probability of the matrix.

The absolute numbers can be transformed into the transition probabilities of a matrix due to the Markovian nature of the matrix: i.e. the outcome of the matrix depends on the starting position, as well as the ergodic structure of the matrix (Formby *et al.* 2004; Liberda & Peczkowski 2005). This ergodic structure implies that the transition probabilities of the 'Total' columns' can be interpreted as long-term probabilities. The transition probabilities on the diagonal represent the immobility of the individual: i.e. being unable to move away from their initial position, while the off-diagonal probabilities show the mobility prospects of the individual moving upward or downward from their starting position.

The significance and mobility index of the movements in the matrix can be compared to other row movements within the same transition matrix, as well as to other transition matrices with similar dimensions. The equations employed are described below. These equations are some of many that can be used to significance test and calculate the mobility of the matrix. For more tests to apply please refer to Formby *et al.* (2004) and Schluter (1998). The Absolute TMM assumes asymptotic distribution, as is most often the case (Biewen 2002).

The study's large sample size, however, permits this assumption because of the consequences of the large sample properties and the central limit theorem holding true.

The significance tests and mobility index are drawn from Jappelli and Pistaferri (2000). Although the equations were applied to quintile TMM, the equations are still employable for the Absolute TMM because of its foundations in Shorrock's (1978a) index (Shorrocks 1978a; Schulter 1998). The study adopts the slight modifications adapted by Jappelli and Pistaferri (2000) for their study: the denominator binds the estimator between 0 and 1 for maximum likelihood estimation.

The equation can be expressed as follows: P is the transition matrix, $S(P)$ is the mobility index, $S(\tilde{P})$ is the maximum likelihood estimator of $S(P)$ and q is the number of savings classes.

$$S(\tilde{P}) = \frac{q - trace(P)}{q} \quad (2)$$

The interpretation of the estimator ranks the mobility of similar-sized matrices where one is perfect mobility and zero is immobility (Shorrock 1978a). It is important to note that this index only has meaning if it is compared to another matrix, and on its own cannot provide much sense unless it is significance tested.

It follows that to test the significance of this index, the constructed Z-values taken from both Schluter (1998) and Jappelli and Pistaferri (2000) are:

$$Z_1 = \frac{\frac{q - \sum_i \hat{p}_{ii}}{q} - V}{\sqrt{\frac{1}{q^2}\sum_i \frac{\widetilde{p_{ii}}(1 - \widetilde{p_{ii}})}{n_i}}} \sim N(0,1) \qquad (3)$$

The Z_1 value tests the significance of the index such that V, the variance of the transition matrix, assumes a given value V; $\widetilde{p_{ii}}$ is the probability that a household will stay in its original savings class i across the 't' year period; n_i is the probability that a household will fall into a savings class i, and N represents asymptotic normal distribution with mean zero and variance one. The null hypothesis for Z_1 is that the variance assumes the given value V.

The interpretation of Z_1 is that the mobility index is statistically significant if the value determined from equation three exceeds the Z-value under the normal distribution table.

The implication of equation three suggests that a household characteristic is important in influencing the different savings rate classes (seen in the differences in the transition probabilities of the various rows of the same matrix). To test the significance of one matrix to another, equation four below is employed.

Equation four determines whether a specific household characteristic under the TMM is more significant pre-GFC or post-GFC. It can also test whether a specific category within the household characteristic, for example the female household head, is more statistically significant in impacting on household savings behaviour.

Equation four is described below where Z_2 is the difference-of-means test value, $S(\widehat{P_t})$ is the estimator of a transition matrix across time, and $S(\widehat{P_v})$ denotes the estimator of a transition matrix across different household categories.

$$Z_2 = \frac{S(\widehat{P_t}) - S(\widehat{P_v})}{\sqrt{s.e.(S(\widehat{P_t}))^2 + (S(\widehat{P_v}))^2}} \sim N(0,1) \qquad (4)$$

In the second methodology, the econometric model that arises from the theoretical model shown in equation one results in an OLS regression with savings rate as the dependent variable denoted as 's' (Equation 5). The right-hand side independent variables of age, age squared (represents the hump-shape of the LCH) and wealth in equation five represents the parameters of the LCH model (see equation one). In order to test the LCH model in its pure form, other demographic variables included in the mobility matrix analysis such as education and gender has been put aside.

The additional variables of social pensions and population group dummies were included for interest in order to understand whether country-specific factors such as South Africa's past (considered to be captured in the population group dummies) and South Africa's social grants system has a contributing effect on South African household savings behaviour. These independent variables or regressors have additive impacts on household savings rate.

$$s = Age + Age^2 + dummy + Age_{dummy} + Age^2_{dummy} + wealth + wealth_{dummy} + totalgrants + totalgrants_{dummy} + majority_{population} + majority_{population_{dummy}} + error \qquad (5)$$

The above independent variables or regressors are repeated in equation five with the subscript *dummy* to represent the post-GFC period, in other words, the impact of these demographic factors on household savings behaviour after the shock of the GFC.

The *dummy* variable in equation five therefore represents the time period post-GFC or the impact of the GFC on household savings behaviour. Details on the construction and definition of the regressors in the model are described in the data section below. The relevant model specification tests for cross-sectional data using an OLS regression model are also performed.

The outcomes of these standard tests of multicollinearity, heteroskedasticity, kurtosis and skewness, and the normality of the white noise error term (Gujarati 2003) are provided in Appendix 10b.

5. The Data

The study utilised Statistics South Africa's General Household Survey (GHS) data from the years 2002, 2004, 2008 and 2010, where 2002 and 2004 represented the pre-GFC period, and 2008 and 2010 denoted the post-GFC period. A comparison of the survey data's savings rate and population growth to National data was provided in order to illustrate the representativeness of the survey data. A description of the data cleaning process from the raw data files of the GHS survey, as well as a descriptive summary and definitions of the dependent and independent variables guided by the LCH framework, then follows.

5a. Comparison of National and Survey Data

When comparing the GHS and National account figures the GHS survey data appears to both overestimate and underestimate the savings rates (Table 2). Although the survey data appears to differ substantially from the National data, it is important to mention that the GHS survey data is only based on the households that were present in both time periods pre- and post-GFC (see section 5b for details). In spite of this the GHS survey data, and survey data in general (Modigliani 2005a), have been known to suffer from omissions and inaccuracy, especially in the case of sensitive information such as household incomes, and even consumption expenditure (Statistics South Africa 2002, 2004, 2008, 2010). Though the GHS survey data has been found to be rather robust due to its national coverage and low attrition rates (Statistics South Africa 2002, 2004, 2008, 2010), the interpretation of the results within the LCH framework should take into account the constructed data sample used.

Table 2: Comparison of National and Survey Data

	Household Savings Rate (%)			Population			
	National	GHS Survey		National (Millions)	Growth (%)	GHS Survey (Millions)	Growth (%
2002	0.70%	0.47%		45.81	-	15.63	-
2004	0.40%	-3.67%		47.02	2.57%	16.54	5.87%
2008	-0.01%	6.07%		49.56	5.13%	22.79	37.74%
2010	-0.01%	-6.94%		50.90	2.62%	15.21	-33.25%

Source: Quarterly Bulletin of the South African Reserve Bank (2013), Statistics South Africa (2002, 2004, 2008, 2010), Statistics South Africa Country Projections by Population, Sex and Age (2013)

The sample population analysed varied from the National population as only the same individuals that were interviewed over the two years over each time period had been included in the sample. An interesting figure to note was that of the 2010 GHS sample population figure where the number of individuals had declined by 33% from the 2008 level.

This decline was attributed to household size decreasing due to a larger proportion of households in 2010 being categorised as having one or two household members compared to the average four members of the other survey years. Thus household size may play an important role in explaining household savings behaviour in the post-GFC period.

5b. Data Cleaning Process

The study tracked the same household – which comprises one household head (the same person leading the household) and at least one household member – over a short period of time. This household was known as the *true* household, which collectively made up a true household panel set for each time period. Due to the limitations of the GHS survey, the years that followed the same households over time were those of 2002 and 2004 (pre-GFC), and 2008 and 2010 (post-GFC). The two sample periods each provided a true household panel.

The raw data format provided by Statistics South Africa had many data inconsistencies. The individual household responses for the age, gender and ethnic group questions did not always match over the two years in each sample period. Information also appeared to be missing due to the omission of questions. Moreover, problems arose from the definition of the household and the household's dwelling unit resulting in issues of multiple-headed households. The last point illustrates a limitation in the GHS methodology as a household was defined as a group of individuals living in the same dwelling unit, such as a residential house, and not by the composition of a (true) household. Both household panel sets therefore required an intensive cleaning process in order to sort the data for the study.

The cleaning process entailed several steps. The first step was to check for consistencies in terms of matching gender and ethnic group across the two years for both sample periods. The age of the individual was also checked according to the equation of age increasing by one year (the individual may have completed the survey before the birthday), by two years (this is expected due to the survey being conducted two years later), and by three years (the individual may have celebrated a birthday just before receiving the survey to complete) over the sample period. All persons that did not satisfy these requirements were excluded from the sample, as were persons with any missing information such as that of income.

A true household panel was then established through using the existing household definition from the sample data. This pertinent step was the most delicate as households were, for the purposes of the current study, also permitted to change household compositions. In this instance, household heads could be re/married, separated, divorced or widowed, as well as increase or decrease their household size over the two years. The changing household compositions were permitted in order to retain large sample sizes.

The starting point to establishing a true household panel was in using the dataset's unique household identifier to ensure that the individuals of the same household lived in the same dwelling unit. The responses to the *Relationship-to-the-household-head* question in the GHS survey were then examined, where the consistency of the responses for the two years resulted in a true household. This evaluation also ensured that multiple-headed households were separated into true individual households within the same dwelling unit, which was also made possible due to household members' information typically following that of the household head. This simple methodology appeared to be suitable as the majority of the individuals belonging to the same household resided in the same dwelling unit and were readily matched across the sample years of 2002 to 2004 and 2008 to 2010.

The construction of a true household among those with changing compositions also utilised the unique household identifier in addition to the following:

- Marital Status – This applied to household heads changing marital status where the initial household head's characteristics of gender, ethnic group and age were cross-referenced to the same variables for the marital partner of the household head two years later. This was similarly performed for the partners of the household heads who later became the household head due to divorce, separation or widowhood.

- Household size – This applied to households changing household sizes where the *Relationship-to-the-household head* question was again employed for consistency checks for both existing members and new additions. The new additions' age and gender were assessed to ensure that the responses to the *Relationship-to-the-household-head* question were reliable. Households that decreased in household size were treated in the same manner as households that did not change composition.

The ages of the household head analysed in this study were between the ages of 15 – 75 years. This was done to include the working age years and the retirement years of the household. The resulting number of households analysed in the study were therefore 7,801 households for pre-GFC and 8,979 households for post-GFC.

5c. Variable Definition and Data Summary

The variables analysed in the study were the primary factors of household savings rates. Namely: age and age squared of the household head, total household grant receipts, household wealth, and the interactive population-age groups of the household head. Additional variables assessed in the study that contributed to the expectation of the LCH savings behaviour were the household demographic variables as described under the independent variable section of Table 3. All variables in the table below were kept static for TMM: i.e. households that had changed marital statuses were not analysed under the TMM for comparison of household savings mobility under the same variable categories across pre- and post-GFC. The dependent variable was constructed as detailed in Deaton & Paxson (1994). Household savings was converted to constant 2008 prices for comparison.

Table 3: Independent & Dependent Variables

Variables	Description
Independent	
Age, Age squared	Five age groups: first group is 15 – 34 years old, second group is 35 – 44 years old, third group is 45 – 54 years old, fourth group is 55 – 64 years old, and the fifth group is 65 and over years old, based on Liberda & Pezckowski (2005) and Harris, *et al.* (2002)
Gender	Male and Female, sourced directly from GHS survey data
Population group	Majority: African/Black and Minority: Coloured, Indian and White, sourced directly from GHS survey data
Education	Three education levels: basic primary, basic secondary, and tertiary education according to the education classifications of the Department of Education (SAinfo, 2013)
Marital Status	Married/Living together as husband and wife, and Single comprising of never married or divorced/separated/widowed, sourced directly from GHS survey data
Household Size	Three groups: first group consists of less than/equal to two household members, second group consists of between two to five household members and third group comprises of over five household members, determined from the graphical distribution of the household size variable calculated using GHS survey data
Dependency Ratio	Total household members not in the work force: less than 15 years old and equal to/older than 65 years of age divided by total household members in the work force: between 15 – 65 years of age
Total Grant Receipts	Determined from GHS survey data
Location	Urban and Rural, sourced directly from GHS survey data
Wealth	Ownership of durable goods of house and car, determined from GHS survey data. GHS 2010 did not include the question with regards to car ownership
Main Income Source	Six main income sources: Salaries/wages, remittances, pensions/grants (assumed social pensions), sale of farm goods/services, sale of non-farm goods/services, no income
Income Level	Determined from GHS survey data includes contributions to contractionary and discretionary savings less taxes. Households qualifying for the tax thresholds were determined and therefore excluded tax deductions.
Expenditure Level	Sourced directly from GHS survey data includes all expenses incurred, e.g. groceries, rent, transport costs
Job Title, Industry	Sourced directly from GHS survey data. Job title and Industry is categorised into 10 categories, see Appendix 10a for the list of job titles and industries. For the study, two main jobs and industries will be analysed due to the majority of household heads involved in these areas: 1) job titles are Plant and Machinery Operators and Assemblers and Elementary Occupations, and 2) industries are Financial Intermediation, Insurance, Real Estate and Business Services and Community, Social and Personal Services. These figures were excluded in the 2010 GHS survey, hence no savings conclusions could be made with regards to the post-GFC period. Note: Elementary Occupations are the lowest skilled workers while plant and machinery operators and assemblers are a skills level about them.
Dependent	
Household Savings Rate	Household income less household expenditure derived from the monthly savings level multiplied by twelve and divided by the yearly income where the assumption of constant income for that survey year was made, constructed from the GHS survey data.

Source: Compiled from Statistics South Africa (2002, 2004, 2008, 2010) & Author's own variable construction

The household savings rate variable was constrained to represent only average values. This limitation arose from the categorical responses of the household income and expenditure data in the GHS survey.

The categorical format rendered exact savings figures impossible as expenditure and income amounts referred to a particular bracket; for example, expenditure figure one referred to total monthly spending of R0 – R2,400. The midpoint of the different income and spending brackets was therefore taken to represent the household's total monthly income and expenditure. The midpoint technique also assisted in avoiding any over- or under-estimation.

A household's income was represented by the main income source where the majority of the sample indicated that salaries and wages were their main income streams in pre-GFC sample data, while in the post-GFC sample, households' main income streams included non-farm sales in addition to salary and wage incomes. The income source of pensions and social grants was more observed among older household heads (65 – 75 years old). The calculation of the total grant variable was constructed as follows: first, the number of household members receiving the different types of grants was established followed by the product of these members and the specific grant amount they received in that year. Then the total grant amounts were summed for the household, providing the total grant receipts variable for each of the four survey years (refer to Appendix 10c for the formulas). The value of total grant receipts was also converted into constant 2008 prices.

A graphical analysis of the household income and consumption variables in Table 3 plotted against the ages of the household head (Figures 4 – 7) suggested that LCH savings behaviour may be evident among South African households. All figures utilised the graphics from STATA version 12.

Figure 4: Household Income & Consumption 2002

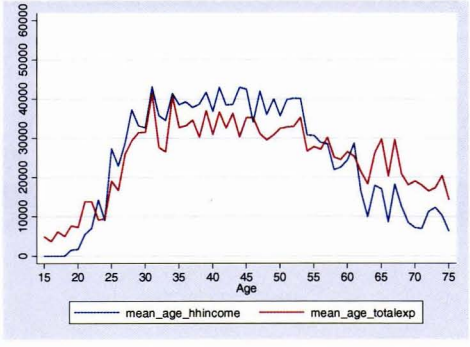


Figure 5: Household Income & Consumption 2004

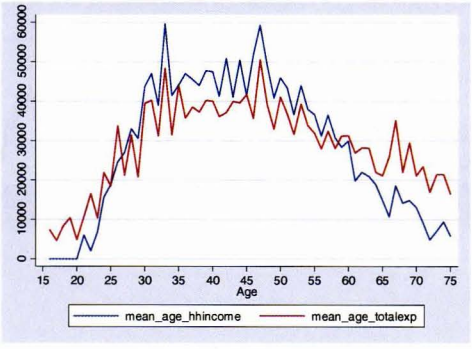


Figure 6: Household Income & Consumption 2008

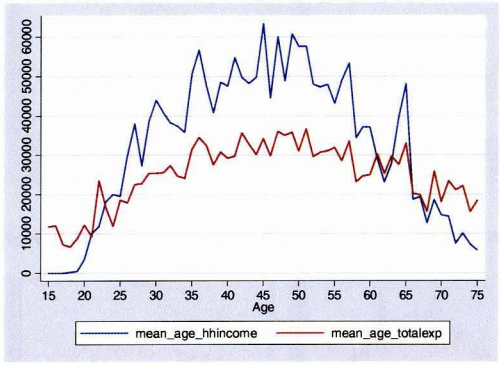
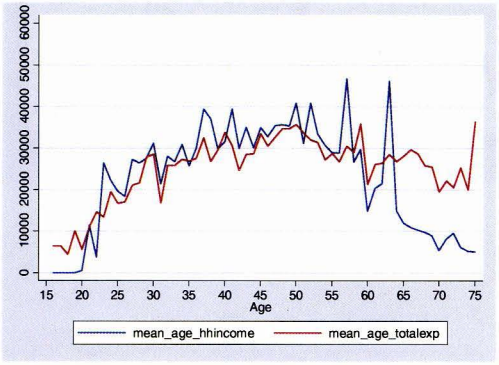


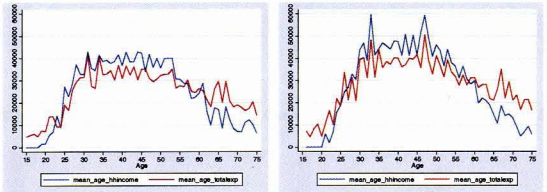
Figure 7: Household Income & Consumption 2010



Across all the survey years household incomes are observed to follow the hump-shaped path (especially pronounced in 2004 and 2008) as expected under the LCH model. Moreover, the expectation that the young working ages and the older retired ages dis-save compared with the working ages is clearly illustrated in Figures 4 – 7. The hump is especially high during the working years of ages 30 – 55 implying a greater amount of residual income is put aside as savings; also, as expected under the LCH model, household consumption is greater than household incomes during the younger working ages of 15 – 25 years and, similarly, after the working age years from around 55 – 60.

The household incomes and consumption of the various household demographic variables were also plotted against time to look for any variations in the hump-shape. Only the main household variables such as gender, population group, social pensions and grant receipts were included below (Figures 8 – 17). The illustrations of these household demographic variables displayed similar trends as seen in Figures 4 – 7. An interesting observation was the similarities in income and consumption of both African/Black and Non-African/Black households, as well as in grant receiving and non-grant receiving households.

Figures 8a & 8b: Household Income & Consumption of Males in 2002 & 2004



Figures 9a & 9b: Household Income & Consumption of Females in 2002 & 2004

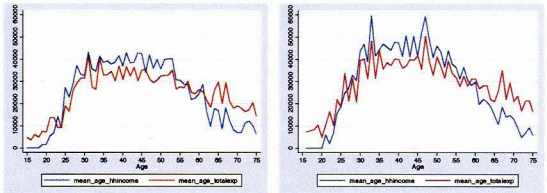
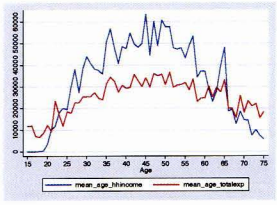


Figure 10a & 10b: Household Income & Consumption of Males in 2008 & 2010



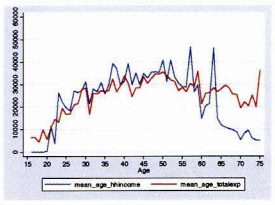
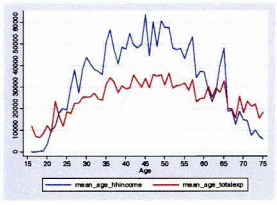


Figure 11a & 11b: Household Income & Consumption of Females in 2008 & 2010



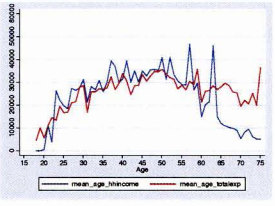
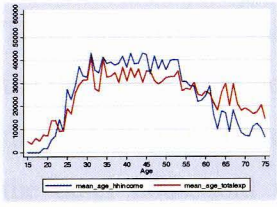


Figure 12a & 12b: Household Income & Consumption of African/Blacks in 2002 & 2004



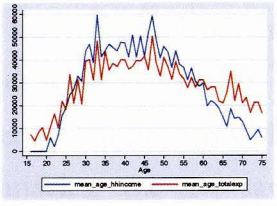
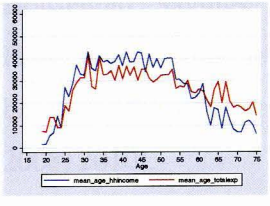


Figure 13a & 13b: Household Income & Consumption of African/Blacks in 2002 & 2004



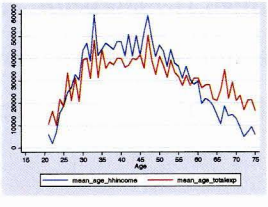
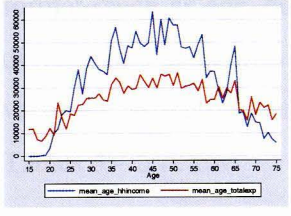


Figure 14a & 14b: Household Income & Consumption of Non-African/Blacks in 2008 & 2010



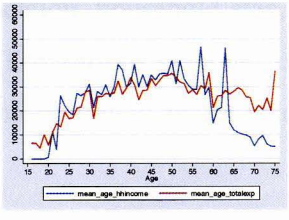
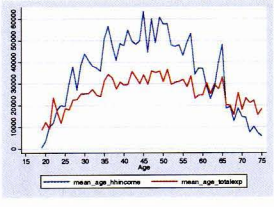


Figure 15a & 15b: Household Income & Consumption of Non-African/Blacks in 2008 & 2010



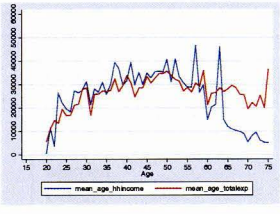
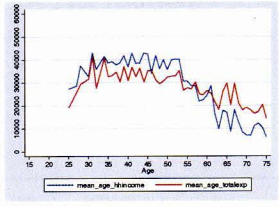


Figure 16a & 16b: Household Income & Consumption of Grants Receivers in 2002 & 2004



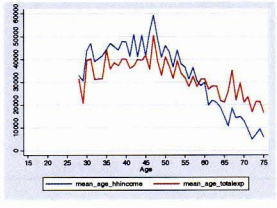
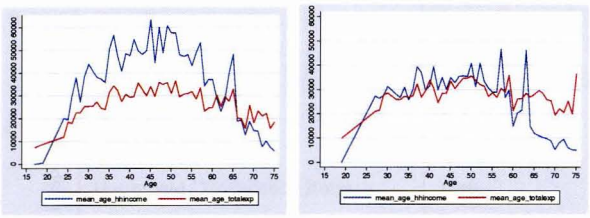


Figure 17a & 17b: Household Income & Consumption of Grant Receivers in 2008 & 2010



Categorisation of the survey data was required due to the initial methodology of the Absolute TMM employed in the study. Recall from the methodology section that the construction of the dependent variable of household savings rates involves an exogenously set category for the savings rates in order to compare across the two sample periods. This is also required for the other household variables. The five savings rate categories employed for the TMM coincided with the study 'Households' Saving Mobility in Poland' and the 'Determinants of Household Savings in Australia' (Liberda & Peczkowski 2005; Harris *et al.* 2002). Household income levels analysed in this study were categorised into five separate groups based on the categorical responses from the GHS survey data (Statistics SA 2002, 2004, 2008, 2010).

