HAPPINESS AND THE ELDERLY: A SUBJECTIVE WELLBEING IMPACT OF SOCIAL GRANTS IN SOUTH AFRICA.

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Abstract

This study establishes the extent to which the state old age pension grant impacts on the subjective wellbeing of the elderly in South Africa for the period 2008 to 2015. It makes use of a sub sample of data collected from the first four waves of the National Income dynamics study (NIDS) composed of elderly persons aged between 55 and 64 years old to estimate the causal impacts of the grant. The main framework for establishing causal relationship was is the difference in difference model but ordinary least squares and fixed effects models were also estimated. Ordinal logistic regression model was estimated as a robustness check for other models and because of the ordinal nature of the dependent variable. The state old age pension consistently produced positive and significant estimates within linearly and non-linearly specified models. Within the difference in difference model specifically, anticipatory effect was checked and not found to exist, and the results indicate that, the SOAP significantly and statistically improves life satisfaction by 0.047 points on the 1 to 10-point life satisfaction scale. Other big correlates of life satisfaction are income step, religion and having a medical aid which significantly increase life satisfaction by 0.625, 0.483 and 0.337 respectively. A 1000 rand increase in income per person improves life satisfaction by 0.047 points on the same measurement scale.

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1. INTRODUCTION

There are many demographic challenges facing countries of the world but one of the most important for low and middle-income economies is the rapidly increasing population of elderly persons (Salinas-Rodriguez, Torres-Pereda, Manrique-Espinaza, Moreno-Tamayo & Solis, 2014). Different studies, institutions or countries have defined the elderly in various ways but to the United Nations (UN), these cohorts are persons aged 60 years or older. Data obtained from the United Nation's (2015) revision of world population prospects finds that, the population of persons 60years and above is the fastest growing and between 2015 and 2030, the proportion of these group in total world population is expected to grow by 56 percent. In South Africa, the World Health Organization's report on ageing and health in 2015 estimated that there were 4.209 million elderly persons in the country who are projected to more than double to 10.06 million by 2050. The same study finds that, because these individuals do not always have the financial resources to access health care, health care coverage stood at 48% leading to a large proportion of them being unable to bath, eat, dress or do other basic things for themselves like getting in and out of the bed or using the toilet. Such statistics serve to highlight the significant costs that growth in the older population may impose on families and the entire state. In families with elderly persons, members often must forgo productive time or pay someone to take care of their old which is stressful and costly. The costs to the state are in terms of the ever-increasing expenditures on safety net programmes which have raised concerns of long term sustainability (Mabugu & Chitiga-Mabudu, 2013).

One of such safety net programmes, is the South African state old age pension[1] (SOAP) grant which is a non-contributory means-tested income transfer to persons aged 60 years and above. This governmental support had been introduced since 1928 for white citizens but universal coverage only truly started in the early 1990s extending access to pensions to black South Africans (Legido-Quigley, 2003:2). The value and coverage of SOAP has constantly been increasing and just within the past 7 years, reports from the South African Social Security Agency (SASSA) shows that, the grant was 1200 Rands with a coverage of 2.8million in 2012, increased to 1520 Rands and a coverage of 3million in 2016 and today, the value stands at R1600 with a slight increase to the 2018 budget. Old age is a time often characterized by reduction or complete cut off in formal paid work and governments recognized that, income insecurity in old age within a country that has been described

[1] The SOAP is one of 8 grants in a broader social safety net system of income transfers. Other grants are: Social Relief of Distress, Grants-in-aid, Child Support Grant, Foster Care Grant, Care Dependency Grant, War Veteran's Grant and Disability Grant.

as one of the most unequal in the world, will have huge ramifications for subjective wellbeing. For many decades, material well-being had been equated to subjective well-being (SWB) which might have been due to the difficulty encountered in designing indicators that capture the individual effects of policy changes. It was regarded that utility maximizing individuals choose to spend money on goods and services; implying that money, by allowing them to increase the goods and services that they can buy, ought to bring them more utility (Boyce, 2009:5). As a result, the prescriptions of research almost exclusively relied on income redistributions to improve the economic situation of individuals in society. Recently however and with much progress made towards instruments that better capture quality of life (Diener and Lucas,2000; Krueger & Schkade, 2008 and Oswald & Wu, S. 2010) more studies are critically appraising the role that improvements in economic circumstances play in promoting subjective wellbeing or happiness[2] (Heady & Wearing ,1992 and Boes & Winkelmann, 2006).

Although the desired policy outcome of social grants in South Africa- the SOAP inclusive, has been to redistribute income to the poor elderly and reduce income inequality, its role in life satisfaction has either been equated to or neglected in favor of economic wellbeing. Glancing at the empirical evidence which we review in section 2, we find a plethora of studies that have investigated economic wellbeing impacts of grants but very scanty studies on subjective wellbeing. The only known study to the best of the author's knowledge that directly relates OAP to Subjective wellbeing in South Africa is Schatz, Gomez-Olive, Ralston, Menken and Tollman (2012) which has been reviewed in section 2 and shown to suffer from serious methodological issues and offering results that are only average treatment effects[3](ATE). The importance of estimating life satisfaction equations is explained on a conference paper by Layard (2009: 1) who suggests various reasons the most important in the author opinion is that, we ought to measure economic progress in such a way that can guide policy, and this requires a single overarching measure of how well we are doing. This measure must be self-evidently good and because life satisfaction depends on satisfaction with the other domains of life, anything that improves it will be related with improvements in a host of other aspects such as health, family and community relationships which all depend on specific public policy inputs. In summary we are saying that, rather than spill so much ink trying to measure individual aspects of wellbeing like previous studies have done, we can simply estimate the impacts

[2] Throughout this study, subjective wellbeing and Happiness are used interchangeably.
[3] Most often in experimental studies, the aim is to find average treatment effect on the treated (ATT) rather than average treatment effects (ATE)

of the target variable on life satisfaction and then deduce effects on a range of other outcome variables.

From studies based on other countries and the lone known study for South Africa, various hypothesis on the OAP-subjective wellbeing relationship have been tested. There are papers that make a comparison of the impact of the grant on female versus male life satisfaction (Humpert, 2013 and Montgomery, 2016) while papers such as Ferrer-i-carbonell (2004) and Rickardsson & Mellender (2017) have taken interest in ascertaining whether it is relative or absolute income that has a bigger impact on subjective wellbeing. This study first empirically estimates the impact of the SOAP on life satisfaction of elderly persons within a causal impact evaluation setting to fill the gap in the South African literature. It then goes further to provide policy recommendations and avenues for future research.

The paper is structured in the following way. Section 2 which is the literature review, outlines the relevance of social grants and the SOAP to the poor elderly group around the world and in South Africa. The section then progresses to outline international and domestic empirical evidences on the same relationship. On section 3, we discuss the conceptual framework while section 4 presents the econometric methodology. The methodology section provides a detailed explanation of the estimation strategies employed in this study for which an argument for causality is made. The estimation strategy takes into consideration, the limitations of previous research to provide estimates from which valid conclusions on the South African case can be drawn. Section 5 presents a detailed explanation of the data used and the construction of the variables in the estimation. The depth, breadth and flexibility that the data lends to the creation and testing of different variables shows that, it is of superior quality when compared with other data sets such as the World Health Organization's study of ageing and adult health survey. Section 6 presents the results of 6 different regressions on a single table so that at a glance, comparisons of the various models can be made. Robustness checks are also done which led to the conclusion that the main estimation strategy (DiD) was appropriate for the study. Section 7 concludes, provides policy recommendations and avenues for future research.

2. LITERATURE REVIEW

In many economies, poverty alleviation and general improvements in wellbeing still significantly depend on government redistribution programs through cash transfers and other means- that is

social grants and welfare programmes. Most poor households typically do not have savings because they spend whatever income they have on food implying that; social grants may represent the only source of income which supports the entire family and without which they will be destitute if payments are not made in a timely fashion (Rossouw, 2017). The developmental aspects that are impacted by social grants are many fold and perhaps is the reason why income redistribution stands at the forefront of government policies.