The regressors or independent variables of the study that were not initially in categorical format (such as age, education, household size, dependency ratio, total grant receipts) were divided into categories. The various response categories of the dependent and independent variables, as well as the proportion of the sample falling within each category, can be seen in Tables 4 – 6 below.

Table 4: Sample Composition of Household Factors with Binomial Responses

			Proportions (%)			
	Household Factors	Categories	2002	2004	2008	2010
Binomial Response Categories	Gender*	Male	60.8		55.5	
		Female	39.2		44.5	
	Population group*	African/Black	74.33		81.81	
		Non-African/Black	25.67		18.19	
	Marital Status	Single	41.38	41.83	40.34	47.89
		Married	58.62	58.17	59.66	52.11
	Location	Urban	60.3	60.59	57.41	57.73
		Rural	39.7	39.41	42.59	42.27
	Wealth**	Own house & car	76.47	76.94	80.17	100
		Do not own house & car	23.53	23.06	19.83	0
	Job Title/Person Occupation***	Plant & Machinery Operators	50.84	53.97	54.82	NA
		Elementary Occupations	14.45	15.11	15.09	NA
	Industry	Financial Intermediation, Insurance, Real Estate and Business Services	47.43	50.87	52.84	NA
		Community, Social and Personal Services	12.35	12.7	11.76	NA

*Gender and Population group figures represent both survey years **GHS 2010 did not include the question with regards to car ownership hence another question 'means of transport' was used to additionally check that the GHS 2008 car ownership responses could be reconsidered again for the 2010 survey year for the same household ***GHS 2010 did not report these variable responses hence the proportions were taken from the 2008 year to complete the table.

Table 5: Sample Composition of Household Factors with Trinomial Responses

			Proportions (%)			
	Household Factors	Categories	2002	2004	2008	2010
Trinomial Response Categories	Education Level	Primary	47.21	45.06	46.98	52.62
		Secondary	40.81	42.42	43.16	46.05
		Tertiary	11.99	12.52	9.86	1.33
	Household Size	1 to 2	25.69	26.98	23.85	41.25
		2 to 4	33.11	33.35	34.84	35.76
		More than 4	41.2	39.66	41.31	22.99
	Household Dependency Ratio	Zero	29.04	30.09	27.31	28.3
		Zero to 0.5	52.94	27.14	28.24	13.25
		More than 0.5	18.02	42.78	44.45	58.45
	Total Grants	Zero	75.46	95.55	75.04	72.79
		Zero to R10 000	0.21	4.45	0.7	0.01
		More than R10 000	24.33	0	24.26	27.2

Source: Author's own, based on the variable construction of the study

Table 6: Sample Composition of Household Factors with Ordered Responses

			Proportions (%)			
	Household Factors	Categories	2002	2004	2008	2010
Ordered Response Categories	Income	Less than R6,000	43.57	44.55	44.49	54.37
		Between R6,000 to R30 000	22.28	20.57	21.78	17.83
		Between R30 000 to R72 000	21.18	19.61	17.71	15.49
		Between R72 000 to R192 000	11.92	13.47	13.67	11.81
		More than R192 000	1.06	1.79	2.35	0.5
	Consumption Expenditure	Less than R800	0	0	0	0
		Between R800 to R1800	0	0	0	0
		Between R1,800 to R5,000	28.58	14.95	9.91	8.48
		Between R5,000 to R10 000	0	29.06	25.27	19.65
		More than R10 000	71.42	55.99	64.82	71.88
	Household Savings Rates	Less than -20%	21.2	23.51	11.21	28.28
		Between -20% to -5%	7.64	4.24	5.4	7.34
		Between -5% to +5%	8.36	10.91	4.22	20.19
		Between +5% to +20%	46.18	44.23	1.92	30.57
		More than +20%	16.62	17.11	77.26	13.62
	Main Income Source	Salaries/Wages	56.42	53.17	54.29	49.56
		Remittances	12.46	12.05	9.77	6.26
		Pensions/Grants	21.35	26.64	31.69	8.8
		Farm Sales	1.12	1.01	0.73	1.85
		Non-farm Sales	6.06	6.26	1.72	33.35
		No Income	2.58	0.87	1.8	0.18

Source: Author's own, based on variable construction of the study

The composition of the sample for each survey year suggested that household structures were similar over the two periods pre- and post-GFC. The decrease in household incomes was observed in the post-GFC period where it can be seen that the proportion of low income receivers had increased from 2008 to 2010 (Table 6). Savings rates during the post-GFC period had also declined with a greater proportion of households saving between 5% and 20% in 2010 from more than 20% in 2008. This was also in contrast to the higher savings rates in the pre-GFC period (Table 6).

An interesting change in sample composition was observed in the proportion of smaller households as well as the dependency ratio proportion from pre- to post-GFC. Although household size had decreased, the number of dependents (by the definition employed in the survey data) to working age members had increased. Based on the data in Table 5, it implies that the decrease in household size resulted in one working age adult supporting one child or pensioner, therefore the dependency ratio of a household increased. Similarly, the proportion of high spending households also increased from pre- to post-GFC. These observations suggested a potential impact on savings mobility post-GFC in addition to the negative and temporary impact of the GFC on household incomes.

6. Results

The results of the bi-variate TMM and multivariate OLS regression analysis of household savings rate, income, and consumption against the ages of the household head were assessed and compared in this section. Household demographic variables were additionally evaluated under the TMM technique, although these demographic variables were analysed in terms of the savings groups and not the age groups of the household head. Recall from the theoretical section that the savings path was assumed to display the hump-shape of the LCH under the various household characteristics, as well as for the income and savings trends. Moreover, the expected savings path and savings mobility was expected to be positive in pre-GFC and negative in post-GFC. The savings categories under the various household characteristics as well as the variables of savings, income, and consumption, were therefore compared over the two time periods to analyse the pre- and post-GFC expectations.

6a. Transition Mobility Matrix (TMM)

i. Savings-Age Mobility of Households

Table 7: Household Savings Rate (%) of Age Group 15 – 34 Years Old

	2004								2010							
2002	Savings Classes	1	2	3	4	5	Total	πi 2002	Savings Classes	1	2	3	4	5	Total	πi 2008
	1	89.90%	0.00%	10.10%	0.00%	0.00%	100%	10.01%	1	28.87%	0.00%	31.96%	25.77%	13.40%	100%	9.32%
	2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%	2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	3	10.10%	0.00%	10.42%	66.45%	13.03%	100%	31.04%	3	0.00%	0.00%	22.08%	37.66%	40.26%	100%	7.40%
	4	0.00%	0.00%	7.53%	69.89%	22.58%	100%	18.81%	4	7.43%	0.00%	21.71%	54.86%	16.00%	100%	16.81%
	5	6.30%	0.00%	15.11%	23.43%	55.16%	100%	40.14%	5	0.00%	0.00%	24.42%	59.54%	16.04%	100%	66.47%
	Total (πi 2004)	14.66%	0.00%	11.73%	43.17%	30.43%	100%		Total (πi 2010)	3.94%	0.00%	24.50%	53.99%	17.58%	100%	

Mobility Index$_{2002\text{-}2004}$:0.54, Mobility Index$_{2008\text{-}2010}$: 0.75, $Z_{1\ (2002\text{-}2004)}$: 1.25 (0.010), $Z_{1\ (2008\text{-}2010)}$: 1.01 (0.015), Z_2: -10.95***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level ☐ Colour bar representing the diagonal

Table 8: Household Savings Rate (%) of Age Group 35 – 44 Years Old

	2004								2010							
2002	Savings Classes	1	2	3	4	5	Total	πi 2002	Savings Classes	1	2	3	4	5	Total	πi 2008
	1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%	1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%	2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	3	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%	3	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	4	0.00%	0.00%	15.78%	48.93%	35.29%	100%	86.47%	4	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	5	0.00%	0.00%	0.00%	100.00%	0.00%	100%	13.53%	5	0.00%	12.48%	26.50%	37.68%	23.35%	100%	100.00%
	Total (πi 2004)	0.00%	0.00%	13.65%	55.84%	30.51%	100%		Total (πi 2010)	0.00%	12.48%	26.50%	37.68%	23.35%	100%	

Mobility Index$_{2002\text{-}2004}$:0.90, Mobility Index$_{2008\text{-}2010}$: 0.95, $Z_{1\ (2002\text{-}2004)}$: 8.28*** (0.002), $Z_{1\ (2008\text{-}2010)}$: 11.18*** (0.002), Z_2: -15.21***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level ☐ Colour bar representing the diagonal

Table 9: Household Savings Rate (%) of Age Group 45 – 54 Years Old

Savings Classes	1	2	3	4	5	Total	πi 2002		Savings Classes	1	2	3	4	5	Total	πi 2008
1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%		1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%		2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
3	0.00%	0.00%	0.00%	35.71%	64.29%	100%	11.67%		3	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
4	0.00%	0.00%	0.00%	92.47%	7.53%	100%	63.85%		4	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
5	0.00%	0.00%	0.00%	93.19%	6.81%	100%	24.49%		5	0.00%	11.68%	24.05%	52.25%	12.02%	100%	100.00%
Total (πi 2004)	0.00%	0.00%	0.00%	86.03%	13.97%	100%			Total (πi 2010)	0.00%	11.68%	24.05%	52.25%	12.02%	100%	

Mobility Index$_{2002\text{-}2004}$:0.80, Mobility Index$_{2008\text{-}2010}$: 0.97, $Z_{1\ (2002\text{-}2004)}$: 6.48*** (0.003), $Z_{1\ (2008\text{-}2010)}$: 14.93*** (0.001), Z_2: -51.44***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level ☐ Colour bar representing the diagonal

Table 10: Household Savings Rate (%) of Age Group 55 – 64 Years Old

2002 / 2004	Savings Classes	1	2	3	4	5	Total	πi 2002
	1	14.21%	85.79%	0.00%	0.00%	0.00%	100%	15.19%
	2	50.41%	20.56%	26.20%	2.82%	0.00%	100%	50.04%
	3	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	4	21.72%	11.46%	0.00%	66.83%	0.00%	100%	34.77%
	5	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	Total (πi 2004)	34.94%	27.30%	13.11%	24.65%	0.00%	100%	

2008 / 2010	Savings Classes	1	2	3	4	5	Total	πi 200
	1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.0
	2	73.77%	0.00%	0.00%	0.00%	26.23%	100%	11.2
	3	33.93%	0.00%	0.00%	0.00%	66.07%	100%	10.3
	4	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.0
	5	38.17%	10.61%	0.00%	2.30%	11.29%	62%	78.4
	Total (πi 2010)	59.80%	13.34%	0.00%	2.89%	23.97%	100%	

Mobility Index$_{2002\text{-}2004}$:0.79, Mobility Index$_{2008\text{-}2010}$: 0.97, $Z_{1\ (2002\text{-}2004)}$: 2.73 (0.007), $Z_{1\ (2008\text{-}2010)}$: 13.6*** (0.001), Z_2: -22.97***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Table 11: Household Savings Rate (%) of Age Group 65 Years & Older

2002 / 2004	Savings Classes	1	2	3	4	5	Total	πi 2002
	1	100.00%	0.00%	0.00%	0.00%	0.00%	100%	100.00%
	2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	3	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	4	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	5	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	Total (πi 2004)	100.00%	0.00%	0.00%	0.00%	0.00%	100%	

2008 / 2010	Savings Classes	1	2	3	4	5	Total	πi 200
	1	100.00%	0.00%	0.00%	0.00%	0.00%	100%	61.5
	2	100.00%	0.00%	0.00%	0.00%	0.00%	100%	15.7
	3	94.59%	5.41%	0.00%	0.00%	0.00%	100%	11.7
	4	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.0
	5	100.00%	0.00%	0.00%	0.00%	0.00%	100%	10.9
	Total (πi 2010)	99.36%	0.64%	0.00%	0.00%	0.00%	100%	

Mobility Index$_{2002\text{-}2004}$:0.80, Mobility Index$_{2008\text{-}2010}$: 0.80, $Z_{1\ (2002\text{-}2004)}$: NA, $Z_{1\ (2008\text{-}2010)}$: NA, Z_2: NA

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Households displayed life cycle savings patterns in both periods before and after the GFC. In the pre-GFC period, younger households during the earning years illustrated a higher probability of saving in the upper two savings classes, although this upward mobility declined in the post-GFC period. In contrast, older headed households from 55 – 75 years of age were observed to dis-save across both time periods. This downward mobility was larger during the post-GFC period. Overall, savings had expectedly and significantly declined in the post-GFC period compared with the pre-GFC period.

ii. Income-Age Mobility of Households

Table 12: Household Income (R) of Age Group 15 – 34 Years Old

2002 / 2004	Savings Classes	1	2	3	4	5	Total	πi 2002
	1	68.66%	21.53%	6.70%	2.87%	0.24%	100%	42.26%
	2	18.40%	62.50%	17.36%	1.74%	0.00%	100%	29.12%
	3	12.43%	16.38%	49.15%	20.34%	1.69%	100%	17.90%
	4	12.87%	2.97%	17.82%	55.45%	10.89%	100%	10.21%
	5	20.00%	0.00%	0.00%	40.00%	40.00%	100%	0.51%
	Total (πi 2004)	38.02%	30.54%	18.50%	11.22%	1.72%	100%	

2008 / 2010	Savings Classes	1	2	3	4	5	Total	πi 2008
	1	72.25%	17.84%	6.83%	3.08%	0.00%	100%	43.61
	2	37.37%	45.55%	15.30%	1.78%	0.00%	100%	26.99
	3	20.11%	21.23%	44.13%	14.53%	0.00%	100%	17.20
	4	14.68%	5.50%	30.28%	48.62%	0.92%	100%	10.47
	5	11.11%	0.00%	5.56%	77.78%	5.56%	100%	1.73
	Total (πi 2010)	46.78%	24.30%	17.96%	10.76%	0.19%	100%	

Mobility Index$_{2002\text{-}2004}$:0.44, Mobility Index$_{2008\text{-}2010}$: 0.56, $Z_{1\ (2002\text{-}2004)}$: -1.14 (0.046), $Z_{1\ (2008\text{-}2010)}$: 0.41 (0.017), Z_2: -2.41

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Table 13: Household Income (R) of Age Group 35 – 44 Years Old

	2004								2010							
2002	Savings Classes	1	2	3	4	5	Total	πi 2002	Savings Classes	1	2	3	4	5	Total	πi 2008
	1	64.31%	22.55%	7.84%	4.90%	0.39%	100%	30.39%	1	70.59%	18.04%	8.43%	2.94%	0.00%	100%	31.50
	2	21.74%	55.80%	19.08%	3.38%	0.00%	100%	24.67%	2	33.75%	45.34%	18.14%	2.77%	0.00%	100%	24.52
	3	9.44%	12.66%	53.65%	23.18%	1.07%	100%	27.77%	3	21.37%	22.96%	39.31%	16.36%	0.00%	100%	23.41
	4	8.52%	3.33%	21.48%	60.37%	6.30%	100%	16.09%	4	15.12%	5.15%	27.84%	50.86%	1.03%	100%	17.97
	5	5.56%	0.00%	38.89%	33.33%	22.22%	100%	1.07%	5	11.90%	4.76%	14.29%	64.29%	4.76%	100%	2.59
	Total (πi 2004)	28.96%	24.67%	25.86%	18.83%	1.67%	100%		Total (πi 2010)	38.54%	23.22%	21.68%	16.24%	0.31%	100%	

Mobility Index$_{2002\text{-}2004}$:0.48, Mobility Index$_{2008\text{-}2010}$: 0.57, $Z_{1\ (2002\text{-}2004)}$: -0.35 (0.021), $Z_{1\ (2008\text{-}2010)}$: 0.71 (0.011), Z_2: -3.63**

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Table 14: Household Income (R) of Age Group 45 – 54 Years Old

	2004								2010							
2002	Savings Classes	1	2	3	4	5	Total	πi 2002	Savings Classes	1	2	3	4	5	Total	πi 2008
	1	70.31%	17.77%	6.25%	4.88%	0.78%	100%	32.82%	1	73.13%	15.23%	6.47%	4.74%	%	100%	34.02
	2	28.23%	46.51%	19.62%	5.65%	0.00%	100%	23.85%	2	42.62%	37.97%	16.67%	2.53%	0.21%	100%	23.17
	3	14.82%	11.31%	56.03%	16.83%	1.01%	100%	25.51%	3	29.90%	17.84%	33.67%	18.09%	0.50%	100%	19.45
	4	10.40%	3.60%	16.80%	54.40%	14.80%	100%	16.03%	4	19.66%	5.41%	24.08%	48.65%	2.21%	100%	19.89
	5	21.43%	0.00%	10.71%	32.14%	35.71%	100%	1.79%	5	19.72%	0.00%	8.45%	69.01%	2.82%	100%	3.47
	Total (πi 2004)	35.64%	20.38%	23.91%	16.54%	3.53%	100%		Total (πi 2010)	45.16%	18.52%	17.69%	17.79%	0.83%	100%	

Mobility Index$_{2002\text{-}2004}$:0.47, Mobility Index$_{2008\text{-}2010}$: 0.60, $Z_{1\ (2002\text{-}2004)}$: -0.24 (0.020), $Z_{1\ (2008\text{-}2010)}$: 0.95 (0.009), Z_2: -5.80***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Table 15: Household Income (R) of Age Group 55 – 64 Years Old

	2004								2010							
2002	Savings Classes	1	2	3	4	5	Total	πi 2002	Savings Classes	1	2	3	4	5	Total	πi 2008
	1	77.31%	13.46%	5.48%	3.29%	0.47%	100%	53.03%	1	85.96%	8.50%	3.45%	1.97%	0.12%	100%	49.91
	2	42.98%	35.09%	16.67%	5.26%	0.00%	100%	18.92%	2	60.90%	25.96%	11.22%	1.92%	0.00%	100%	19.18
	3	28.02%	16.43%	43.48%	12.08%	0.00%	100%	17.18%	3	39.33%	16.10%	32.96%	10.86%	0.75%	100%	16.41
	4	26.72%	0.86%	20.69%	44.83%	6.90%	100%	9.63%	4	39.38%	7.25%	22.28%	29.53%	1.55%	100%	11.86
	5	13.33%	0.00%	20.00%	46.67%	20.00%	100%	1.24%	5	16.28%	2.33%	11.63%	58.14%	11.63%	100%	2.64
	Total (πi 2004)	56.68%	16.68%	15.77%	9.71%	1.16%	100%		Total (πi 2010)	66.13%	12.78%	12.23%	8.17%	0.68%	100%	

Mobility Index$_{2002\text{-}2004}$:0.55, Mobility Index$_{2008\text{-}2010}$: 0.62, $Z_{1\ (2002\text{-}2004)}$: -0.20 (0.024), $Z_{1\ (2008\text{-}2010)}$: 0.52 (0.014), Z_2: -2.43

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Table 16: Household Income (R) of Age Group 65 Years & Older

	2004								2010							
2002	Savings Classes	1	2	3	4	5	Total	πi 2002	Savings Classes	1	2	3	4	5	Total	πi 2008
	1	88.12%	6.54%	3.60%	1.47%	0.27%	100%	74.60%	1	90.85%	5.73%	2.65%	0.77%	0.00%	100%	72.73
	2	57.94%	30.16%	9.52%	2.38%	0.00%	100%	12.55%	2	67.09%	21.52%	11.39%	0.00%	0.00%	100%	12.67
	3	45.56%	15.56%	25.56%	13.33%	0.00%	100%	8.96%	3	64.41%	7.63%	21.19%	6.78%	0.00%	100%	9.46
	4	35.29%	2.94%	23.53%	32.35%	5.88%	100%	339.00%	4	46.30%	12.96%	14.81%	25.93%	0.00%	100%	4.33
	5	0.00%	0.00%	40.00%	20.00%	40.00%	100%	0.50%	5	40.00%	0.00%	10.00%	50.00%	0.00%	100%	0.80
	Total (πi 2004)	78.29%	10.16%	7.17%	3.78%	0.60%	100%		Total (πi 2010)	83.00%	8.18%	6.09%	2.73%	0.00%	100%	

Mobility Index$_{2002\text{-}2004}$:0.56, Mobility Index$_{2008\text{-}2010}$: 0.68, $Z_{1\ (2002\text{-}2004)}$: -1.16 (0.040), $Z_{1\ (2008\text{-}2010)}$: 0.67 (0.015), Z_2: -2.23

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Income mobility of households was positive during the pre-GFC period compared with the downward mobility in the post-GFC period. The income potential of households increased as the age of the household head increased up until the age group 35 – 44 years. Thereafter, income mobility started to decline towards the lower income groups in the age group pre-retirement until post-retirement.

These trends were similarly observed post-GFC, although in the post-GFC period income potential had declined and therefore downward mobility was illustrated. The mobility patterns were only significant for age groups two (35 – 44 years old) and three (45 – 54 years old).

iii. Consumption-Age Mobility of Households

Table 17: Household Consumption (R) of Age Group 15 – 34 Years Old

		2004								2010							
2002	Savings Classes	1	2	3	4	5	Total	πi 2002	2008	Savings Classes	1	2	3	4	5	Total	πi 20
	1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%		1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.0
	2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%		2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.0
	3	0.00%	0.00%	38.02%	39.75%	22.22%	100%	40.95%		3	0.00%	0.00%	28.67%	30.67%	40.67%	100%	14.
	4	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%		4	0.00%	0.00%	18.53%	34.50%	46.96%	100%	30.
	5	0.00%	0.00%	10.62%	22.43%	66.95%	100%	59.05%		5	0.00%	0.00%	7.09%	16.09%	76.82%	100%	55.
	Total (πi 2004)	0.00%	0.00%	21.84%	29.52%	48.63%	100%			Total (πi 2010)	0.00%	0.00%	13.64%	23.73%	62.63%	100%	

Mobility Index$_{2002\text{-}2004}$:0.79, Mobility Index$_{2008\text{-}2010}$: 0.72, $Z_{1\,(2002\text{-}2004)}$: 3.85* (0.006), $Z_{1\,(2008\text{-}2010)}$: 1.96 (0.009), Z_2: 6.04***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Table 18: Household Consumption (R) of Age Group 35 – 44 Years Old

		2004								2010							
2002	Savings Classes	1	2	3	4	5	Total	πi 2002	2008	Savings Classes	1	2	3	4	5	Total	πi 2
	1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%		1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0
	2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%		2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0
	3	0.00%	0.00%	38.06%	36.56%	25.38%	100%	27.71%		3	0.00%	0.00%	34.42%	35.71%	29.87%	100%	9
	4	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%		4	0.00%	0.00%	12.46%	36.23%	51.30%	100%	21
	5	0.00%	0.00%	6.43%	17.89%	75.68%	100%	72.29%		5	0.00%	0.00%	4.38%	12.50%	83.13%	100%	69
	Total (πi 2004)	0.00%	0.00%	15.20%	23.06%	61.74%	100%			Total (πi 2010)	0.00%	0.00%	8.96%	19.77%	71.28%	100%	

Mobility Index$_{2002\text{-}2004}$:0.77, Mobility Index$_{2008\text{-}2010}$: 0.69, $Z_{1\,(2002\text{-}2004)}$: 3.46* (0.005), $Z_{1\,(2008\text{-}2010)}$: 1.42 (0.009), Z_2: 7.40***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Table 19: Household Consumption (R) of Age Group 45 – 54 Years Old

		2004								2010							
2002	Savings Classes	1	2	3	4	5	Total	πi 2002	2008	Savings Classes	1	2	3	4	5	Total	πi 20
	1	0%	0%	0%	0%	0%	0%	0.00%		1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.0
	2	0%	0%	0%	0%	0%	0%	0.00%		2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.0
	3	0%	0%	0%	0%	0%	0%	26.79%		3	0.00%	0.00%	29.56%	33.00%	37.44%	100%	9.9
	4	0%	0%	0%	0%	0%	0%	0.00%		4	0.00%	0.00%	13.57%	35.07%	51.36%	100%	21.
	5	0%	0%	0%	0%	0%	0%	73.21%		5	0.00%	0.00%	4.50%	12.28%	83.23%	100%	68.
	Total (πi 2004)	0.00%	0.00%	0.00%	0.00%	0.00%	0%	100%		Total (πi 2010)	0.00%	0.00%	8.94%	19.26%	71.80%	100%	

Mobility Index$_{2002\text{-}2004}$:1, Mobility Index$_{2008\text{-}2010}$: 0.70, $Z_{1\,(2002\text{-}2004)}$: 0 (0), $Z_{1\,(2008\text{-}2010)}$: 1.55 (0.008), Z_2: 36.50***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Table 20: Household Consumption (R) of Age Group 55 – 64 Years Old

		2004								2010							
2002	Savings Classes	1	2	3	4	5	Total	πi 2002	2008	Savings Classes	1	2	3	4	5	Total	πi 2(
	1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%		1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.
	2	0%	0%	0%	0%	0%	0%	0.00%		2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.
	3	0.00%	0.00%	31.20%	44.01%	24.79%	100%	29.79%		3	0.00%	0.00%	21.08%	28.31%	50.60%	100%	10
	4	0%	0%	0%	0%	0%	0%	0.00%		4	0.00%	0.00%	9.11%	30.37%	60.51%	100%	26
	5	0.00%	0.00%	8.98%	27.19%	63.83%	100%	70.21%		5	0.00%	0.00%	3.19%	13.26%	83.54%	100%	63
	Total (πi 2004)	0.00%	0.00%	15.60%	32.20%	52.20%	100%			Total (πi 2010)	0.00%	0.00%	6.58%	19.30%	74.12%	100%	

Mobility Index$_{2002\text{-}2004}$:0.80, Mobility Index$_{2008\text{-}2010}$: 0.72, $Z_{1\,(2002\text{-}2004)}$: 3.74* (0.005), $Z_{1\,(2008\text{-}2010)}$: 1.91 (0.008), Z_2: 7.99***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Table 21: Household Consumption (R) of Age Group 65 Years & Older

	2004								2010							
	Savings Classes	1	2	3	4	5	Total	πi 2002	Savings Classes	1	2	3	4	5	Total	πi 2
2002	1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%	1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.
	2	0%	0%	0%	0%	0%	0%	0.00%	2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.
	3	0.00%	0.00%	15.84%	61.99%	22.17%	100%	22.01%	3	0.00%	0.00%	2.60%	31.17%	66.23%	100%	6.
	4	0%	0%	0%	0%	0%	0%	0.00%	4	0.00%	0.00%	5.00%	21.94%	73.06%	100%	28
	5	0.00%	0.00%	7.92%	35.76%	56.32%	100%	77.99%	5	0.00%	0.00%	2.72%	15.68%	81.60%	100%	64
	Total (πi 2004)	0.00%	0.00%	9.66%	41.53%	48.80%	100%		Total (πi 2010)	0.00%	0.00%	3.37%	18.44%	78.19%	100%	

Mobility Index$_{2002\text{-}2004}$:0.85, Mobility Index$_{2008\text{-}2010}$: 0.78, $Z_{1\ (2002\text{-}2004)}$: 4.26** (0.006), $Z_{1\ (2008\text{-}2010)}$: 3.32* (0.006), Z_2: 7.78***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level ☐ Colour bar representing the diagonal

Household consumption was consistently high for both time periods. Spending patterns of households displayed the greatest mobility for the upper expenditure categories across both time periods as the age of the household head increased. These patterns were statistically significant in the pre-GFC period but insignificant in the post-GFC period.

iv. Gender-Savings Mobility of Households

Table 22: Savings Mobility of Male Households (%)

	2004								2010							
	Savings Classes	1	2	3	4	5	Total	πi 2002	Savings Classes	1	2	3	4	5	Total	πi 200
2002	1	87.38%	11.63%	0.99%	0.00%	0.00%	100%	15.00%	1	88.80%	0.00%	4.20%	4.48%	2.52%	100%	7.19
	2	52.89%	20.06%	24.01%	3.04%	0.00%	100%	7.00%	2	89.14%	0.00%	0.00%	0.00%	10.86%	100%	5.38
	3	4.05%	0.00%	9.23%	48.20%	38.51%	100%	9.45%	3	51.67%	0.00%	5.74%	7.66%	34.93%	100%	4.21
	4	53	29	260	1 536	458	2 336	49.71%	4	4	0	20	63	20	107	2.16
	4	2.27%	1.24%	11.13%	65.75%	19.61%	100%	49.71%	4	3.74%	0.00%	18.69%	58.88%	18.69%	100%	2.16
	5	1.81%	0.00%	14.69%	53.56%	29.94%	100%	18.83%	5	13.79%	9.29%	25.22%	37.91%	13.79%	100%	81.0
	Total (πi 2004)	18.66%	3.77%	11.00%	47.54%	19.03%	100%		Total (πi 2010)	24.61%	7.53%	21.39%	32.65%	13.82%	100%	

Mobility Index$_{2002\text{-}2004}$:0.57, Mobility Index$_{2008\text{-}2010}$: 0.66, $Z_{1\ (2002\text{-}2004)}$: 0.76 (0.006), $Z_{1\ (2008\text{-}2010)}$: 0.13 (0.010), Z_2: -7.14***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level ☐ Colour bar representing the diagonal

Table 23: Savings Mobility of Female Households (%)

	2004								2010							
	Savings Classes	1	2	3	4	5	Total	πi 2002	Savings Classes	1	2	3	4	5	Total	πi 20
2002	1	89.50%	10.09%	0.40%	0.00%	0.00%	100%	24.94%	1	93.03%	0.00%	3.85%	2.16%	0.96%	100%	10.
	2	47.45%	21.17%	28.83%	2.55%	0.00%	100%	9.20%	2	91.59%	0.00%	0.00%	0.00%	8.41%	100%	5.
	3	6.02%	0.00%	11.57%	41.67%	40.74%	100%	7.25%	3	50.57%	0.00%	2.84%	7.39%	39.20%	100%	4.
	4	2.89%	1.44%	11.85%	66.57%	17.25%	100%	44.18%	4	13.24%	0.00%	26.47%	48.53%	11.76%	100%	1.
	5	2.09%	0.00%	14.42%	54.65%	28.84%	100%	14.43%	5	17.43%	9.37%	23.50%	35.28%	14.42%	100%	77.
	Total (πi 2004)	28.70%	5.10%	10.91%	40.55%	14.74%	100%		Total (πi 2010)	31.15%	7.25%	19.18%	28.70%	13.71%	100%	

Mobility Index$_{2002\text{-}2004}$:0.56, Mobility Index$_{2008\text{-}2010}$: 0.68, $Z_{1\ (2002\text{-}2004)}$: 0.73 (0.008), $Z_{1\ (2008\text{-}2010)}$: 0.06 (0.012), Z_2: -7.66***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level ☐ Colour bar representing the diagonal

Irrespective of the gender of the household head, household savings was significant and upwardly mobile in the pre-GFC period while the post-GFC period was insignificant and downwardly mobile. Male-headed households in both periods appeared to display slightly higher savings potentials compared with female-headed households.

v. Population Group-Savings Mobility of Households

Table 24: Savings Mobility of African/Blacks Households (%)

	2004								2010							
	Savings Classes	1	2	3	4	5	Total	πi 2002	Savings Classes	1	2	3	4	5	Total	πi 2008
2002	1	87.85%	11.23%	0.92%	0.00%	0.00%	100%	19.05%	1	90.34%	0.00%	4.60%	3.37%	1.69%	100%	8.98%
	2	51.64%	18.54%	26.76%	3.05%	0.00%	100%	7.47%	2	91.44%	0.00%	0.00%	0.00%	8.56%	100%	5.47%
	3	4.60%	0.00%	12.00%	44.80%	38.60%	100%	8.77%	3	49.69%	0.00%	5.25%	8.33%	36.73%	100%	4.46%
	4	2.22%	1.33%	11.23%	66.35%	18.88%	100%	47.49%	4	7.55%	0.00%	22.01%	53.46%	16.98%	100%	2.19%
	5	2.14%	0.00%	14.48%	53.72%	29.66%	100%	17.21%	5	15.19%	9.08%	24.35%	37.03%	14.35%	100%	78.90%
	Total (πi 2004)	22.42%	4.16%	11.05%	44.91%	17.46%	100%		Total (πi 2010)	27.48%	7.16%	20.34%	31.06%	13.95%	100%	

Mobility Index$_{2002\text{-}2004}$:0.57, Mobility Index$_{2008\text{-}2010}$: 0.67, $Z_{1\ (2002\text{-}2004)}$: 0.75 (0.006), $Z_{1\ (2008\text{-}2010)}$: 0.17 (0.008), Z_2: -9.58***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Table 25: Savings Mobility of Non-African/Blacks Households (%)

	2004								2010							
	Savings Classes	1	2	3	4	5	Total	πi 2002	Savings Classes	1	2	3	4	5	Total	πi 200
2002	1	90.33%	9.67%	0.00%	0.00%	0.00%	100%	18.30%	1	95.04%	0.00%	0.83%	2.48%	1.65%	100%	7.4
	2	47.46%	25.42%	24.86%	2.26%	0.00%	100%	8.95%	2	85.42%	0.00%	0.00%	0.00%	14.58%	100%	5.9
	3	5.00%	0.00%	3.75%	50.00%	41.25%	100%	8.09%	3	59.02%	0.00%	0.00%	3.28%	37.70%	100%	3.7
	4	3.28%	1.27%	11.85%	65.19%	18.41%	100%	47.78%	4	6.25%	0.00%	18.75%	68.75%	6.25%	100%	0.9
	5	1.20%	0.00%	14.97%	54.49%	29.34%	100%	16.89%	5	16.05%	10.40%	25.02%	35.72%	12.81%	100%	81.8
	Total (πi 2004)	22.95%	4.65%	10.72%	44.59%	17.09%	100%		Total (πi 2010)	27.58%	8.51%	20.73%	30.23%	12.95%	100%	

Mobility Index$_{2002\text{-}2004}$:0.57, Mobility Index$_{2008\text{-}2010}$: 0.64, $Z_{1\ (2002\text{-}2004)}$: 0.87 (0.009), $Z_{1\ (2008\text{-}2010)}$: -0.26 (0.023), Z_2: -2.93

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Regardless of the population group of the household head, savings was upwardly mobile in the pre-GFC period while in the post-GFC period it was downwardly mobile. Positive mobility in the pre-GFC period was observed for all population groups, although the majority population group displayed a greater probability for higher savings rates. In comparison, the post-GFC period showed that both population groups' savings declined and moved towards the lower savings classes. The minority population groups displayed slightly lower savings than the majority population group post-GFC. Only the majority population groups' mobility was significant in the pre-GFC period compared with the post-GFC period.

vi. Marital Status-Savings Mobility of Households

Table 26: Savings Mobility of Single Households (%)

	2004								2010							
	Savings Classes	1	2	3	4	5	Total	πi 2002	Savings Classes	1	2	3	4	5	Total	πi 20
2002	1	89.45%	9.57%	0.98%	0.00%	0.00%	100%	28.64%	1	86.59%	0.00%	6.59%	4.55%	2.27%	100%	13.
	2	48.16%	19.49%	30.15%	2.21%	0.00%	100%	9.56%	2	93.00%	0.00%	0.00%	0.00%	7.00%	100%	6.1
	3	10.57%	0.00%	17.62%	39.21%	32.60%	100%	7.98%	3	47.54%	0.00%	9.29%	8.20%	34.97%	100%	5.6
	4	3.55%	1.68%	9.49%	67.82%	17.46%	100%	39.63%	4	12.24%	0.00%	20.41%	51.02%	16.33%	100%	3.0
	5	4.70%	0.00%	16.09%	48.27%	30.94%	100%	14.20%	5	19.31%	8.18%	21.73%	35.84%	14.94%	100%	71.
	Total (πi 2004)	33.13%	5.27%	10.61%	37.07%	13.91%	100%		Total (πi 2010)	34.42%	5.85%	17.58%	28.26%	13.90%	100%	

Mobility Index$_{2002\text{-}2004}$:0.54, Mobility Index$_{2008\text{-}2010}$: 0.67, $Z_{1\ (2002\text{-}2004)}$: 0.65 (0.009), $Z_{1\ (2008\text{-}2010)}$: 0.37 (0.011), Z_2: -8.65***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Table 27: Savings Mobility of Married Households (%)

2002 \ 2004	1	2	3	4	5	Total	πi 2002
1	86.85%	13.15%	0.00%	0.00%	0.00%	100%	13.19%
2	52.25%	20.76%	23.88%	3.11%	0.00%	100%	6.87%
3	1.35%	0.00%	4.59%	48.92%	45.14%	100%	8.79%
4	2.17%	1.31%	12.08%	65.66%	18.78%	100%	52.52%
5	0.77%	0.00%	12.24%	58.67%	28.32%	100%	18.63%
Total (πi 2004)	16.44%	3.85%	10.67%	49.93%	19.11%	100%	

2008 \ 2010	1	2	3	4	5	Total	πi 20
1	98.78%	0.00%	0.41%	0.41%	0.41%	100%	5.6
2	89.82%	0.00%	0.00%	0.00%	10.18%	100%	5.1
3	60.53%	0.00%	0.00%	5.26%	34.21%	100%	3.4
4	0.00%	0.00%	25.45%	67.27%	7.27%	100%	1.2
5	13.58%	9.85%	26.29%	36.87%	13.41%	100%	84.
Total (πi 2010)	23.80%	8.32%	22.54%	32.18%	13.16%	100%	

Mobility Index$_{2002\text{-}2004}$:0.58, Mobility Index$_{2008\text{-}2010}$: 0.64, $Z_{1\ (2002\text{-}2004)}$: 0.81 (0.007), $Z_{1\ (2008\text{-}2010)}$: -0.08 (0.012), Z_2: -3.65**

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Household savings mobility displayed significant upward and downward mobility in the pre- and post-GFC periods respectively. Married households appeared to illustrate slightly higher savings potentials compared with single households for both time periods. Although married households were more likely to save in the upper savings brackets, both marital types showed downward mobility post-GFC.

vii. Location-Savings Mobility of Households

Table 28: Savings Mobility of Urban Households (%)

2002 \ 2004	1	2	3	4	5	Total	πi 2002
1	88.70%	10.78%	0.52%	0.00%	0.00%	100%	16.49%
2	49.71%	23.10%	24.85%	2.34%	0.00%	100%	7.32%
3	3.89%	0.00%	7.30%	46.72%	42.09%	100%	8.80%
4	2.39%	0.94%	12.33%	65.04%	19.29%	100%	50.17%
5	1.62%	0.00%	14.93%	54.48%	28.98%	100%	17.22%
Total (πi 2004)	20.09%	3.94%	11.31%	46.30%	18.37%	100%	

2008 \ 2010	1	2	3	4	5	Total	πi 200
1	92.33%	0.00%	2.06%	3.83%	1.77%	100%	6.60
2	88.35%	0.00%	0.00%	0.00%	11.65%	100%	5.18
3	52.33%	0.00%	0.00%	8.72%	38.95%	100%	3.35
4	2.06%	0.00%	24.74%	59.79%	13.40%	100%	1.89
5	13.82%	9.29%	25.71%	37.04%	14.14%	100%	82.9
Total (πi 2010)	23.92%	7.71%	21.94%	32.41%	14.02%	100%	

Mobility Index$_{2002\text{-}2004}$:0.57, Mobility Index$_{2008\text{-}2010}$: 0.66, $Z_{1\ (2002\text{-}2004)}$: 0.76 (0.006), $Z_{1\ (2008\text{-}2010)}$: 0.14 (0.010), Z_2: -7.51***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Table 29: Savings Mobility of Rural Households (%)

2002 \ 2004	1	2	3	4	5	Total	πi 2002
1	88.20%	10.91%	0.88%	0.00%	0.00%	100%	22.54%
2	51.34%	17.24%	27.97%	3.45%	0.00%	100%	8.68%
3	6.02%	0.00%	14.46%	44.98%	34.54%	100%	8.28%
4	2.67%	1.99%	9.70%	67.84%	17.80%	100%	43.52%
5	2.35%	0.00%	14.09%	53.03%	30.53%	100%	16.99%
Total (πi 2004)	26.40%	4.82%	10.44%	42.55%	15.79%	100%	

2008 \ 2010	1	2	3	4	5	Total	πi 200
1	90.09%	0.00%	5.53%	2.76%	1.61%	100%	11.5
2	92.51%	0.00%	0.00%	0.00%	7.49%	100%	6.0
3	50.23%	0.00%	7.98%	6.57%	35.21%	100%	5.6
4	14.10%	0.00%	17.95%	48.72%	19.23%	100%	2.0
5	17.69%	9.38%	22.60%	36.39%	13.93%	100%	74.5
Total (πi 2010)	32.40%	7.00%	18.32%	28.85%	13.43%	100%	

Mobility Index$_{2002\text{-}2004}$:0.56, Mobility Index$_{2008\text{-}2010}$: 0.67, $Z_{1\ (2002\text{-}2004)}$: 0.75 (0.008), $Z_{1\ (2008\text{-}2010)}$: 0.14 (0.011), Z_2: -7.70***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

For both locations savings mobility was significant and upward in the pre-GFC period while in the post-GFC period it was significant and downward. Households residing in urban areas were more likely to save in the upper two savings groups than households living in rural areas in the pre-GFC period. While in the post-GFC period all household savings declined and moved downward towards savings group one. Rural households were especially impacted in the post-GFC period compared with the urban households.

viii. Education-Savings Mobility of Households

Table 30: Savings Mobility of Primary Educated Households (%)

		2004								2010						
2002	Savings Classes	1	2	3	4	5	Total	πi 2002	2008	Savings Classes	1	2	3	4	5	Total	πi 200
	1	87.40%	12.37%	0.23%	0.00%	0.00%	100%	28.10%		1	98.53%	0.00%	0.37%	0.74%	0.37%	100%	10.4
	2	50.44%	19.06%	27.27%	3.23%	0.00%	100%	11.18%		2	92.78%	0.00%	0.00%	0.00%	7.22%	100%	7.44
	3	1.46%	0.00%	5.84%	43.80%	48.91%	100%	4.49%		3	56.20%	0.00%	0.73%	4.38%	38.69%	100%	5.26
	4	4.01%	2.27%	9.37%	69.16%	15.19%	100%	43.38%		4	6.67%	0.00%	20.00%	53.33%	20.00%	100%	0.58
	5	0.77%	0.00%	9.69%	62.76%	26.79%	100%	12.85%		5	22.67%	9.85%	21.32%	31.93%	14.23%	100%	76.2
	Total (πi 2004)	32.10%	6.59%	8.69%	40.39%	12.23%	100%			Total (πi 2010)	37.48%	7.52%	16.46%	24.97%	13.58%	100%	

Mobility Index$_{2002\text{-}2004}$:0.58, Mobility Index$_{2008\text{-}2010}$: 0.66, $Z_{1\ (2002\text{-}2004)}$: 0.85 (0.008), $Z_{1\ (2008\text{-}2010)}$: -0.81 (0.025), Z_2: -3.05

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Table 31: Savings Mobility of Secondary Educated Households (%)

		2004								2010						
2002	Savings Classes	1	2	3	4	5	Total	πi 2002	2008	Savings Classes	1	2	3	4	5	Total	πi 200
	1	89.88%	7.80%	2.31%	0.00%	0.00%	100%	13.42%		1	62.69%	0.00%	18.66%	11.19%	7.46%	100%	4.97
	2	44.80%	28.00%	27.20%	0.00%	0.00%	100%	4.85%		2	80.00%	0.00%	0.00%	0.00%	20.00%	100%	2.22
	3	7.07%	0.00%	12.12%	47.81%	33.00%	100%	11.52%		3	27.16%	0.00%	16.05%	17.28%	39.51%	100%	3.00
	4	1.34%	0.79%	12.07%	64.51%	21.29%	100%	49.17%		4	7.76%	0.00%	21.55%	55.17%	15.52%	100%	4.30
	5	3.13%	0.00%	15.29%	48.62%	32.97%	100%	21.05%		5	5.64%	7.54%	28.70%	42.09%	16.04%	100%	85.5
	Total (πi 2004)	16.36%	2.79%	12.18%	47.46%	21.21%	100%			Total (πi 2010)	10.86%	6.45%	26.87%	39.44%	16.38%	100%	

Mobility Index$_{2002\text{-}2004}$:0.54, Mobility Index$_{2008\text{-}2010}$: 0.70, $Z_{1\ (2002\text{-}2004)}$: 0.47 (0.010), $Z_{1\ (2008\text{-}2010)}$: 0.12 (0.014), Z_2: -8.44***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Table 32: Savings Mobility of Tertiary Educated Households (%)

		2004								2010						
2002	Savings Classes	1	2	3	4	5	Total	πi 2002	2008	Savings Classes	1	2	3	4	5	Total	πi 200
	1	85.71%	14.29%	0.00%	0.00%	0.00%	100%	9.82%		1	100.00%	0.00%	0.00%	0.00%	0.00%	100%	7.50
	2	51.11%	22.22%	26.67%	0.00%	0.00%	100%	6.31%		2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00
	3	1.32%	0.00%	7.89%	34.21%	56.58%	100%	10.66%		3	0.00%	0.00%	0.00%	50.00%	50.00%	100%	5.00
	4	2.15%	0.81%	15.32%	62.63%	19.09%	100%	52.17%		4	0.00%	0.00%	0.00%	0.00%	100.00%	100%	2.50
	5	0.00%	0.00%	19.33%	54.00%	26.67%	100%	21.04%		5	11.76%	8.82%	14.71%	55.88%	8.82%	100%	85.0
	Total (πi 2004)	12.90%	3.23%	14.59%	47.69%	21.60%	100%			Total (πi 2010)	17.50%	7.50%	12.50%	50.00%	12.50%	100%	

Mobility Index$_{2002\text{-}2004}$:0.58, Mobility Index$_{2008\text{-}2010}$: 0.78, $Z_{1\ (2002\text{-}2004)}$: 0.70 (0.018), $Z_{1\ (2008\text{-}2010)}$: 12.65*** (0.009), Z_2: -9.24***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Education levels of the household head appeared to display a positive relationship with household savings. In the pre-GFC period households were more likely to increase their savings potential as the education levels of the household head increased. Similarly, during the post-GFC period households with higher education levels had a greater probability of continued high savings rates compared with less-educated households. Savings mobility was only significant for households with secondary and tertiary education levels.

ix. Wealth-Savings Mobility of Households

Table 33: Savings Mobility of Wealthy Households (%)

	2004								2010							
	Savings Classes	1	2	3	4	5	Total	πi 2002	Savings Classes	1	2	3	4	5	Total	πi 2008
2002	1	100.00%	0.00%	0.00%	0.00%	0.00%	100%	15.07%	1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00
	2	39.08%	28.74%	29.89%	2.30%	0.00%	100%	6.62%	2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00
	3	0.00%	0.00%	6.60%	51.89%	41.51%	100%	8.07%	3	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00
	4	0.42%	0.56%	12.20%	69.14%	17.67%	100%	54.26%	4	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00
	5	0.00%	0.00%	9.52%	65.24%	25.24%	100%	15.98%	5	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00
	Total (πi 2004)	17.88%	2.21%	10.65%	52.28%	16.97%	100%		Total (πi 2010)	0.00%	0.00%	0.00%	0.00%	0.00%	0%	

Mobility Index$_{2002\text{-}2004}$:0.54, Mobility Index$_{2008\text{-}2010}$: 1, $Z_{1\ (2002\text{-}2004)}$: 0.69 (0.012), $Z_{1\ (2008\text{-}2010)}$: 0 (0), Z_2: NA

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Table 34: Savings Mobility of Non-Wealthy Households (%)

	2004								2010							
	Savings Classes	1	2	3	4	5	Total	πi 2002	Savings Classes	1	2	3	4	5	Total	πi 2008
2002	1	87.84%	11.25%	0.91%	0.00%	0.00%	100%	19.96%	1	89.99%	0.00%	4.48%	3.74%	1.79%	100%	9.41
	2	48.50%	20.55%	27.94%	3.00%	0.00%	100%	7.84%	2	92.02%	0.00%	0.00%	0.00%	7.98%	100%	5.29
	3	5.47%	0.00%	11.13%	44.94%	38.46%	100%	8.95%	3	48.48%	0.00%	4.88%	8.84%	37.80%	100%	4.61
	4	2.49%	1.11%	10.62%	66.39%	19.39%	100%	45.85%	4	7.74%	0.00%	19.64%	55.95%	16.67%	100%	2.36
	5	2.50%	0.00%	15.71%	50.68%	31.11%	100%	17.40%	5	15.41%	9.09%	24.20%	36.81%	14.50%	100%	78.32
	Total (πi 2004)	23.40%	4.36%	10.97%	43.52%	17.75%	100%		Total (πi 2010)	27.83%	7.12%	20.06%	30.91%	14.08%	100%	

Mobility Index$_{2002\text{-}2004}$:0.56, Mobility Index$_{2008\text{-}2010}$: 0.66, $Z_{1\ (2002\text{-}2004)}$: 0.74 (0.006), $Z_{1\ (2008\text{-}2010)}$: 0.23 (0.008), Z_2: -9.86***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

The wealth of a household (ownership of a house and a car) displayed positive impacts on household savings mobility. During the pre-GFC period, households with wealth had a greater chance of saving in the upper two savings groups compared to households with no wealth. Households with no wealth, however, still showed strong savings potential. This savings trend could only be compared in the pre-GFC period due to the data constraints in the post-GFC period. Households with no wealth had significant mobility patterns in the pre-GFC period compared with the post-GFC period.

x. Household Size-Savings Mobility of Households

Table 35: Savings Mobility of Households with 1 – 2 Members (%)

	2004								2010							
	Savings Classes	1	2	3	4	5	Total	πi 2002	Savings Classes	1	2	3	4	5	Total	πi 2008
2002	1	88.59%	9.78%	1.63%	0.00%	0.00%	100%	23.96%	1	83.25%	0.00%	6.70%	6.70%	3.35%	100%	11.5
	2	50.81%	16.13%	31.45%	1.61%	0.00%	100%	8.07%	2	89.57%	0.00%	0.00%	0.00%	10.43%	100%	6.37
	3	10.67%	0.00%	15.33%	44.00%	30.00%	100%	9.77%	3	41.58%	0.00%	13.86%	7.92%	36.63%	100%	5.60
	4	3.71%	1.35%	9.95%	66.61%	18.38%	100%	38.61%	4	8.47%	0.00%	20.34%	55.93%	15.25%	100%	3.27
	5	4.65%	0.00%	17.94%	43.85%	33.55%	100%	19.60%	5	16.36%	8.18%	23.71%	38.18%	13.56%	100%	73.1
	Total (πi 2004)	28.71%	4.17%	11.78%	38.74%	16.60%	100%		Total (πi 2010)	29.93%	5.99%	19.57%	30.99%	13.53%	100%	

Mobility Index$_{2002\text{-}2004}$:0.55, Mobility Index$_{2008\text{-}2010}$: 0.66, $Z_{1\ (2002\text{-}2004)}$: 0.78 (0.011), $Z_{1\ (2008\text{-}2010)}$: 0.33 (0.015), Z_2: -5.51***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Table 36: Savings Mobility of Households with 2 – 4 Members (%)

	2004								2010							
2002	Savings Classes	1	2	3	4	5	Total	πi 2002	Savings Classes	1	2	3	4	5	Total	πi 2008
	1	90.95%	8.57%	0.48%	0.00%	0.00%	100%	12.53%	1	90.24%	0.00%	6.10%	3.66%	0.00%	100%	5.57
	2	42.71%	29.17%	27.08%	1.04%	0.00%	100%	5.73%	2	95.16%	0.00%	0.00%	0.00%	4.84%	100%	4.21
	3	3.68%	0.00%	9.47%	46.84%	40.00%	100%	11.34%	3	47.92%	0.00%	2.08%	12.50%	37.50%	100%	3.26
	4	1.82%	1.03%	12.30%	66.06%	18.79%	100%	52.39%	4	10.53%	0.00%	28.95%	39.47%	21.05%	100%	2.58
	5	1.32%	0.00%	16.89%	50.00%	31.79%	100%	18.02%	5	9.74%	9.18%	27.38%	37.84%	15.86%	100%	84.35
	Total (πi 2004)	15.45%	3.28%	12.17%	48.99%	20.11%	100%		Total (πi 2010)	19.09%	7.74%	24.25%	33.56%	15.35%	100%	

Mobility Index$_{2002\text{-}2004}$:0.54, Mobility Index$_{2008\text{-}2010}$: 0.70, $Z_{1\ (2002\text{-}2004)}$: 0.54 (0.012), $Z_{1\ (2008\text{-}2010)}$: 0.35 (0.017), Z_2: -7.32***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level ☐ Colour bar representing the diagonal

Table 37: Savings Mobility of Households with More than 4 Members (%)

	2004								2010							
2002	Savings Classes	1	2	3	4	5	Total	πi 2002	Savings Classes	1	2	3	4	5	Total	πi 2008
	1	87.18%	12.82%	0.00%	0.00%	0.00%	100%	20.38%	1	97.66%	0.00%	2.34%	0.00%	0.00%	100%	9.92
	2	56.87%	16.11%	21.80%	5.21%	0.00%	100%	8.48%	2	89.09%	0.00%	0.00%	0.00%	10.91%	100%	6.38
	3	1.32%	0.00%	1.97%	43.42%	53.29%	100%	6.11%	3	59.30%	0.00%	0.00%	1.16%	39.53%	100%	4.99
	4	2.83%	1.38%	11.65%	65.86%	18.28%	100%	49.68%	4	13.33%	0.00%	33.33%	33.33%	20.00%	100%	0.87
	5	0.79%	0.00%	9.69%	65.18%	24.35%	100%	15.35%	5	20.21%	9.84%	22.60%	34.23%	13.12%	100%	77.8
	Total (πi 2004)	24.20%	4.66%	9.24%	45.82%	16.08%	100%		Total (πi 2010)	34.18%	7.66%	18.11%	26.99%	13.06%	100%	

Mobility Index$_{2002\text{-}2004}$:0.69, Mobility Index$_{2008\text{-}2010}$: 0.71, $Z_{1\ (2002\text{-}2004)}$: 1.09 (0.008), $Z_{1\ (2008\text{-}2010)}$: -0.31 (0.024), Z_2: -3.93**

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level ☐ Colour bar representing the diagonal

Household savings mobility displayed significant upward savings trends in the pre-GFC period whereas in the post-GFC period the savings trend was downwards. In the pre-GFC period households with two to four members showed the greatest savings probabilities followed by households with more than four members and the smallest household size showed the lowest savings probabilities. In the post-GFC period, however, the larger households displayed low savings potential and were more likely to move towards the lowest savings group.

xi. Household Dependency Ratio-Savings Mobility of Households

Table 38: Savings Mobility of Households with a Zero Dependency Ratio (%)

	2004								2010							
2002	Savings Classes	1	2	3	4	5	Total	πi 2002	Savings Classes	1	2	3	4	5	Total	πi 2008
	1	64.67%	31.33%	4.00%	0.00%	0.00%	100%	8.52%	1	22.45%	0.00%	30.61%	34.69%	12.24%	100%	2.68%
	2	52.17%	19.57%	26.63%	1.63%	0.00%	100%	10.45%	2	79.79%	0.00%	0.00%	0.00%	20.21%	100%	5.15%
	3	10.83%	0.00%	13.38%	43.95%	31.85%	100%	8.92%	3	21.79%	0.00%	12.82%	10.26%	55.13%	100%	4.27%
	4	3.33%	1.66%	8.88%	69.81%	16.32%	100%	51.16%	4	5.77%	0.00%	19.23%	59.62%	15.38%	100%	2.85%
	5	3.79%	0.00%	14.36%	51.22%	30.62%	100%	20.95%	5	13.84%	8.37%	24.45%	38.87%	14.48%	100%	85.06%
	Total (πi 2004)	14.42%	5.57%	11.87%	50.54%	17.60%	100%		Total (πi 2010)	17.57%	7.12%	22.71%	36.12%	16.48%	100%	

Mobility Index$_{2002\text{-}2004}$:0.60, Mobility Index$_{2008\text{-}2010}$: 0.78, $Z_{1\ (2002\text{-}2004)}$: 0.62 (0.012), $Z_{1\ (2008\text{-}2010)}$: 0.08 (0.019), Z_2: -7.59***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level ☐ Colour bar representing the diagonal

Table 39: Savings Mobility of Households with a 0 – 0.5 Dependency Ratio (%)

	2004								2010							
2002	Savings Classes	1	2	3	4	5	Total	πi 2002	Savings Classes	1	2	3	4	5	Total	πi 2008
	1	82.59%	16.96%	0.45%	0.00%	0.00%	100%	13.29%	1	94.44%	0.00%	5.56%	0.00%	0.00%	100%	2.90%
	2	45.51%	23.95%	26.95%	3.59%	0.00%	100%	9.91%	2	88.89%	0.00%	0.00%	0.00%	11.11%	100%	5.80%
	3	1.57%	0.00%	6.30%	43.31%	48.82%	100%	7.54%	3	35.00%	0.00%	0.00%	5.00%	60.00%	100%	3.22%
	4	1.63%	0.98%	13.48%	65.98%	17.93%	100%	54.60%	4	0.00%	0.00%	25.00%	25.00%	50.00%	100%	0.64%
	5	0.81%	0.00%	10.53%	65.99%	22.67%	100%	14.66%	5	16.02%	8.66%	23.02%	36.83%	15.47%	100%	87.44
	Total (πi 2004)	16.62%	5.16%	12.11%	49.32%	16.80%	100%		Total (πi 2010)	23.03%	7.57%	20.45%	32.53%	16.43%	100%	

Mobility Index$_{2002\text{-}2004}$:0.59, Mobility Index$_{2008\text{-}2010}$: 0.73, $Z_{1\ (2002\text{-}2004)}$: 0.83 (0.011), $Z_{1\ (2008\text{-}2010)}$: -0.45 (0.044), Z_2: -2.88

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level ☐ Colour bar representing the diagonal

Table 40: Savings Mobility of Households with a More than 0.5 Dependency Ratio (%)

2002 \ 2004	1	2	3	4	5	Total	πi 2002
1	96.67%	3.09%	0.24%	0.00%	0.00%	100%	36.96%
2	44.74%	28.95%	23.68%	2.63%	0.00%	100%	3.34%
3	2.35%	0.00%	8.24%	38.82%	50.59%	100%	7.46%
4	1.69%	0.72%	13.77%	62.08%	21.74%	100%	36.35%
5	1.66%	0.00%	15.47%	45.86%	37.02%	100%	15.89%
Total (πi 2004)	38.28%	2.37%	8.96%	32.84%	17.56%	100%	

2008 \ 2010	1	2	3	4	5	Total	πi 2008
1	98.53%	0.00%	0.73%	0.55%	0.18%	100%	16.80%
2	93.86%	0.00%	0.00%	0.00%	6.14%	100%	7.03%
3	69.59%	0.00%	2.34%	2.34%	25.73%	100%	5.27%
4	9.26%	0.00%	29.63%	51.85%	9.26%	100%	1.66%
5	12.64%	9.92%	26.57%	36.94%	13.93%	100%	69.24%
Total (πi 2010)	35.72%	6.87%	19.14%	26.66%	11.62%	100%	

Mobility Index$_{2002\text{-}2004}$:0.53, Mobility Index$_{2008\text{-}2010}$: 0.66, $Z_{1\ (2002\text{-}2004)}$: 0.25 (0.018), $Z_{1\ (2008\text{-}2010)}$: 0.04 (0.001), Z_2: -5.79***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level ☐ Colour bar representing the diagonal

The dependency ratio of the household displayed a negative relationship with a household's savings mobility across both time periods pre- and post-GFC. Households with higher dependency ratios were more likely to be in the lower savings groups. Furthermore, households with the greatest number of dependents showed the most savings losses in the post-GFC period. This can be seen in the increasing proportion of households with greater than 0.5 dependency ratio moving towards savings category one compared with the other dependency ratio groups. The decline in savings mobility was only found to be significant for households with zero and greater than one half of a dependency ratio.

xii. Person Occupation-Savings Mobility of Households

Table 41: Savings Mobility of Households working as a Plant and Machine Operator & Assembler (%)

2002 \ 2004	1	2	3	4	5	Total	πi 2002
1	89.37%	10.10%	0.52%	0.00%	0.00%	100%	36.36%
2	56.59%	18.01%	22.19%	3.22%	0.00%	100%	9.85%
3	7.82%	0.00%	18.44%	36.87%	36.87%	100%	5.67%
4	4.50%	2.20%	8.82%	69.58%	14.90%	100%	35.92%
5	2.60%	0.00%	11.95%	55.84%	29.61%	100%	12.20%
Total (πi 2004)	40.45%	6.24%	8.05%	34.21%	11.05%	100%	

2008 \ 2010	1	2	3	4	5	Total	πi 20
1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.0
2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.0
3	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.0
4	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.0
5	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.0
Total (πi 2010)	0.00%	0.00%	0.00%	0.00%	0.00%	0%	

Mobility Index$_{2002\text{-}2004}$:0.54, Mobility Index$_{2008\text{-}2010}$: NA, $Z_{1\ (2002\text{-}2004)}$: 0.54 (0.009), $Z_{1\ (2008\text{-}2010)}$: NA, Z_2: NA

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level ☐ Colour bar representing the diagonal

Table 42: Savings Mobility of Households working in an Elementary Occupation (%)

2002 \ 2004	1	2	3	4	5	Total	πi 2002
1	89.66%	6.90%	3.45%	0.00%	0.00%	100%	4.61%
2	28.00%	28.00%	40.00%	4.00%	0.00%	100%	3.97%
3	4.55%	0.00%	9.09%	56.06%	30.30%	100%	10.49%
4	0.81%	0.27%	14.86%	66.49%	17.57%	100%	58.82%
5	2.88%	0.00%	17.27%	46.76%	33.09%	100%	22.10%
Total (πi 2004)	6.84%	1.59%	15.26%	55.48%	20.83%	100%	

2008 \ 2010	1	2	3	4	5	Total	πi 20
1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.0
2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.0
3	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.0
4	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.0
5	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.0
Total (πi 2010)	0.00%	0.00%	0.00%	0.00%	0.00%	0%	

Mobility Index$_{2002\text{-}2004}$:0.54, Mobility Index$_{2008\text{-}2010}$: NA, $Z_{1\ (2002\text{-}2004)}$: 0.29 (0.024), $Z_{1\ (2008\text{-}2010)}$: NA, Z_2: NA

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level ☐ Colour bar representing the diagonal

Plant and machine operators, as well as assemblers illustrated lower savings mobility compared to persons with an elementary occupation title.

Recall from Table 3 that elementary occupation has the lowest skills level compared with plant and machine operators and assemblers, which have a skills set higher than the elementary occupation workers. The savings mobility of person occupations could only be observed in the pre-GFC period due to data constraints in the post-GFC period. The trends of the pre-GFC period showed that those in the elementary occupations were more likely to save in the upper two savings groups compared with plant and machine operators and assemblers. The results were, however, insignificant.

xiii. Industry-Savings Mobility of Households

Table 43: Savings Mobility of Households working in Financial Intermediation, Insurance, Real Estate and Business Services (%)

	2004								2010							
	Savings Classes	1	2	3	4	5	Total	π_i 2002	Savings Classes	1	2	3	4	5	Total	π_i 2008
2002	1	89.63%	9.85%	0.52%	0.00%	0.00%	100%	38.82%	1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	2	55.70%	19.22%	22.15%	2.93%	0.00%	100%	10.39%	2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	3	10.43%	0.00%	20.25%	33.74%	35.58%	100%	5.52%	3	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	4	5.42%	2.51%	8.02%	69.51%	14.54%	100%	33.74%	4	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	5	2.93%	0.00%	12.90%	56.30%	27.86%	100%	11.54%	5	0.00%	0.00%	0.00%	0.00%	0.00%	0	0.00%
	Total (π_i 2004)	43.32%	6.67%	7.82%	32.12%	10.08%	100%		Total (π_i 2010)	0.00%	0.00%	0.00%	0.00%	0.00%	0%	

Mobility Index$_{2002\text{-}2004}$:0.54, Mobility Index$_{2008\text{-}2010}$: NA, $Z_{1\ (2002\text{-}2004)}$: 0.50 (0.009), $Z_{1\ (2008\text{-}2010)}$: NA, Z_2: NA

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Table 44: Savings Mobility of Households working in Community, Social & Personal Services (%)

	2004								2010							
	Savings Classes	1	2	3	4	5	Total	π_i 2002	Savings Classes	1	2	3	4	5	Total	π_i 2008
2002	1	63.64%	36.36%	0.00%	0.00%	0.00%	100%	1.39%	1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	2	24.32%	35.14%	40.54%	0.00%	0.00%	100%	4.69%	2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	3	2.13%	0.00%	4.26%	44.68%	48.94%	100%	11.91%	3	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	4	1.30%	0.43%	15.12%	61.77%	21.38%	100%	58.68%	4	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	5	0.00%	0.00%	15.76%	57.07%	27.17%	100%	23.32%	5	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	Total (π_i 2004)	3.04%	2.41%	14.96%	54.88%	24.71%	100%		Total (π_i 2010)	0.00%	0.00%	0.00%	0.00%	0.00%	0%	

Mobility Index$_{2002\text{-}2004}$:0.61, Mobility Index$_{2008\text{-}2010}$: NA, $Z_{1\ (2002\text{-}2004)}$: -0.31 (0.034), $Z_{1\ (2008\text{-}2010)}$: NA, Z_2: NA

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Household heads working in the community, social and personal services industry (such as health) illustrated greater savings mobility compared with households involved in the financial services industry. These savings trends could only be observed in the pre-GFC period due to question omissions in the post-GFC survey. The upward trends observed in the pre-GFC period showed that more than half of workers across both industries were more likely to save between 5% and 20% of their incomes (fourth savings group). Although the financial services industry showed positive savings, they were also more likely to save in the savings category one. The results were, however, insignificant.

xiv. Main Income Source-Savings Mobility of Households

Table 45: Savings Mobility of Households with Salaries/Wages (%)

	2004								2010							
	Savings Quintile	1	2	3	4	5	Total	πi 2002	Savings Quintile	1	2	3	4	5	Total	πi 2008
2002	1	86.88%	13.13%	0.00%	0.00%	0.00%	100%	4.49%	1	67.86%	0.00%	7.14%	17.86%	7.14%	100%	1.59%
	2	44.57%	25.00%	27.17%	3.26%	0.00%	100%	5.16%	2	78.57%	0.00%	0.00%	0.00%	21.43%	100%	1.99%
	3	3.41%	0.00%	7.61%	50.39%	38.58%	100%	10.69%	3	37.68%	0.00%	0.00%	15.94%	46.38%	100%	1.96%
	4	1.07%	0.58%	13.05%	64.46%	20.84%	100%	57.65%	4	0.00%	0.00%	24.68%	59.74%	15.58%	100%	2.19%
	5	1.40%	0.00%	15.69%	54.08%	28.83%	100%	22.00%	5	7.36%	9.66%	27.30%	40.84%	14.84%	100%	92.27%
	Total (πi 2004)	7.49%	2.22%	13.19%	54.62%	22.48%	100%		Total (πi 2010)	10.17%	8.92%	25.84%	39.59%	15.48%	100%	

Mobility Index$_{2002\text{-}2004}$:0.57, Mobility Index$_{2008\text{-}2010}$: 0.71, $Z_{1\ (2002\text{-}2004)}$: 0.43 (0.009), $Z_{1\ (2008\text{-}2010)}$: -0.27 (0.016), Z_2: -7.27***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Table 46: Savings Mobility of Households with Remittances (%)

	2004								2010							
	Savings Quintile	1	2	3	4	5	Total	πi 2002	Savings Quintile	1	2	3	4	5	Total	πi 2008
2002	1	86.27%	5.88%	7.84%	0.00%	0.00%	100%	10.49%	1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	2	42.11%	26.32%	26.32%	5.26%	0.00%	100%	3.91%	2	50.00%	0.00%	0.00%	0.00%	50.00%	100%	4.76%
	3	7.50%	0.00%	30.00%	35.00%	27.50%	100%	16.46%	3	0.00%	0.00%	0.00%	100.00%	0.00%	100%	4.76%
	4	0.00%	1.86%	12.56%	64.65%	20.93%	100%	44.24%	4	50.00%	0.00%	0.00%	50.00%	0.00%	100%	4.76%
	5	6.61%	0.00%	10.74%	45.45%	37.19%	100%	24.90%	5	2.78%	8.33%	30.56%	52.78%	5.56%	100%	85.71%
	Total (πi 2004)	13.58%	2.47%	15.02%	45.88%	23.05%	100%		Total (πi 2010)	7.14%	7.14%	26.19%	52.38%	7.14%	100%	

Mobility Index$_{2002\text{-}2004}$:0.51, Mobility Index$_{2008\text{-}2010}$: 0.88, $Z_{1\ (2002\text{-}2004)}$: 0.26 (0.026), $Z_{1\ (2008\text{-}2010)}$: 1.46 (.0.071), Z_2: -4.96**

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Table 47: Savings Mobility of Households with Pensions/Grants (%)

	2004								2010							
	Savings Quintile	1	2	3	4	5	Total	πi 2002	Savings Quintile	1	2	3	4	5	Total	πi 2008
2002	1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	65.48%	1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	17.37%
	2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	9.11%	2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	6.59%
	3	0.00%	0.00%	0.00%	0.00%	0.00%	0%	1.16%	3	0.00%	0.00%	0.00%	0.00%	0.00%	0%	4.79%
	4	13.89%	2.78%	3.97%	69.84%	9.52%	100%	20.86%	4	0.00%	0.00%	0.00%	0.00%	0.00%	0%	2.99%
	5	0.00%	0.00%	7.32%	70.73%	21.95%	100%	3.39%	5	0.00%	0.00%	0.00%	0.00%	14.91%	15%	68.26%
	Total (πi 2004)	68.21%	7.37%	3.31%	17.88%	3.23%	100%		Total (πi 2010)	26.17%	6.04%	26.17%	27.52%	14.09%	100%	

Mobility Index$_{2002\text{-}2004}$:0.81, Mobility Index$_{2008\text{-}2010}$: 0.97, $Z_{1\ (2002\text{-}2004)}$: 1.16 (0.014), $Z_{1\ (2008\text{-}2010)}$: 11.83*** (.0.006), Z_2: -9.82***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Table 48: Savings Mobility of Households with Farm Sales (%)

	2004								2010							
	Savings Classes	1	2	3	4	5	Total	πi 2002	Savings Classes	1	2	3	4	5	Total	πi 2008
2002	1	87.50%	12.50%	0.00%	0.00%	0.00%	100%	22.86%	1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	2	50.00%	25.00%	25.00%	0.00%	0.00%	100%	11.43%	2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	3	0.00%	0.00%	0.00%	25.00%	75.00%	100%	11.43%	3	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	4	0.00%	0.00%	0.00%	93.33%	6.67%	100%	42.86%	4	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	5	0.00%	0.00%	25.00%	25.00%	50.00%	100%	11.43%	5	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
	Total (πi 2004)	25.71%	5.71%	5.71%	45.71%	17.14%	100%		Total (πi 2010)	0.00%	0.00%	0.00%	0.00%	0.00%	0%	

Mobility Index$_{2002\text{-}2004}$:0.48, Mobility Index$_{2008\text{-}2010}$: 1, $Z_{1\ (2002\text{-}2004)}$: 0.73 (0.071), $Z_{1\ (2008\text{-}2010)}$: NA, Z_2: NA

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Table 49: Savings Mobility of Households with Non-Farm Sales (%)

	2004								2010							
	Savings Classes	1	2	3	4	5	Total	πi 2002	Savings Classes	1	2	3	4	5	Total	πi 200
2008	1	81.25%	18.75%	0.00%	0.00%	0.00%	100%	11.76%	1	100.00%	0.00%	0.00%	0.00%	0.00%	100%	13.8
	2	33.33%	46.67%	20.00%	0.00%	0.00%	100%	11.03%	2	100.00%	0.00%	0.00%	0.00%	0.00%	100%	11.1
	3	0.00%	0.00%	0.00%	41.67%	58.33%	100%	8.82%	3	100.00%	0.00%	0.00%	0.00%	0.00%	100%	2.78
	4	4.48%	1.49%	8.96%	70.15%	14.93%	100%	49.26%	4	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00
	5	0.00%	0.00%	0.00%	57.69%	42.31%	100%	19.12%	5	23.08%	3.85%	15.38%	46.15%	11.54%	100%	72.2
	Total (πi 2004)	15.44%	8.09%	6.62%	49.26%	20.59%	100%		Total (πi 2010)	44.44%	2.78%	11.11%	33.33%	8.33%	100%	

Mobility Index$_{2002\text{-}2004}$:0.51, Mobility Index$_{2008\text{-}2010}$: 0.77, $Z_{1\ (2002\text{-}2004)}$: 0.67 (0.039), $Z_{1\ (2008\text{-}2010)}$: 10.25*** (0.012), Z_2:-6.24***

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Table 50: Savings Mobility of Households with No Income (%)

	2004								2010							
	Savings Quintile	1	2	3	4	5	Total	πi 2002	Savings Quintile	1	2	3	4	5	Total	πi 2008
2002	1	100.00%	0.00%	0.00%	0.00%	0.00%	100%	8.33%	1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00
	2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%	2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00
	3	0.00%	0.00%	0.00%	0.00%	100.00%	100%	8.33%	3	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00
	4	0.00%	0.00%	0.00%	71.43%	28.57%	100%	58.33%	4	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00
	5	33.33%	0.00%	0.00%	33.33%	33.33%	100%	25.00%	5	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00
	Total (πi 2004)	16.67%	0.00%	0.00%	50.00%	33.33%	100%		Total (πi 2008)	0.00%	0.00%	0.00%	0.00%	0.00%	0%	

Mobility Index$_{2002\text{-}2004}$:0.59, Mobility Index$_{2008\text{-}2010}$: NA, $Z_{1\ (2002\text{-}2004)}$: NA, $Z_{1\ (2008\text{-}2010)}$: NA, Z_2: NA

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Regardless of the main source of income, household savings mobility showed upward mobility in the pre-GFC period compared to the downward mobility in the post-GFC period. During the pre-GFC period household savings tended towards savings group four. The exception to this trend was seen in households receiving pensions and grants, which were observed to save in savings category one. In the post-GFC period all households moved towards savings category one. Households receiving remittances were, however, less likely to have a decline in savings. The results were significant for salaries and wages, remittances, pensions and grants, as well as non-farm sales.

xv. Social Pensions/Grants-Savings Mobility of Households

Table 51: Savings Mobility of Households with Zero Grant Receipts (%)

	2004								2010							
	Savings Classes	1	2	3	4	5	Total	πi 2002	Savings Classes	1	2	3	4	5	Total	πi 200
2002	1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	5.73%	1	50.71%	0.00%	22.14%	17.86%	9.29%	100%	2.24
	2	42.41%	27.51%	26.36%	3.72%	0.00%	100%	6.06%	2	80.26%	0.00%	0.00%	0.00%	19.74%	100%	1.22
	3	4.90%	0.00%	10.27%	45.81%	39.02%	100%	11.00%	3	22.58%	0.00%	12.10%	22.58%	42.74%	100%	1.99
	4	1.43%	0.96%	12.19%	65.35%	20.06%	100%	55.85%	4	7.51%	0.00%	21.97%	54.34%	16.18%	100%	2.77
	5	2.03%	0.00%	15.22%	52.89%	29.86%	100%	21.35%	5	6.51%	10.07%	27.50%	40.87%	15.05%	100%	91.7
	Total (πi 2004)	8.98%	3.13%	12.96%	53.06%	21.87%	100%		Total (πi 2010)	8.75%	9.25%	26.58%	39.87%	15.56%	100%	

Mobility Index$_{2002\text{-}2004}$:0.73, Mobility Index$_{2008\text{-}2010}$: 0.73, $Z_{1\ (2002\text{-}2004)}$: 1.09 (0.006), $Z_{1\ (2008\text{-}2010)}$: -0.28 (0.012), Z_2: -0.11

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

Table 52: Savings Mobility of Households with More than R10 000 Grant Receipts (%)

	2004								2010							
	Savings Quintile	1	2	3	4	5	Total	πi 2002	Savings Quintile	1	2	3	4	5	Total	πi 200
2002	1	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%	1	100.00%	0.00%	0.00%	0.00%	0.00%	100%	46.5
	2	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%	2	94.62%	0.00%	0.00%	0.00%	5.38%	100%	13.7
	3	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%	3	70.92%	0.00%	0.00%	0.00%	29.08%	100%	11.5
	4	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%	4	0.00%	0.00%	0.00%	0.00%	0.00%	0%	1.9
	5	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%	5	56.51%	6.28%	10.72%	17.15%	9.34%	100%	26.2
	Total (πi 2004)	0.00%	0.00%	0.00%	0.00%	0.00%	0%		Total (πi 2010)	79.47%	2.35%	4.01%	6.42%	7.74%	100%	

Mobility Index$_{2002\text{-}2004}$:1, Mobility Index$_{2008\text{-}2010}$: 0.78, $Z_{1\ (2002\text{-}2004)}$: NA, $Z_{1\ (2008\text{-}2010)}$: 8.11*** (0.002), Z_2: NA

*Significant at the 10% level **Significant at the 5% level ***Significant at the 1% level Colour bar representing the diagonal

The savings mobility of social pensions and grant receiving households overall displayed downward savings mobility. The majority of households during the pre-GFC period did not receive grants and therefore the savings trends of grant and pension receivers could not be compared across time.

During the post-GFC period households that did receive government assistance were more likely to decrease their savings and move downwards toward savings category one. The results were insignificant.

6b. Summary of TMM

Household savings behaviour in South Africa illustrated the LCH savings path as expected. The expected savings trends of upward savings mobility in the pre-GFC period and downward savings mobility in the post-GFC period were also confirmed in the mobility matrix results. The savings patterns found across all household demographic factors conformed to the LCH framework's expectations.

Households with married, highly-educated, male household heads were observed to have greater savings probabilities. Similarly, households living in urban areas with a smaller dependency ratio and household size were also seen to have greater savings potential. Wealth of the household also contributed to the upward savings mobility of households in the pre-GFC period. Households receiving grants were observed to lower upward savings probabilities compared to households that did not receive grants. Also, households working in the community, social and personal services industry as well as having an elementary occupation title appeared to have greater upward savings mobility compared with those in the financial services industry, plant and machine operators and assemblers occupation. All of the main income sources positively contributed to savings potential. The outcomes for the variables of wealth, person occupations, industries, and social pensions and grant receipts were, however, insignificant.

Overall, household savings mobility illustrated upward savings during the pre-GFC period and downward savings during the post-GFC period. This trend was consistently observed across all household demographic factors and was significant for the main household factors except for social pensions and grants, wealth, person occupation and industry.

6c. OLS Regression

Multivariate OLS regression is employed for the analysis of household savings in cross-sectional data. The number of households analysed was similar to the first methodology of TMM where 7,801 households were assessed during period one and 8,979 households were assessed in period two. Dissimilar to the TMM analysis, however, was that only two cross-sections: 2004 and 2010, were analysed in the OLS regression.

This was done for two reasons: to evaluate the final years of household savings rates and past savings behaviour.

The independent variables analysed in the OLS regression are described in Equation 5. Recall that household savings rates are expected to be influenced by the age of the household head, the age squared of the household head (to denote the hump-shape of the LCH), wealth, social pension and grant receipts, and the population group variable. Also recall that the dummy and subscripts of the dummy variable/s in the econometric regression equation represented the post-GFC period. The results in Table 53 describe the impact of these factors on household savings rates in South Africa. The model has an adjusted R-squared of 65: 38%.

It can be observed that South African households show evidence for life cycle savings behaviour. The positive and significant sign of the age variable in both pre-GFC and post-GFC periods implied that the household increased their savings rates the closer the household grew towards an elderly age. This is expected as households save towards retirement. Furthermore, the age squared of the household supported the LCH expectations of a hump-shaped savings path, that is, the sign of the coefficient was negative and significant. The negative impact of the GFC on household savings rates was further confirmed by the OLS regression where the dummy variable displayed a significantly negative sign.

Table 53: OLS Regression Results

	OLS Regression	
Number of Observations	16729	
R-Squared	65.38	
Variables	**Coefficient (Robust Standard Errors)**	**T-values**
Age	0.207*** (0.009)	22.69
Age Squared	-0.002*** (0.00008)	-26.91
Total grant receipts (Social pensions)	4.6-07 (8.74e-07)	0.53
Wealth	-0.013*** (0.007)	-1.73
Majority Population Group (African/Blacks)	-0.001 (0.011)	-0.14
Post-GFC Dummy	-2.149*** (0.363)	-5.92
Age dummy (Post-GFC)	0.107*** (0.014)	7.45
Age Squared dummy (Post-GFC)	-0.001*** (0.0001)	-9.33
Total grant receipts (Social pensions) dummy (Post-GFC)	8.2e-06*** (1.96e-06)	4.18
Wealth dummy (Post-GFC)	omitted due to collinearity	
Majority Population Group (African/Blacks) dummy (Post-GFC)	0.12 (0.018)	0.67
Constant	-4.357*** (0.235)	-18.51

The wealth, social pensions and grant receipts, and the population group variables of the household head displayed mixed impacts on household savings. Surprisingly, wealth (which is expected to have a positive impact on savings under the LCH framework) has a significantly negative coefficient during the pre-GFC period. While social pensions and grant receipts showed positive influences during the post-GFC period only, the majority population group displayed positive yet insignificant results across both time periods. Past household savings behaviour was eventually excluded in the econometric model.

This was due to the negligible impact of these household variables and also because of the variables' decreasing effects on the adjusted R-squared of the OLS regression suggesting that the variables' impacts may have already been captured by the other household factors included in the model.

Model specification tests were run for the OLS regression from which it was concluded that the model was robust (see Appendix 10b for test outcomes). The tests for normality displayed that the error terms followed a normal, though peaked, distribution and did not suffer from skewness (Table 56). The predicted residuals were also plotted against the dependent variable and displayed no relationship. The sample was also tested for heteroskedasticity using the Breusch-Pagan/Cook-Weisberg test (Cook & Weisberg 1983; Breusch & Pagan 1979). The test-statistics showed that heteroskedasticity was present. To overcome this problem the study followed a standard and simple solution of regressing the model again, but specifying for robust standard errors (University of California Statistical Consulting Group 2007). Table 53 displays the robust model.

Finally, the assumption of multicollinearity was tested in the variance inflation factor matrix (VIF). No multicollinearity was detected in the model as the VIF values were less than the rule-of-thumb [Table 57] (O'Brien 2007). Although the age, age squared, the dummy and the dummy subscripts of these variables showed higher rule-of-thumb values, the non-linear relationship between the age and age squared variables, and the large sample size implied that the results remained robust (O'Brien 2007).

6d. Comparison of TMM and OLS Regression

The main results of the TMM and the OLS Regression supported each of the variable findings concluded from the techniques. The outcomes, however, were not directly comparable due to the bi-variate and multivariate analysis of each of the methodologies. A descriptive comparison explaining the similarity in findings of the main results of age, wealth, population groups, and social pensions and grant receipts is therefore provided.

Recall that the outcomes of TMM showed that savings increased as the age group of the household head increased, and declined during the retirement years. This trend was observed across both time periods, although during the post-GFC period savings mobility was downward and moved towards negative savings.

The significantly downward mobility illustrated in the post-GFC was further supported by the significant and negative sign of the dummy variable in the OLS regression.

The significant patterns of the upward mobility of household savings and age implied that life cycle savings behaviour was present in South African households. The outcome of this was also confirmed in the results of the OLS regression where the age variable had a positive and significant sign, as well as in the significant and negative sign of the age squared variable. The wealth of the household on the other hand displayed a positive influence on savings pre-GFC under TMM methodology, however, in the OLS regression wealth resulted in a negative impact. The results of the TMM for wealth were, however, insignificant.

The mobility patterns displayed for the population groups showed similarities in savings trends. This similarity between the two savings mobilities in both the period pre- and post-GFC was also supported in the OLS regression. Social pensions and grant receipts, however, were only significant and positive in the OLS regression for the post-GFC period. Hence, the OLS regression results are taken as the overall impact of the social pension and grant variable. The table below describes the impacts of the main variables of the OLS regression and the TMM matrix.

Table 54: Comparison of TMM & OLS Regression Results

Variables	**TMM**	**OLS**
Age	Positive, Significant	Positive, Significant
Age Squared	Favourable	Negative, Significant
Dummy/Time effect	Negative, Significant	Negative, Significant
Wealth	Positive, Insignificant	Negative, Significant
Total grant receipts/Social pensions	Negative, Insignificant	Positive, Significant

7. Discussion

Household savings in South Africa show support for the LCH framework. Across both methodologies of the TMM and OLS regression, the savings-age profile of South African households implies hump-shaped savings rate behaviour. Additionally, the savings peaks of South African households were also observed during the pre-retirement years. Although the results showed support for the LCH model, some unexpected outcomes were also observed. The findings of all the expected and unexpected household factors are discussed below.

The results of this study, particularly the hump-shaped savings and income paths, are in accordance with in accordance with the literature on the household savings behaviour of Taiwan, Italy, Germany, the US and the UK (Modigliani 2005b; Belke *et al.* 2012; Deaton & Paxson 1994; Attanasio & Szekely 2001; Attanasio & Browning 1994). Although the hump-shape of the LCH model is in accordance with the above-mentioned studies, the degree of the hump, as well as the ages where savings and dis-savings occurred in the pre-retirement ages, is dissimilar.

South African household savings behaviour like Italian, German, Taiwanese, US and UK households started to accumulate savings during the earning years – typically from the mid-20s until the late 50s, and even into the 60s (Modigliani 2005b; Belke *et al.* 2012; Deaton & Paxson 1994; Attanasio & Szekely 2001; Attanasio & Browning 1994). These trends were as expected under the LCH model.

Dissimilar to the US, UK and Italian households was the fact that South African households achieved their income peaks in the earlier working years of 35 – 44 years of age, while in the aforementioned developed countries, incomes peaked towards the late 40s and 50s (Modigliani 2005b; Attanasio & Browning 1994). The savings peaks and hump-shapes illustrated in these countries are therefore comparatively longer and only began to dip towards the ages of the early 60s and 70s.

The reasons for this could potentially be attributed to the differences in the life expectancy of households in South Africa compared with that of the developed nations (Freire 2004a). Life expectancy in South Africa is comparatively shorter than developed nations largely due to the impact of HIV/AIDS, which also directly impacts savings behaviour (Freire 2004a, 2004b). According to the LCH framework, a shortened life expectancy still results in greater savings, although this savings accumulation would occur during the earlier working years compared with countries that have a longer life expectancy, ceteris paribus.

Other household factors also contributing to the early savings peaks among South African households are the smaller household sizes. This is assuming that there was a decrease in the number of dependents, such as in the case of Polish household savings (Liberda & Peczkowski 2005). Another factor is the absolute income effect, such as in the case of Australian households (Harris *et al.* 2002). Although South African household sizes had declined during the post-GFC period, the household dependency ratio had increased. The smaller household consisted of one worker to one dependent, and a more plausible explanation for younger savings peaks in South African households may be better explained by the increased incomes (Figures 5 – 8). Although increased incomes contribute to the understanding of increased savings behaviour, the life cycle effect of shorter life expectancies continues to dominate the absolute income effect as assumed by the theoretical framework employed in this study.

On the other hand, German household savings behaviour illustrated similarities to the earlier savings peaks of South African households (Belke *et al.* 2012). Although this savings trend was shared in both a developed country such as Germany, and a developing country such as South Africa, it may be attributed to the wealth effect. In Germany household wealth, especially real estate assets, was greatly accumulated during in the younger earning years. This positive wealth impact contributed largely to the savings trends of young German households resulting in peaked savings in the earlier years that were similar to those in South Africa (Belke *et al.* 2012).

The wealth impact in South Africa, however, displayed dissimilarities and unexpected outcomes compared with the LCH model and other countries such as Germany and Australia (Belk *et al.* 2012; Harris *et al.* 2002). Wealth could only be observed in the pre-GFC period due to data omissions, and it was concluded to significantly decrease household savings. This outcome was dissimilar to the TMM results where wealth had a positive impact. Although the two outcomes are contradictory, it can be reconciled that the mobility matrix outcome is insignificant and the mobility patterns are similar to households with no wealth. Households illustrated similar upward mobility patterns for both wealth and no wealth household types.

One of the reasons for the downward wealth effect on savings could be question omissions. In the GHS survey, households were asked whether they owned a house and a car. Thus, there was no differentiation between whether it was passed down from parent to child and whether the house was given by the State otherwise known as 'RDP housing.'

The possibility of the wealth variable representing both households that are wealthy and not wealthy (poor and supported by the State) leads to potential biases in the conclusion of the wealth impact on household savings behaviour in South Africa. Therefore, the impact of wealth on savings is in inconclusive based on the data in this study.

Another factor in the model was South Africa's social pensions and grants. The outcomes of this factor also displayed contradictory impacts. In the TMM methodology, this factor was observed to decrease and even have a negligible impact on household savings rates while in the OLS regression the impact was positive and significant during the post-GFC period. Overall, the impact of social pensions and grant receipts appears to be negligible even though it is observed to be significant and positive. This is because of the small magnitude of the social pensions and grant receipts displayed in the OLS regression.

The reasons for this negligible impact could potentially be explained by the increases in household dependency ratios and the high but stable consumption patterns from pre- to post-GFC. Households with a higher dependency ratio (a greater support for children and/or pensioners) would be expected to receive greater grant amounts if the number of dependents increased (van der Berg *et al.* 2010). However, in 2010 household size had declined while the household dependency ratio had increased. This implies that only one or two social pensions/grants could potentially be received, if households claimed grants at all (van der Berg, *et al.* 2010). Due to social pensions and grant receipts being perceived as household incomes (van der Berg *et al.* 2010; Betrand *et al.* 2001) and the fact that consumption expenditure remained unchanged in the post-GFC period, the impact on household savings is potentially ambiguous. This ambiguity arises from the number of dependents receiving grants and the magnitude of the grants received. If the grant amount is large enough to cover the unchanged consumption expenditure, the impact on savings would be expected to be positive or even negligible. If, however, the grant amount is small and not able to cover consumption then the impact would be negative. The effect of social pensions and grants is thus ambiguous and can be perceived as inconclusive. This conclusion is also supported by the opposing signs of the social pension and grant factor from the two methodologies employed in the study.

Other explanations for the social pensions and grant impact could be attributed to the loss of other sources of income that contributed, in addition to the main source of pensions and grants incomes, to household incomes.

The job losses experienced during the aftermath of the GFC event were greater for the informal sector compared with the formal sector (Verick 2010). Households mainly reliant on government assistance may be those households that had heavily relied on informal sector employment. Hence, in the post-GFC period those receiving grants and pensions may have been negatively impacted and therefore the receipt of pensions and grants were able to positively and significantly influence household savings. Despite this, the amount received would have to be rather large to impact household savings behaviour in these households.

Compared to Taiwanese savings patterns where Taiwan was known to not receive any government assistance (Deaton & Paxson 1994), South African households expectedly illustrated shorter savings paths with earlier savings peaks. Taiwanese household savings, on the other hand, peaked much later, even compared to the developed countries of the US and the UK, in the later working years during the ages of 60 – 80 (Deaton & Paxson 1994; Attanasio & Szekely 2001). Once education levels of the household head had been controlled, however, savings peaked between 60 – 70 years old (Attanasio & Szekely 2001). Similar to the Taiwanese household savings rates was the fact that wealth also had similar impacts as in South African households (Deaton & Paxson 1994). However, the difference between the wealth impact of Taiwanese and South African households was that Taiwanese households saved substantially more than South African households. Hence, wealth adjustment in assets is not necessary and has a minimal impact on savings behaviour.

The impact of the population demographic variable on South Africa's household savings rate differed from the findings of the US and also from a previous microeconomic savings study conducted in South Africa (Lusardi 2007; Esson 2003). In the study by Lusardi (2007) and Esson (2003), the African/Black population group – or the majority population group – was observed to have lower savings rates compared with other population groups. The main reasons for this were lower education or skills levels and therefore lower income earning potential. Although the education levels in South Africa were low with over 80% of the population having only a secondary – either partially or fully completed – education (Table 6), the savings mobility patterns continued to be upwardly mobile (Tables 30 – 32). Indeed, savings mobility increased as the education levels of the household head increased. However, savings continued to be upwardly mobile across all the education levels.

This upward trend could thus potentially explain the savings behaviour of the majority population group. Moreover, the negligible differences between the savings patterns of the majority and minority groups could also be explained by the general upward savings mobility illustrated for all the education levels.

Consumption patterns of South Africans were consistent as expected under the LCH framework. Although consumption expenditure was consistently high in both pre- and post-GFC periods, the consumption paths displayed 'tracking' of household incomes (Figures 4 – 7). This may be explained by the accessibility of credit as observed in Chauke (2011) and du Plessis (2008). As incomes increased consumption would also increase because accessibility of credit increased. Controlling for credit under the LCH model may result in a flatter consumption path, although South African income and consumption figures suggest a more direct relationship as described by Keynes' (1936a, 1936b) absolute income hypothesis.

Finally, South African households' long-run savings probabilities are discussed. The long run probabilities illustrated in South Africa could only be compared with Polish household savings mobility because that is the only other study that had employed mobility matrices (Liberda & Peczkowski 2005). The long-run probabilities in South African households differed from Poland's long-run savings probabilities.

In the pre-GFC period, South African savings had a greater chance of augmenting savings rates: i.e. households were more likely to save in the upper savings groups. In the post-GFC period, however, due to the temporary and negative impact of the GFC on household incomes, lower savings probabilities were shown. Polish, household savings probabilities were constantly increasing in the long run. These probabilities were consistent over the analysed years of 1997 – 2000, even though the savings rates distribution varied slightly during the sample time period.

Due to South Africa's change in savings rate distribution from pre- to post-GFC, it was expected that the long run savings probabilities would decline from the pre-GFC period to the post-GFC period. Therefore, the long run likelihood should also differ from Poland's time periods that had not been exposed to a shock such as the GFC. This leaves only the pre-GFC period (2002 – 2004) available for comparison to Poland's long run probabilities (1997 – 2000). However, the difference in length, as well as other country specific factors, may contribute to the differences in each country's savings distribution and behaviour.

8. Conclusion

The findings of household savings in this investigation supported the LCH framework. Household savings rates were observed to increase with the age of the household head, although the negative impacts of the GFC were also observed to decrease the hump of the savings path in the post-GFC period. The expected hump-shaped path of the LCH was also illustrated in the results despite the temporary decreases in household incomes. Unexpected findings were additionally discovered during this investigation in the variables of wealth, population groups, and social pensions and grants.

The outcome of the study on household savings rates in both methodologies concluded that South African household incomes followed the hump-shape path as expected under the LCH framework. Furthermore, the savings peaks of South African households were observed to be between the ages of 30 – 40 years of age (similar to Poland) and as would be expected in developing countries with relatively low life expectancies. Although these savings peaks also coincided with the developed countries of Germany and Australia, these trends could be explained by wealth and income impacts. The influence of the household demographic factors on savings displays LCH implications in both methodologies employed in this study. The negative impact of the GFC was additionally observed.

The two factors of wealth, and social pension and grant, illustrated somewhat unexpected results. In the case of the wealth variable, the negative and significant influence during the pre-GFC period is the opposite of expectations under the LCH framework. The ambiguity in the results can be attributed to the lack of data that is distinguished in the GHS. Social pensions and grant effects on the other hand illustrated a positive and significant impact during the post-GFC period, although the magnitude was small and could potentially be considered as negligible. The impacts of this may be explained by the dependency ratio where the number of dependents receiving grants and the magnitude of these grants influences the effect social pensions and grants have on household savings behaviour.

Overall, the findings of this investigation revealed that South African household savings behaviour conform to the Life Cycle Hypothesis of Modigliani. Moreover, the negative and temporary impacts of the GFC on household incomes were found to be significant and negative based on the assumption of a permanent increase in incomes in the pre-GFC period and a temporary decrease in incomes during the post-GFC period. Household demographic factors broadly followed LCH expectations.

9. References

1. Abdelkhalek, T., Arestoff, F., Mage-Bertomeu, S. & El Mekkaoui, N., 2009, '*A Microeconometric Analysis of Households Saving Determinants in Morocco'*, in *University Paris-Dauphin Open Access*, viewed 20 July 2012, from http://basepub.dauphine.fr/xmlui/bitstream/handle/123456789/5550/A27CA046d01.pdf?sequence=1.

2. Ando, A. & Modigliani, F., 1963, 'The 'Life Cycle' Hypothesis of Saving: Aggregate Implications and Tests', *American Economic Review* 53(1), 55-84.

3. Aron, J. & Muelbauer, J., 2000, 'Personal and corporate saving in South Africa', *The World Economic Review* 14(3), 509-544.

4. Aron, J. & Muelbauer, J., 2006, 'Estimates of household sector wealth in South Africa 1970 – 2003', *Review of Income and Wealth* 52(2), 285-307.

5. Attanasio, O. P. & Browning, M., 1994, 'Testing the Life Cycle Model of Consumption: What can we learn from Microeconomic and Macroeconomic data?', *Investigaciones Economicas* 18(3), 433-463.

6. Attanasio, O. P. & Szekely, M., 2001, 'Household Saving in East Asia and Latin America: Inequality, Demographics, and All That', in *Annual World Bank Conference in Development Economics,* 2002, 393-438.

7. Belke, A., Dreger, C. & Ochmann, R., 2012,. '*Do Wealthier Households Save More: The Impact of the Demographic Factor,'* Bonn, IZA: Discussion Paper Series.

8. Betrand, M.; Mullainathan, S. & Miller, D., 2003, 'Public Policy and Extended Families: Evidence from Pensions in South Africa', *The World Bank Economic Review* 17(1), 27-50.

9. Bhattacharya, D. & Mazumder, B., 2011, 'A non parametric analysis of Black-White differences in intergenerational income mobility in the United States', Federal Reserve Bank of Chicago.

10. Biewen, M., 2002, 'Bootstrap inference for inequality, mobility and poverty measurement', *Journal of Econometrics* 108(2), 317-342.

11. Bureau for Research and Economic Analysis of Development, 2003, 'Data from Developing Countries', in *Household Surveys*, viewed 1 October 2012, from http://ipl.econ.duke.edu/dthomas/dev_data/index.html#hhsurveys.

12. Breusch, T. S. & Pagan, A. R., 1979, 'A Simple Test for Heteroscedasticity and Random Coefficient Variation', *Econometrica: Journal of the Econometric Society:* 1287-1294.

13. Browning, M. & Crossley, T. F., 2001, 'The life-cycle model of consumption and savings', *American Economic Association* 15(3), 3-22.

14. Browning, M. & Lusardi, A., 1996, 'Household savings: micro theories and micro facts', *Journal of Economic Literature* 34(4), 1797-1855

15. Burkhauser, R. V., Holt-Eakin, D. & Rhody, S. E., 1997, '*Labor earnings and inequality in the United States and Germany during the growth years of the 1980s'*, Cambridge: NBER Working Paper Series.

16. Carroll, C. D., 1997, 'Buffer-stock saving and the life cycle/permanent income hypothesis', *The Quartery Journal of Economics* 112(1), 1-55.

17. Carroll, C. D., 2011, 'Theoretical foundations of buffer stock saving', Dept. of Economics, John Hopkins University.

18. Case, A., 1998, 'Income Distribution and Expenditure Patterns in South Africa', Dept. of Economics, Princeton University.

19. Case, D. & Deaton, A., 1998, 'Large Cash Transfers to the Elderly in South Africa', *The Economic Journal* 108(450), 1330-1361.

20. Chauke, H., 2011, 'The Determinants of Household Savings: The South African Black Middle Class Perspective', in fulfillment of a Masters of Business Administration, Dept. of Economics, University of Pretoria.

21. Chen, W. H., 2009, 'Cross-National Differences in Income Mobility: Evidence from Canada, the United States, Great Britain and Germany', *Review of Income and Wealth* 55(1), 75-100.

22. Chowa, G. A., 2006, 'Savings Perfomarnce among Rural Households in Sub-Saharan Africa: The Effect of Gender', *Social Development Issues* 28(2), 106-116.

23. Constantinides, G. M., 1990, 'Habit formation: A Resolution of the Equity Premium Puzzle', *The Journal of Political Economy:* 519 – 543.

24. Cook, R. D. & Weisberg, S., 1983, 'Diagnostics for Heteroscedasticity in Regression', *Biometrika* 70(1), 1-10.

25. DataFirst., 2000, '*Khayelitsha Mitchell's Plain Survey 2000'*, viewed 20 October 2011, from http://www.datafirst.uct.ac.za/catalogue3/index.php/catalog/4/datafile/F3/V1019.

26. Deaton, A., 1985, 'Panel Data from Time Series of Cross Sections', *Journal of Econometrics* 30(1), 109-126.

27. Deaton, A., 1991, Savings and liquidity constraints. *Econometrica: Journal of the Econometric Society:* 1221-1248.

28. Deaton, A., 2005, 'Franco Modigliani and the Life Cycle Theory of Consumption', paper presented at Convegno Internazionale Franco Modgliani, Accademia Nazionale dei Lincei, Rome, 17-18th February.

29. Deaton, A. S. & Paxson, C. H., 1994, 'Saving, Growth, and Aging in Taiwan', in D. A. Wise (eds.), *Studies in the Economics of Aging,*.pp. 331-362 University of Chicago Press, Chicago.

30. du Plessis, G., 2008, 'An Exploration of the Determinants of South Africa's Personal Savings Rate – Why do South Afircan Households Save so Little?', in fulfillment of a Masters of Business Administration, Dept. of Economics, University of Pretoria.

31. Economic Policy Research Institute, 2002, '*Social Security Reform and the Basic Income Grant for South Africa'*, NA: International Labour Organisation (ILO).

32. Ersado, L.; Alwang, J. & Alderman, H., 2000, '*Changes in Consumption and Savings Behaviour Before and After Economic Shocks: Evidence from Zimbabwe'*, Chicago: International Food and Agribusiness Management Association.

33. Esson, R., 2003, *'Savings and Savers: An Analysis of Saving Behaviour Among Cape Town's Poor'*, Cape Town: Centre for Social Science Research University of Cape Town CSSR Working Paper No. 59.

34. Fields, G. S., Hernandez, R. D., Rodriguez, S. F. & Puerta, M. L., 2006, *'Income mobility in Latin America'*, New York: Cornell University IRL School Working Paper No. 12.

35. Fields, G. S. & Ok, E. A., 1999, *'The Measurement of Income Mobility:An Introduction to the Literature'*, New York: C. V. Starr Center For Applied Economics.

36. Formby, J. P., Smith, J. W. & Zheng, B., 2004, 'Mobility measurement, transition matrices and statistical inference', *Journal of Econometrics* 120(1), 181-205.

37. Freire, S., 2004a, 'Funeral Costs, Saving Behaviour and HIV/AIDS', in dPru-tiPs-cornell univeristy Forum, *African Development and Poverty Reduction: The Macro-Micro Linkage,* pp. 13-15.

38. Freire, S., 2004b, 'Impact of HIV/AIDS on Saving Behaviour in South Africa', in dPru-tiPs-cornell univeristy Forum, *African Development and Poverty Reduction: The Macro-Micro Linkage*, Somerset West, South Africa, 13-15th October, 2004, pp. 1-19.

39. Gali, J., 1990, 'Finite Horizons, Life-Cycle Savings, and Time-Series Evidence on Consumption', *Journal of Monetary Economics* 26(3), 433-452.

40. Gujarati, D. N., 2003, *Basic Econometrics.* 4th edn., McGraw-Hill, New York.

41. Harris, M. N., Loundes, J. & Webster, E., 2002, 'Determinants of Household Saving in Australia,' *The Economic Record* 78(241), 207-223.

42. Jappelli, T. & Pistaferri, L., 2000, 'Intertemporal Choice and Consumption Mobility', *Journal of the European Ecnomic Association* 4(1), 75-15.

43. Keynes, J. M., 1936a, 'The Definition of Income, Saving and Investment', in J. M. Keynes (ed.), *The General Theory of Employment, Interest, and Money,* pp. 35-36, Harcourt Brace, New York.

44. Keynes, J. M., 1936b, 'The Propensity to Consumer: I. Objective Factors', in J. M. Keynes (ed.), *The General Theory of Employment, Interest, and Money,* pp. 50-60, Harcourt Brace, New York.

45. Liberda, B. & Peczkowski, M., 2005, 'Households' Saving Mobility in Poland', *Ekonomia* 17, 28-42.

46. Lusardi, A., 2007, '*Household Savings Behaviour in the United States: The Role of Literacy, Information, and Financial Education Programs'*, Boston: Implications of Behavioural Economics for Economic Policy.

47. Mahlo, N., 2011, 'Determinants of Household Savings in South Africa', Masters Disseration, Dept. of Economics, Univeristy of Johannesburg.

48. Mazumder, B., 2012, '*Black-White Differences in Intergenerational Economic Mobility in the US'*, Chicago: Federal Reserve Bank of Chicago.

49. Mba, C. J., 2007, 'Impact of HIV/AIDS mortality on South Africa's life expectancy and implications for the elderly population', *African Journal of Health Sciences* 14(3), 201-210.

50. Modigliani, F., 2005a, 'Utility analysis and the consumption function: an interpretation of cross-section data', in F. Modigliani (ed.), *The Collected Papers of Franco Modigliani,* pp. 3-46, The MIT Press, Cambridge.

51. Modigliani, F., 2005b, 'The Age Saving Profile and the Life-Cycle Hypothesis', in F. Modigliani (ed.), *The Collected Papers of Franco Modigliani,* pp. 47-78, The MIT Press, Cambridge.

52. Moyo, S., Musona, D., Mbhele, W. T. & Coetzee, G., 2002, '*Use and Impact of Savings Services Among Low IncomePeople in South Africa'*, Nairobi: MicroSave.

53. National Treasury of South Africa, 2012, 'Technical Paper D Incentivising non-retirement savings', viewed 2 January 2013, from http://www.treasury.gov.za/comm_media/press/2012/Incentivising%20non-retirement%20savings.pdf.

54. National Treasury of South Africa, 2012, 'Technical Paper E Improving Tax Incentives for Retirement Savings', viewed 2 January 2013, from http://www.treasury.gov.za/comm_media/press/2012/Improving%20tax%20incentives%20for%20retirement%20savings.pdf

55. Nga, M. T., 2007, 'An Investigative Analysis into the Saving Behaviour of Poor Households in Developing Countries: With Specific Reference to South Africa', in fulfillment of a Masters of Economics, Dept. of Economics, University of the Western Cape.

56. Nhabinde, V. C. & Schoeman, N. J., 2008, 'The Impact of Retirement Benefits on Consumption and Saving in South Africa', Dept. of Economics, University of Pretoria.

57. O'Brien, R. M., 2007, 'A Caution Regarding Rules of Thumb for Variance Inflation Factors', *Quality & Quantity* 41(5), 673-690.

58. Pistaferri, L., 2009, 'The life cycle hypothesis: an assessment of some recent evidence', *Rivista di Politica Economica:* 35-65.

59. Rhee, W., 2004, 'Habit formation and precautionary saving: evidence from the Korean household panel studies', *Journal of Economic Development* 29(2), 1-19.

60. Sachs, J. & Malaney, P., 2002, 'The Economic and Social Burden of Malaria', *Insight*, February.

61. South Africa.Info, 2013, *Education in South Africa*, viewed 4 January 2012, from http://www.southafrica.info/about/education/education.htm.

62. Southern Africa Labour and Development Research Unit, 2008., *National Income Dynamics Study 2008,* Cape Town: s.n.

63. South African Reserve Bank, 2013, *Quarterly Bulletin – Online Statistical Query,* Pretoria: South African Reserve Bank.

64. Schluter, C., 1998, 'Statistical Inferences with Mobility Indices', *Economic Letters* 59(2), 157-162.

65. Shangase, G. M., 2007, 'Examining the Effectiveness of BEE Implementation: A Case', Masters Dissertation, Dept. for Development Studies, University of the Witwatersrand.

66. Shorrocks, A. F., 1978a, 'The Measurement of Mobility', *Econometrica: Journal of the Econometric Society:* 1013-1024.

67. StataCorp version 12, 2012, *Stata Statistical Software: Release 12*, StataCorp LP., College Station, TX.

68. Statistics South Africa, 2002, 2004, 2008 , 2010, *General Household Survey,* Pretoria: Statistics South Africa.

69. Statistics South Africa, 2005/6, 2010/11, *Income and expenditure survey,* Pretoria: Statistics South Africa.

70. Statistics South Africa, 2013, *Mid-year Population Estimates 2013*, viewed 28 May 2013, from http://www.statssa.gov.za/publications/P0302/P03022013.pdf.

71. University of California Statistical Consulting Group, 2007, *Introduction to SAS,* viewed 19 February 2013, from http://www.ats.ucla.edu/stat/stata/webbooks/reg/chapter2/statareg_self_assessment_answers2.htm.

72. van der Berg, S., Sieberts, K. & Lekezwa, B., 2010, '*Efficiency and Equity Effects of Social Grants in South Africa',* Stellenbosch: Stellenbosch Economic Working Papers: 15/10.

73. Verick, S., 2010, '*Unravelling the Impact of the Global Financial Crisis on the South African Labour Market',* Geneva: International Labour Office: Employment Working Paper No. 48.

74. Villanger, E., 2003, '*The Effects of Disasters on Income Mobility: Bootstrap Inference and Measurement Error Simulations',* Bergen: Chr. Michelsen Institute Working Paper 2003:6.

75. Woolard, I. & Klasen, S., 2004., '*Determinants of Income Mobility and Household Poverty Dynamics in South Africa',* Bonn: IZA Discussion Paper Series DP No. 1030.

76. Zeldes, S. P., 1989., 'Consumption and Liquidity Constraints: An Empirical Investigation', *The Journal of Political Economy:* 305 – 346.

10. Appendix

10a. Job Titles and Industry

Table 55: Person Occupation/Job Titles & Industries

	Job Title/Person Occupation	Industry
0	Armed forces, occupations unspecified and not elsewhere classified and not economically active persons	PRIVATE HOUSEHOLDS, EX-TERRITORIAL ORGANISATIONS, REPRESENTITIVES OF FOREIGN GOVERNMENTS AND OTHER ACTIVITIES NOT ADEQUATELY DEFINED
1	Legislators, senior officials and managers	AGRICULTURE, HUNTING AND RELATED SERVICES
2	Professionals	MINING AND QUARRYING
3	Technicians and associate professionals	MANUFACTURING
4	Clerks	ELECTRICITY, GAS AND WATER SUPPLY
5	Service workers and shop and market sales workers	CONSTRUCTION
6	Skilled agricultural and fishery workers	WHOLESALE AND COMMISSION TRADE, EXCEPT OF MOTOR VEHICLES AND MOTOR CYCLES
7	Craft and related trades workers	TRANSPORT, STORAGE AND COMMUNICATION
8	Plant and machinery operators and assemblers	FINANCIAL INTERMEDIATION, INSURANCE, REAL ESTATE AND BUSINESS SERVICES
9	Elementary occupations	COMMUNITY, SOCIAL AND PERSONAL SERVICES

Source: Statistics South Africa (2004)

10b. Model Specification Tests

Table 56: Test for Skewness/Kurtosis

Skewness/Kurtosis tests for Normality

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	joint adj chi2(2)	joint Prob>chi2
residuals4	1.8e+04	0.0000	0.0000	.	.
yhat4	1.8e+04	0.0000	0.0000	.	.

Figure 18: Breusch/Pagan & Cook-Weisberg Heteroskedasticity Tests

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of savrat1

         chi2(1)      = 22309.49
         Prob > chi2  =   0.0000
```

Figure 19: Histogram of Residuals

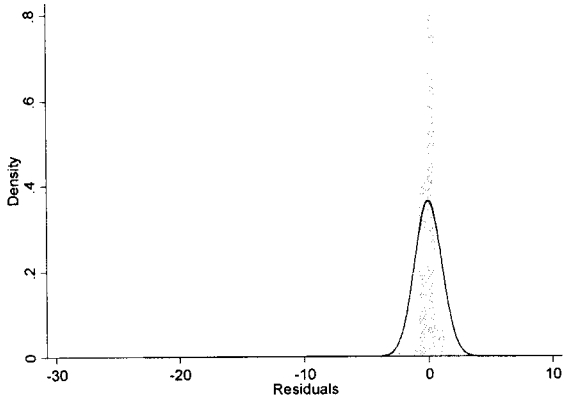


Figure 20: Plot of Residuals & Fitted Values of Household Savings Rates

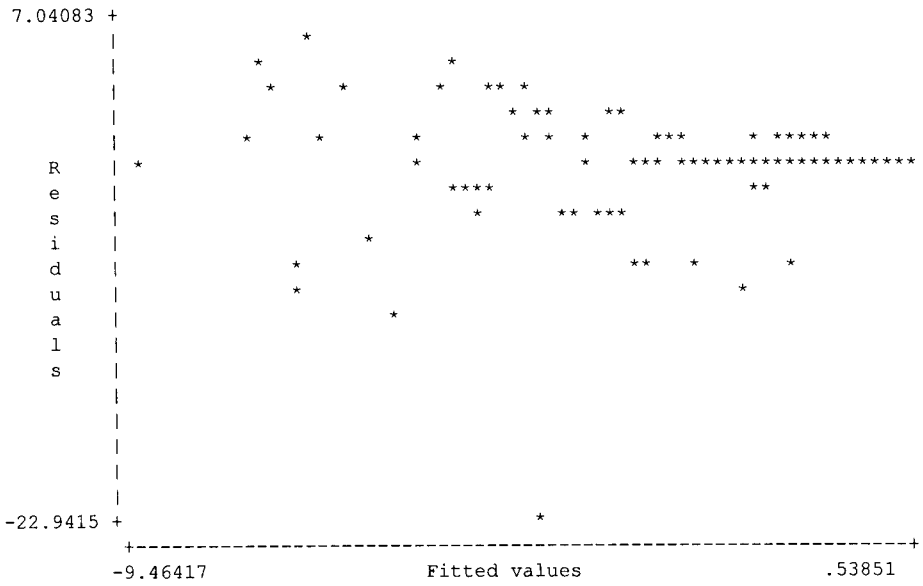


Table 57: Variance Inflation Factors of Independent Variables in OLS Regression

Variable	VIF	1/VIF
Age_dummy	1037.70	0.000964
age_sqr_du~y	411.94	0.002428
dummy	207.17	0.004827
age_sqr	135.96	0.007355
Age	126.78	0.007888
black_dummy	6.38	0.156617
totalgrant~y	4.97	0.201246
totalgrant	4.17	0.239997
black	2.25	0.443838
wealthdummy	1.42	0.703219
Mean VIF	193.87	

10c. Stata Codes for Data Cleaning Process

*Step1: Sorting of the data

*Using Person file for each year of 2002, 2004 and 2008, 2010

sort UqNr PersonNr

*Using Worker file for each year of 2002, 2004 and 2008, 2010

sort UqNr PersonNr

rename Gender Gender_w

rename Age Age_w

rename Popgrp popgrp_w

*For 2002 Worker file specifically

rename C_Gender C_Genderw

rename D_Age D_Agew

rename E_Race E_Racew

*For 2010 Person file specifically

rename Head_popgrp Popgrp

rename Head_age Age

```
rename Head_sex Gender

*Use the respective person files and merge with corresponding worker file for each year of 2002, 2004 and 2008, 2010.

merge m:m /*Merged with variables UqNr PersonNr Gender Age Popgrp, Alternatively could also merge one-to-one on UqNr and PersonNr variables*/

*Generating Year variables

gen Y=2002

gen Y=2004

gen Y=2008

gen Y=2010

*Constructed variable to differentiate between those below 15 (working age) vs. those 15 and older (considered as part of working population in South Africa).

gen nonworkerC=1 if _merge==1 & Age<15

replace nonworkerC=2 if _merge==3

replace nonworkerC=0 if _merge==1 & Age>15

drop if nonworkerC==0

*Checking for consistency of observations by matching popgrp, gender.

gen age_match=1 if  Age==Age_w

gen gender_match=1 if  Gender==Gender_w

gen race_match=1 if  popgrp==popgrp_w

gen prov_match=1 if Prov==Prov_w

rename _merge merge1

*Merged the merged person and worker file with house file for each year of 2002, 2004 and 2008, 2010.

merge m:m UqNr Gender Popgrp /*For each year of 2002, 2004 and 2008, 2010*/

sort UqNr PersonNr
```

*Checking Head of household exists for each year of 2002, 2004 and 2008, 2010.

gen head_exists=1 if _merge==3 & PersonNr==1

rename _merge merge2

*Keeping variables – note the same variables were kept across all survey years. The only differences are in the labelling of the variables kept. The variable names below identify those question names from the 2002 year.

keep UqNr PersonNr PSU Prov Gender Age Q46Owner Q119inju Popgrp Q11relshh Q12amari Q19hiedu Q131soci Q131gran Q131pove Q133pens Q133disa Q133chil Q133care Q133fost Q133gran Q133soci PERSON_W Y Q26Occup Q28Indus Q29Salto Q210Salp Q211Salc Q212inHh Q212NotH Q212Char Q212UIFS Q212Savi Q212Pens Q212Othr WORKERS nonworkerC Q468mnin Q469tota Q470tran Q470hous Q470clot Q470food Q470pers Q470othr HOUSE_WG merge2 head_exists

*Renaming variables to have the same variable names for years of 2002, 2004 and 2008, 2010.

rename Q11relshh relsh

rename Q12amari marital

rename Q19hiedu highedu

rename Q131soci needsocialworker

rename Q131gran needgrant

rename Q131pove needpovrelief

rename Q29Salto totalsal

rename Q210Salp salperiod

rename Q211Salc incomecate

rename Q26Occup personsoccup

rename Q28Indus indusact

rename Q468mnin mainincome

rename Q469tota totalhhexp

rename HOUSE_WG HOUSE_WG8

```
rename Q119inju illness_injurypastmonth

rename Q46Owner ownhouse

save /*each year was saved*/

*Step 2: Generating the required variables

*Generating main income amount (from main source of income, giving exact amounts rounded to whole numbers).

gen annualsal =  totalsal*52 if salperiod==1

replace annualsal= totalsal*12 if salperiod==2

replace annualsal =  totalsal if salperiod==3

replace annualsal=. if totalsal == 9999999

replace annualsal=. if totalsal == 8888888

*Generating main income amount: If had not given exact amounts, used income categories – see below.

gen lowerb =. if  incomecate==0 |incomecate==1

replace lowerb = 1 if  incomecate==2

gen upperb = 2400 if incomecate==2

replace lowerb = 2401 if incomecate==3

replace upperb = 6000 if incomecate==3

replace lowerb=6001 if incomecate==4

replace upperb=12000 if incomecate==4

replace lowerb=12001 if incomecate==5

replace upperb=18000 if incomecate==5

replace lowerb=18001 if incomecate==6

replace upperb=30000 if incomecate==6

replace lowerb=30001 if incomecate==7
```

```
replace upperb=42000 if incomecate==7

replace lowerb=42001 if incomecate==8

replace upperb=54000 if incomecate==8

replace lowerb=54001 if incomecate==9

replace upperb=72000 if incomecate==9

replace lowerb=72001 if incomecate==10

replace upperb=96000 if incomecate==10

replace lowerb=96001 if incomecate==11

replace upperb=132000 if incomecate==11

replace lowerb=132001 if incomecate==12

replace upperb=192000 if incomecate==12

replace lowerb=192001 if incomecate==13

replace upperb=360000 if incomecate==13

replace lowerb=360001 if incomecate==14

replace upperb = 360002 if incomecate==14

gen midpoint = (lowerb+upperb)/2

replace midpoint = 360001 if lowerb==360001

*Constructing Tax amounts for deduction from main income amounts.

*For 2002

gen tax=annualsal*0.18 if annualsal<=40000

replace tax = annualsal*0.25 + 7200 if annualsal<=80000 & annualsal>40000

replace tax = annualsal*0.3 + 17200 if annualsal<=110000 & annualsal>80000

replace tax = annualsal*0.35 + 26200 if annualsal<=170000 &annualsal>110000

replace tax = annualsal*0.38 + 47200 if annualsal<=240000 &annualsal>170000
```

```
replace tax = annualsal*0.4 +73800 if annualsal >240000

gen tax1 = midpoint*0.18 if midpoint<=40000

replace tax1 = midpoint*0.25 + 7200 if midpoint<=80000 & midpoint>40000

replace tax1 = midpoint*0.3 + 17200 if midpoint<=110000 & midpoint>80000

replace tax1 = midpoint*0.35 + 26200 if midpoint<=170000 & midpoint>110000

replace tax1 = midpoint*0.38 + 47200 if midpoint<=240000 & midpoint>170000

replace tax1 = midpoint*0.4 +73800 if midpoint>240000

*For 2004

gen tax = annualsal*0.18 if annualsal<=74000

replace tax = annualsal*0.25 + 13320 if annualsal<=115000 & annualsal>74000

replace tax = annualsal*0.3 + 23570 if annualsal<=155000 & annualsal>115000

replace tax = annualsal*0.35 + 35570 if annualsal<=195000 &annualsal>155000

replace tax = annualsal*0.38 + 49570 if annualsal<=270000 &annualsal>195000

replace tax = annualsal*0.4 + 78070 if annualsal>270000

gen tax1 = midpoint*0.18 if midpoint<=74000

replace tax1 = midpoint*0.25 + 13320 if midpoint<=115000 & midpoint>74000

replace tax1 = midpoint*0.3 + 23570 if midpoint<=155000 & midpoint>115000

replace tax1 = midpoint*0.35 + 35570 if midpoint<=195000 & midpoint>155000

replace tax1 = midpoint*0.38 + 49570 if midpoint<=270000 & midpoint>195000

replace tax1 = midpoint*0.4 +78070 if midpoint>270000

*For 2008

gen tax = annualsal*0.18 if annualsal<=122000

replace tax = annualsal*0.25 + 21960 if annualsal<=195000 & annualsal>122000

replace tax = annualsal*0.3 + 40210 if annualsal<=270000 & annualsal>195000
```

```
replace tax = annualsal*0.35 + 62710 if annualsal<=380000 &annualsal>270000

replace tax = annualsal*0.38 + 101210 if annualsal<=490000 &annualsal>380000

replace tax = annualsal*0.4 + 143010 if annualsal>490000

gen tax1 = midpoint*0.18 if midpoint<=122000

replace tax1 = midpoint*0.25 + 21960 if midpoint<=195000 & midpoint>122000

replace tax1 = midpoint*0.3 + 40210 if midpoint<=270000 & midpoint>195000

replace tax1 = midpoint*0.35 + 62710 if midpoint<=380000 & midpoint>270000

replace tax1 = midpoint*0.38 + 101210 if midpoint<=490000 & midpoint>380000

replace tax1 = midpoint*0.4 + 143010 if midpoint>490000

*For 2010

gen tax=annualsal*0.18 if annualsal<=132000

replace tax = annualsal*0.25 + 23760 if annualsal<=210000 & annualsal>132000

replace tax = annualsal*0.3 + 43260 if annualsal<=290000 & annualsal>210000

replace tax = annualsal*0.35 + 67260 if annualsal<=410000 &annualsal>290000

replace tax = annualsal*0.38 + 109260 if annualsal<=525000 &annualsal>410000

replace tax = annualsal*0.4 + 152960 if annualsal>525000

gen tax1 = midpoint*0.18 if midpoint<=132000

replace tax1 = midpoint*0.25 + 23760 if midpoint<=210000 & midpoint>132000

replace tax1 = midpoint*0.3 + 43260 if midpoint<=290000 & midpoint>210000

replace tax1 = midpoint*0.35 + 67260 if midpoint<=410000 & midpoint>290000

replace tax1 = midpoint*0.38 + 109260 if midpoint<=525000 & midpoint>410000

replace tax1 = midpoint*0.4 + 152960 if midpoint>525000

gen aftertaxsal = annualsal - tax

replace aftertaxsal = midpoint - tax1 if aftertaxsal==.
```

```
*Deflate to all after tax incomes to 2008 constant prices.

*For 2002

gen aftertaxincome = aftertaxsal/0.664 if Y==2002

gen annualsaladj = annualsal/0.664

gen incomecateadj = midpoint/0.664

*For 2004

gen aftertaxincome = aftertaxsal/0.732

gen annualsaladj = annualsal/0.732

gen incomecateadj = midpoint/0.732

*For 2008

gen aftertaxincome = aftertaxsal

gen annualsaladj = annualsal

gen incomecateadj = midpoint

*For 2010

gen aftertaxincome = aftertaxsal/1.11

gen annualsaladj = annualsal/1.11

gen incomecateadj = midpoint/1.11

*Constructing Tax thresholds for households that qualify for tax exemptions.

*For 2002

replace aftertaxincome = annualsaladj if annualsaladj<40622.65 & Age<=65

replace aftertaxincome = annualsaladj if annualsaladj<64216.87 & Age>65

replace aftertaxincome = incomecateadj if incomecateadj<40622.65 & Age<=65

replace aftertaxincome = incomecateadj if incomecateadj<64216.87 & Age>65
```

```
*For 2004

replace aftertaxincome = annualsaladj if annualsaladj<44019 & Age<=65

replace aftertaxincome = annualsaladj if annualsaladj<68306 & Age>65

replace aftertaxincome = incomecateadj if incomecateadj<44019 & Age<=65

replace aftertaxincome = incomecateadj if incomecateadj<68306 & Age>65

*For 2008

replace aftertaxincome = annualsaladj if annualsaladj<46000 & Age<=65

replace aftertaxincome = annualsaladj if annualsaladj<74000 & Age>65

replace aftertaxincome = incomecateadj if incomecateadj<46000 & Age<=65

replace aftertaxincome = incomecateadj if incomecateadj<74000 & Age>65

*For 2010

replace aftertaxincome = annualsaladj if annualsaladj<51351.35 & Age<=65

replace aftertaxincome = annualsaladj if annualsaladj<79754.95 & Age>65

replace aftertaxincome = incomecateadj if incomecateadj<51351.35 & Age<=65

replace aftertaxincome = incomecateadj if incomecateadj<79754.95 & Age>65

replace aftertaxincome = 0 if aftertaxincome==.

/*Calculate social grants*/

*For 2002 specifically

gen grants = 1 if needgrant==1

gen grantschild = 1 if grants==1 & Age<18

gen grantspens = 1 if grants==1 & Age>65

gen totalpens1 = grantspens*700 /*taken old age amount*/

gen totalchild1 = grantschild*453 /*taken average of child, care, foster grant*/

gen totalgrants = totalpens1+totalchild1 /*sum in excel as stata could not sum, unknown reason*/
```

```
bysort UqNr: egen totalgrant = sum(totalgrants)

*For 2004

gen totalgrantadj = totalgrant/0.664

gen tpension = Q150pens*8880 if Q150pens==1

gen tdisa = Q150disa*8880 if Q150disa==1

gen tchild = Q150chil*2040 if Q150chil==1

gen tcare = Q150care*8880 if Q150care==1

gen tfoster = Q150fost*6720 if Q150fost==1

gen tgrant = Q150gran*2040 if Q150gran==1

bysort UqNr: egen totalgrant = sum(totalgrants) /*Sum totalgratns in excel as stata could not sum, unknown reason*/

gen totalgrantadj = totalgrant/0.732

*For 2008

gen tpension = Q133pens*11280 if Q133pens==1

gen tdisa = Q133disa*11280 if Q133disa==1

gen tchild = Q133chil*2520 if Q133chil==1

gen tcare = Q133care*11280 if Q133care==1

gen tfoster = Q133fost*7800 if Q133fost==1

gen tgrant = Q133gran*2520 if Q133gran==1

bysort UqNr: egen totalgrant = sum(totalgrants) /*Sum totalgratns in excel as stata could not sum, unknown reason*/

gen totalgrantadj = totalgrant

*For 2010

gen tpens = Q136boag*12960 if Q136boag==1

gen tdisa = Q136bdis*12960 if Q136bdis==1
```

```
gen tchild = Q136bcsg*3000 if Q136bcsg==1

gen tcare = Q136bcar*12960 if Q136bcar==1

gen tfoster = Q136bfos*8520 if Q136bfos==1

gen tgrant = Q136bgrn*3000 if Q136bgrn==1

bysort UqNr: egen totalgrant =s um(totalgrants)/*Sum totalgratns in excel as stata could not sum, unknown reason*/

gen totalgrantadj = totalgrant/1.11

/*Generate dummy variable for mixed income, salary income, welfare income*/

bysort UqNr: egen hhincome = sum(income)

replace aftertaxincome = 0 if aftertaxincome==.

gen dummygrants = 3

replace dummygrants = cond(totalgrantadj>0, cond(aftertaxincome>0, 2, 1), cond(aftertaxincome>0, 0, 3))

gen no_income1 = 1 if dummygrants==3 & head==1

bysort UqNr: egen noincome = sum(no_income1)

/*Counting number of members in hh and hhsize person*/

bysort UqNr Y: gen pcounter =_n

bysort UqNr Y: egen hhsize = max(pcounter)

/*HH composition nadults include 'adult kids' */

gen nadults = 1 if Age>=18

gen nchildren = 1 if Age<18

bysort UqNr: egen adults = total(nadults)

bysort UqNr: egen children = total(nchildren)

/*Generating Age groups for Dependency ratio Person File*/

gen Age_over65 = 1 if Age>65
```

```
gen Age_under15 = 1 if Age<15

gen workingage = 1 if Age>=15 & Age<=65

bysort UqNr: egen totalover65 = sum(Age_over65)

bysort UqNr: egen totalunder15 = sum(Age_under15)

bysort UqNr: egen totalworkingage = sum(workingage)

gen depratio = (totalover65+totalunder15)/totalworkingage /*Schmidt-Hebbel defn*/

gen depratio2 = (totalover65+totalunder15)/hhsize /*Korean defn article and it is exactly the same*/

tab Age

gen age_none = 1 if Age==999

bysort UqNr: egen ageless = sum(age_none)

drop if ageless>0

/*Earners versus non earners in the HH worker file*/

gen sal = 1 if aftertaxincome>0

bysort UqNr: egen totalworkers = sum(sal)

gen nonearners = hhsize - totalworkers

gen hhratio = nonearners/totalworkers

/*gen hh expenditure*/

replace totalhhexp = 1 if totalhhexp==2

replace totalhhexp = 1 if totalhhexp==3

replace totalhhexp = 2 if totalhhexp==4

replace totalhhexp = 3 if totalhhexp==5

replace totalhhexp = 4 if totalhhexp==6

replace totalhhexp = 5 if totalhhexp==7

replace totalhhexp = 6 if totalhhexp==8
```

```
replace totalhhexp = 7 if totalhhexp==9

replace totalhhexp = 8 if totalhhexp==10

replace totalhhexp = 9 if totalhhexp==11

replace totalhhexp = 10 if totalhhexp==12

gen explb = 0 if totalhhexp==1

gen expub = 399 if totalhhexp==1

replace explb = 400 if totalhhexp==2

replace expub = 799 if totalhhexp==2

replace explb = 800 if totalhhexp==3

replace expub = 1199 if totalhhexp==3

replace explb = 1200 if totalhhexp==4

replace expub = 1799 if totalhhexp==4

replace explb = 1800 if totalhhexp==5

replace expub = 2499 if totalhhexp==5

replace explb = 2500 if totalhhexp==6

replace expub = 4999 if totalhhexp==6

replace explb = 5000 if totalhhexp==7

replace expub = 9999 if totalhhexp==7

replace explb =10000 if totalhhexp==8

replace expub= 10001 if totalhhexp==8

gen expmidpoint = (explb+expub)/2

gen totalexp = expmidpoint*12

*Deflating Expenditure to 2008 constant prices.
```

```
*For 2002

gen yrlyexp = totalexp/0.664

*For 2004

gen yrlyexp = totalexp/0.732

*For 2008

gen yrlyexp = totalexp

*For 2010

gen yrlyexp = totalexp/1.11

*Dropping those households that were non responsive for household expenditure data.

bysort UqNr Y: egen drophhexp = sum(totalhhexp==11)

bysort UqNr Y: egen drophhexp2 = sum(totalhhexp==12)

drop if drophhexp>=1

drop if drophhexp2>=1

/*99 = unspecified, 9 = dont know, 10 = refuse*/

*Keeping the variables needed.

keep UqNr PersonNr PSU Prov Gender Age ownhouse owncar illness_injurypastmonth popgrp relsh
marital highedu Y personsoccup indusact mainincome totalhhexp HOUS_WGT  head_exists
aftertaxincome hhsize adults children totalover65 totalunder15 totalworkingage depratio depratio2
totalgrantadj hhincome dummygrants noincome totalworkers nonearners hhratio yrlyexp

*Renaming these variables to Merge/Append with the other years corresponding to pre-GFC (ie 2002
- 2004) and post-GFC (ie 2008 - 2010). The digit at the end of the text string denotes the year from
which the variables come.

rename Gender Gender2

rename Age Age2

rename popgrp popgrp2

rename relsh relsh2
```

```
rename marital marital2

rename highedu highedu2

rename personsoccup personoccup2

rename indusact indusact2

rename mainincome mainincome2

rename yrlyexp totalexp2

rename totalgrantadj totalgrant2

rename hhsize hhsize2

rename hhincome hhincome2

rename adults adults2

rename children children2

rename depratio depratio12

rename depratio2 depratio22

rename hhratio hhratio2

rename dummygrants dummygrants2

rename noincome noincome2

rename aftertaxincome aftertaxincome2

rename totalover65 totalover652

rename totalunder15 totalunder152

rename totalworkingage totalworkingage2

rename totalworkers totalworkers2

rename nonearners nonearners2

rename head_exists head_exists2

rename HOUS_WGT HOUS_WGT2
```

```
rename illness_injurypastmonth illness_injurypastmonth2

rename ownhouse ownhouse2

rename owncar owncar2

*Step 3: Merging/Appending

*Step 3A: Merging the 2 years pre-GFC and post-GFC

*Use the earliest of the 2 years e.g. 2002 in the pre-GFC period.

merge 1:1 UqNr PersonNr /*using corresponding years of 2002 - 2004 and 2008 - 2010*/

merge m:m UqNr PersonNr Gender Popgrp /*this was necessary for merging 2008 - 2010 as there were many duplicates*/

*First check consistency in merge

gen gender_match = 1 if  Gender2==Gender4

gen popgrp_match = 1 if popgrp2==popgrp4

gen age_match = 1 if Age2+1==Age4

replace age_match = 2 if Age2+2==Age4

replace age_match = 3 if Age2+3==Age4

*Check how many household heads

gen counter = _n

gen head2 = 1 if relsh2==1

gen head4 = 1 if relsh4==1

recode head2 miss = 0

recode head4 miss = 0

bysort UqNr Y: egen headcount2 = sum(head2)

bysort UqNr: egen headcount4 = sum(head4)

*Same household head across 2 years
```

```
gen head = 1 if relsh2==1 & relsh4==1

recode head miss = 0

bysort UqNr: egen samehh = sum(head)

*Dropping duplicates

duplicates report UqNr PersonNr /*Especially for 2008 and 2010*/

duplicates tag UqNr PersonNr, gen(drops)

drop if drops>0

*Change in household head due to change in marital status, Note: Additional checking was also conducted in Excel as Stata was not picking up on the number of duplicates

gen notmatched = 1 if age_match==. | gender_match==. | popgrp_match==.

replace notmatched = 0 if notmatched==.

gen keephead = 1 if head==1 & notmatched==0

drop if keephead! = 1

*Dropping more than one household head – only after checking if household head changes marital status.

drop if headcount2! = 1

drop if headcount4! = 1

*Generating savings and savings rates

*For 2002 and 2004

gen hhsav2 = hhincome2-totalexp2

gen savrat = hhsav2/hhincome2

gen hhsav4 = hhincome4-totalexp4

gen savrat4 = hhsav4/hhincome4

*For 2008 and 2010

gen hhsav8 = hhincome8-totalexp8
```

gen savrat8 = hhsav8/hhincome8

gen hhsav10 = hhincome-totalexp

gen savrat10 = hhsav10/hhincome

*Step 3B: Making household dataset for each year of 2002, 2004 and 2008, 2010 to append so can read as panel data for TMM.

*Making household datasets for each year (each year follows similar commands as 2002 year below).

drop keephead notmatched samehh head headcount4 headcount2 owncar4 ownhouse4 illness_injurypastmonth4 head4 head2 counter age_match popgrp_match gender_match _merge nogender totalexp4 hhratio4 nonearners totalworkers depratio24 depratio4 workingage Age_under15 Age_over65 nchildren4 nadults4 hhsize4 noincome4 dummygrants4 hhincome4 totalgrant4 annualsal head_exists HOUS_WGT4 Q472Othr Q472Pers Q472Food Q472Clot Q472Hous Q472Tran mainincomee4 Status24 Status14 indusact4 personoccup4 highedu4 marital4 relsh4 popgrp4 Age4 Gender4

*relabel variables

rename Gender2 Gender

rename Age2 Age

rename popgrp2 popgrp

rename relsh2 relsh

rename marital2 marital

rename highedu2 highedu

rename mainincome2 mainincome

rename totalexp2 totalexp

rename totalgrant2 totalgrant

rename hhsize2 hhsize

rename hhincome2 hhincome

rename adults2 adults

rename children2 children

```
rename depratio2 depratio

rename depratio12 depratio2

rename hhratio2 hhratio

rename dummygrants2 dummygrants

rename noincome2 noincome

rename aftertaxincome2 aftertaxincome

rename totalover652 totalover65

rename totalunder152 totalunder15

rename totalworkingage2 totalworkingage

rename totalworkers2 totalworkers

rename nonearners2 nonearners

rename personoccup2 personoccup

rename indusact2 indusact

rename HOUS_WGT2 HOUS_WGT

rename ownhouse2 ownhouse

rename owncar2 owncar

rename illness_injurypastmonth2 illness_injurypastmonth

rename savrat2 savrat

rename hhsav2 hhsav

*Some recoding of variables such as education and marital statuses required for 2004, 2008 and 2010 to the same as 2002s.

*recode 2004s highedu to coincide with 2002s categories.

replace highedu = 17 if highedu==18

replace highedu = 18 if highedu==19|highedu==20
```

```
replace highedu = 19 if highedu==21

replace highedu = 20 if highedu==22|highedu==23|highedu==24

replace highedu = 21 if highedu==25

replace highedu = 22 if highedu==26

*recode same as 2002/4 for 2008.

replace marital = 1 if marital==2

replace marital = 2 if marital==4

replace marital = 4 if marital==5

*recode same as 2002/4 for 2008 households.

replace highedu = 17 if highedu==18

replace highedu = 18 if highedu==19|highedu==20

replace highedu = 19 if highedu==21

replace highedu = 20 if highedu==22|highedu==23|highedu==24

replace highedu = 21 if highedu==25

replace highedu = 22 if highedu==26

*recode same as 2002/4 for 2010.

replace marital = 1 if marital==2

replace marital = 2 if marital==3|marital==4

replace marital = 3 if marital==5

replace marital = 4 if marital==6|marital==7

*recode same as 2002/4 for 2010 households data.

replace highedu = 0 if highedu==98

replace highedu = 1 if highedu==0

replace highedu = 2 if highedu==1
```

```
replace highedu = 3 if highedu==2

replace highedu = 4 if highedu==3

replace highedu = 5 if highedu==4

replace highedu = 6 if highedu==5

replace highedu = 7 if highedu==6

replace highedu = 8 if highedu==7

replace highedu = 9 if highedu==8

replace highedu = 10 if highedu==9

replace highedu = 11 if highedu==10

replace highedu = 12 if highedu==11

replace highedu = 13 if highedu==12

replace highedu = 19 if highedu==17|highedu==18|highedu==26

replace highedu = 17 if highedu==20|highedu==21

replace highedu =18 if highedu==22|highedu==23

replace highedu = 20 if highedu==24|highedu==25|highedu==27|highedu==28|highedu==29

replace highedu = 21 if highedu==30

replace highedu = 22 if highedu==31

*Step 3C: Appending Datasets

use /*Corresponding household datasets*/

append using /*Typically used the earliest year and appended to the latest year*/

sort UqNr PersonNr Y

save /*Title: Appended ready for analysis*/

*For 2008 and 2010 duplicates needed to be removed.

duplicates tag UqNr PersonNr, gen(dropit)
```

```
drop if dropit>0

*For 2002 and 2004, similarly for 2008 and 2010.

xtset UqNr Y

    /*panel variable:  UqNr (strongly balanced)

     time variable:  Y, 2002 to 2004, but with gaps

          delta:  1 unit*/

*For 2002, 2004

gen urban = 1 if
Stratum==1|Stratum==3|Stratum==5|Stratum==7|Stratum==9|Stratum==11|Stratum==13|Stratum==1
5|Stratum==17

replace urban = 0 if
Stratum==2|Stratum==4|Stratum==6|Stratum==8|Stratum==10|Stratum==12|Stratum==14|Stratum==
16|Stratum==18

*For 2008, 2010

gen urban = 1 if GeoType==1|GeoType==2

replace urban = 0 if urban==.

drop if marital>4

gen single = 1 if maritalv1>1

replace single = 0 if maritalv1==1

gen black = 1 if race==1

replace black = 0 if black>1

gen personoccupation = int(personoccup8/1000)

gen industry = int(indusact/100)

*Weighting the data for national population representation.

*National savings rate from survey data.

gen wghted_savrat = savrat*HOUSE_WG
```

```
replace wghted_savrat = 0 if wghted_savrat==.

bysort Y: egen totalhwght = total(HOUSE_WG)

gen savrat_natl = wghted_savrat/totalhwght

bysort Y Age: egen mean_housewghts = mean(HOUSE_WG)

*Step 1: Weighting all household demographic variables.

gen wghted_hhincome = hhincome*HOUSE_WG

replace wghted_hhincome = 0 if wghted_hhincome==.

gen wghted_totalexp = totalexp*HOUSE_WG

replace wghted_totalexp = 0 if wghted_totalexp==.

gen wghted_hhsize = hhsize*HOUSE_WG

replace wghted_hhsize = 0 if wghted_hhsize==.

gen wghted_depratio = depratio*HOUSE_WG

replace wghted_depratio = 0 if wghted_depratio==.

gen wghted_hhratio = hhratio*HOUSE_WG

replace wghted_hhratio = 0 if wghted_hhratio==.

gen wghted_children = children*HOUSE_WG

replace wghted_children = 0 if wghted_children==.

gen wghted_totalgrant = totalgrant*HOUSE_WG

replace wghted_totalgrant = 0 if wghted_totalgrant==.

bysort Y Age: egen mean_hhincome = mean(wghted_hhincome)

bysort Y Age: egen mean_totalexp = mean(wghted_totalexp)

bysort Y Age: egen mean_hhsize= mean(wghted_hhsize)

bysort Y Age: egen mean_depratio = mean(wghted_depratio)

bysort Y Age: egen mean_hhratio = mean(wghted_hhratio)
```

```
bysort Y Age: egen mean_children = mean(wghted_children)

bysort Y Age: egen mean_totalgrant = mean(wghted_totalgrant)

gen mean_age_hhincome = mean_hhincome/mean_housewghts

gen mean_age_totalexp = mean_totalexp/mean_housewghts

gen mean_age_hhsize = mean_hhsize/mean_housewghts

gen mean_age_depratio = mean_depratio/mean_housewghts

gen mean_age_hhratio = mean_hhratio/mean_housewghts

gen mean_age_children = mean_children/mean_housewghts

gen mean_age_totalgrant = mean_totalgrant/mean_housewghts

*For categorical variables

gen wghted_education = education*HOUSE_WG

replace wghted_education = 0 if wghted_education==.

gen wghted_popgrp = popgrp*HOUSE_WG

replace wghted_popgrp = 0 if wghted_popgrp==.

gen wghted_car = owncarv1*HOUSE_WG

replace wghted_car = 0 if wghted_car==.

gen wghted_house = ownerH*HOUSE_WG

replace wghted_house = 0 if wghted_house==.

gen wghted_urban = urban*HOUSE_WG

replace wghted_urban = 0 if wghted_urban==.

gen wghted_single = single*HOUSE_WG

replace wghted_single = 0 if wghted_single==.

gen wghted_maritalv1 = maritalv1*HOUSE_WG

replace wghted_maritalv1 = 0 if wghted_maritalv1==.
```

```
gen wghted_mainincomev1 = mainincomev1*HOUSE_WG

replace wghted_mainincomev1 = 0 if wghted_mainincomev1==.

gen wghted_personoccupation = personoccupation*HOUSE_WG

replace wghted_personoccupation = 0 if wghted_personoccupation==.

gen wghted_industry = industry*HOUSE_WG

replace wghted_industry = 0 if wghted_industry==.

gen wghted_black = black*HOUSE_WG

replace wghted_black = 0 if wghted_black==.

gen wghted_gender = Gender*HOUSE_WG

replace wghted_gender = 0 if wghted_gender==.

bysort Y Age education: egen mean_education = mean(wghted_education)

bysort Y Age popgrp: egen mean_popgrp = mean(wghted_popgrp)

bysort Y Age owncarv1: egen mean_ca r = mean(wghted_car)

bysort Y Age ownerH: egen mean_house = mean(wghted_house)

bysort Y Age urban: egen mean_urban = mean(wghted_urban)

bysort Y Age single: egen mean_single = mean(wghted_single)

bysort Y Age maritalv1: egen mean_maritalv1 = mean(wghted_maritalv1)

bysort Y Age mainincomev1: egen mean_mainincomev1 = mean(wghted_mainincomev1)

bysort Y Age personoccupation: egen mean_personoccupation = mean(wghted_personoccupation)

bysort Y Age industry: egen mean_industry = mean(wghted_industry)

bysort Y Age black: egen mean_black = mean(wghted_black)

bysort Y Age Gender: egen mean_gender = mean(wghted_gender)

bysort Y Age education: egen mean_housewghts_education = mean(HOUSE_WG)

bysort Y Age popgrp: egen mean_housewghts_popgrp = mean(HOUSE_WG)
```

```
bysort Y Age owncarv1: egen mean_housewghts_car = mean(HOUSE_WG)

bysort Y Age ownerH: egen mean_housewghts_house = mean(HOUSE_WG)

bysort Y Age urban: egen mean_housewghts_urban = (HOUSE_WG)

bysort Y Age single: egen mean_housewghts_single = mean(HOUSE_WG)

bysort Y Age maritalv1: egen mean_housewghts_maritalv1 = mean(HOUSE_WG)

bysort Y Age mainincomev1: egen mean_housewghts_mainincomev1 = mean(HOUSE_WG)

bysort Y Age personoccupation: egen mean_housewghts_personoccupation = mean(HOUSE_WG)

bysort Y Age industry: egen mean_housewghts_industry = mean(HOUSE_WG)

bysort Y Age black: egen mean_housewghts_black = mean(HOUSE_WG)

bysort Y Age Gender: egen mean_housewghts_gender = mean(HOUSE_WG)

gen mean_age_education = mean_education/mean_housewghts_education

gen mean_age_popgrp = mean_popgrp/mean_housewghts_popgrp

gen mean_age_car = mean_car/mean_housewghts_car

gen mean_age_house = mean_house/mean_housewghts_house

gen mean_age_urban = mean_urban/mean_housewghts_urban

gen mean_age_single = mean_single/mean_housewghts_single

gen mean_age_maritalv1 = mean_maritalv1/mean_housewghts_maritalv1

gen mean_age_mainincomev1= mean_mainincomev1/mean_housewghts_mainincomev1

gen mean_age_personoccupation = mean_personoccupation/mean_housewghts_personoccupation

gen mean_age_industry = mean_industry/mean_housewghts_industry

gen mean_age_black = mean_black/mean_housewghts_black

gen mean_age_gende r= mean_gender/mean_housewghts_gender

*Categorising variables for TMM.

gen savings = mean_age_hhincome-mean_age_totalexp
```

```
gen savrat1 = savings/mean_age_hhincome

replace savrat1 = 0 if savrat1==.

gen savrat_split = 1 if savrat1<-0.20

replace savrat_split = 2 if savrat1>=-0.2 & savrat1<-0.05

replace savrat_split = 3 if savrat1>=-0.05 &savrat1<0.05

replace savrat_split = 4 if savrat1>=0.05 & savrat1<0.2

replace savrat_split = 5 if savrat1>0.2

gen income_split = 1 if hhincome<6000

replace income_split = 2 if hhincome>=6000 & hhincome<30000

replace income_split = 3 if hhincome>=30000 & hhincome<72000

replace income_split = 4 if hhincome>=72000 & hhincome<192000

replace income_split = 5 if hhincome>=192000

gen expenditure_split = 1 if totalexp<800

replace expenditure_split = 2 if totalexp>=800 & totalexp<1800

replace expenditure_split = 3 if totalexp>=1800 & totalexp<5000

replace expenditure_split = 4 if totalexp>=5000 & totalexp<10000

replace expenditure_split = 5 if totalexp>=10000

gen age_split = 1 if Age<=34

replace age_split = 2 if Age>34 & Age<=44

replace age_split = 3 if Age>44 & Age<=54

replace age_split = 4 if Age>54 & Age<=64

replace age_split = 5 if Age>64

gen edu2 = 1 if highedu==0|highedu==21|highedu==22|
highedu==1|highedu==2|highedu==3|highedu==4|highedu==5|highedu==6|highedu==7|highedu==8
```

```
replace edu2 = 2 if highedu==9|highedu==10|highedu==11|highedu==12|highedu==13

replace edu2 = 3 if
highedu==14|highedu==15|highedu==16|highedu==17|highedu==18|highedu==19|highedu==20

gen hhsizep = 1

replace hhsizep = 2 if hhsize>2 & hhsize<=4

replace hhsizep = 3 if hhsize>4

gen dep_split = 1 if depratio==0

replace dep_split = 2 if depratio>0 & depratio<=0.5

replace dep_split = 3 if depratio>0.5

gen hhratio_split = 1

replace hhratio_split = 2 if hhratio>2

gen totalgrant_split = 1 if totalgrant==0

replace totalgrant_split = 2 if totalgrant<10000 & totalgrant>0

replace totalgrant_split = 3 if totalgrant>=10000

gen age_sqr = Age*Age

gen lnhhincome1 = ln(mean_age_hhincome)

gen lnconsumption1 = ln(mean_age_totalexp)

gen savratln2 = lnhhincome-lnconsumption

gen wealthdummy = mean_age_house*mean_age_car

xi i.mainincomev1

xi i.personoccupation

xi i.industry

*Regressions: 2 cross sections 2004 with 2002 savrat1 and 2010 with 2008 savrat1.

drop if Y==2002 /*for the 2002 2004 appended dataset*/
```

```
save as 2004 household for OLS analysis

drop if Y==2008 /*for the 2008 2010 appended dataset*/

save as 2010 household for OLS analysis

gen dummy = 1 if Y==2010

replace dummy = 0 if dummy==.

gen Age_dummy = Age*dummy

gen age_sqr_dummy = age_sqr*dummy

gen mainincomev1_dummy = mainincomev1*dummy

xi i.mainincomev1_dummy

gen totalgrant_dummy = totalgrant*dummy

gen black_dummy = black*dummy

gen wealthdummy_dummy = wealthdummy*dummy

gen ownerH_dummy = ownerH*dummy

gen owncarv1_dummy = owncarv1*dummy

gen natl_totalexp = totalexp*HOUSE_WG

gen natl_hhincome = hhincome*HOUSE_WG

gen natl_hhsize = hhsize*HOUSE_WG

gen youngestblack = 1 if age_split==1 & black==1

replace youngestblack = 0 if youngestblack==.

gen youngblack = 1 if black==1 & age_split==2

replace youngblack = 0 if youngblack==.

gen middleblack = 1 if age_split==3 & black==1

replace middleblack = 0 if middleblack==.

gen matureblack = 1 if age_split==4 & black==1
```

```
replace matureblack = 0 if matureblack==.

gen retiredblack = 1 if age_split==5 & black==1

replace retiredblack = 0 if retiredblack==.

gen youngestblack_dummy = 1 if youngestblack==1 & Y==2010

replace youngestblack_dummy = 0 if youngestblack_dummy==.

gen youngblack_dummy = 1 if youngblack==1 & Y==2010

replace youngblack_dummy = 0 if youngblack_dummy==.

gen middleblack_dummy = 1 if middleblack==1 & Y==2010

replace middleblack_dummy = 0 if middleblack_dummy==.

gen matureblack_dummy = 1 if matureblack==1 & Y==2010

replace matureblack_dummy = 0 if matureblack_dummy==.

gen retiredblack_dummy = 1 if retiredblack==1 & Y==2010

replace retiredblack_dummy = 0 if retiredblack_dummy==.
```