2.1. Relevance

Economic theory suggests that, social grants impact positively on education in many ways: First, because there are financial barriers to schooling, grants increase income which can be used to buy the necessary materials to excel at school. This income also reduces the opportunity cost of children attending school which is the lost contribution of the child to family income or in terms of lost production for subsistence households. The old age pension redistribution program has been particularly important with regards to educational outcomes. Research commissioned by the Department of Social Development in 2004 on the social and economic impacts of South Africa's social security system found that, school age boys of poor households receiving old age pension have a three percent more chance of enrolling full time at school than their peers without the grant. This outcome was even greater for girls who had a seven percent more chance of enrolling full time at school.

Related to schooling is the contribution to employment and labor market outcomes. Social protection instruments work indirectly to strengthen employability of the households of the recipients and enables them to seek and obtain better and more remunerative work. It also provides a safety net in the event of a livelihood shock, such as loss of a job, illness or the death of a breadwinner. Social benefits encourage meaningful participation in the labor force, building self-reliance and reducing dependency. Notwithstanding these beneficial aspects of social grants there is a rich literature on the influence of pensions on retirement decisions. For example, in Mexico, implementation of the non-contributory cash transfer program for persons who are 70 years and older, reduces the supply of labor of prime-aged men and women residing with a beneficiary (Juarez, 2009).

Improved nutrition has also been linked to families receiving social grants and, the old age pension. The same report by the Department of social development found that household spending of grant

recipients most often focuses more on basics like food, housing and household operations and less on tobacco or debt. Increased household spending on nutrition was linked to better nutritional and health outcomes with grant recipients having lower prevalent rates of hunger for young children and adults while state spending on healthcare was decreased. Since cash is fungible, there are concerns that the poor might be tempted to use the money on non-essential goods, including alcohol and drugs. This argument has sometimes been used to advocate 'in-kind' transfers rather than Cash transfers (Mabugu, Chitiga, Fofana, Abidoye, and Mbanda, 2015:80).

South Africa like other developing economies such as Mexico, Brazil, Turkey and Hunduras has also had large-scale cash transfer programs for many years which constitutes the country's social assistance programs (Muchiri, 2016). These include; Disability Grant (DG), Childcare Grant (CG), and State Old Age Program (SOAP) which have been praised to be exceptionally generous among developing countries. These programs are implemented by the South African Social security agency (SASSA) and section 27 of the Constitution prescribes the right of all citizens to have access to social security, including, if they are unable to support themselves and their dependents. Although the country has a long history of extensive state support which began in the 1920s as reported by Sagner (2000) universal coverage which included all the four races within the country only truly began in the 1990s. Woman have historically had a lower pension eligibility age equal to 60 while that of men decreased incrementally from age 65 to 60 between 2008 and 2010 (Schats et. al. 2012)

The South African state old age pension which is our program of focus is a noncontributory cash transfer and the significance of this is that, it allows recipients the flexibility to meet their most important needs. Through SASSA, the government makes available, a monthly cash transfer to older persons who turn 60years or greater by employing a means test and it has been reported that, for every 100 Rands spent on social grants, 41 Rands goes to the SOAP. Sieneart (2008) and Woolard and Leibbrandt (2010) suggest that, the importance of the program is underscored by the fact that more than two-thirds of the elderly population report receiving pension. The demand for provision of social pensions is driven by poverty among the elderly as well as the breakdown in living arrangements (multi-generation), wherein younger individuals are either no longer able or willing to provide care for their aging parents (case and Deaton, 1998).

2.2. EMPIRICAL LITERATURE

Studies that attempt to examine the role of government pensions can be grouped into two categories. The first type of studies is more common in the economics literature and usually assess the impact of pension income on material well-being such as consumption, physical health and labor supply, while the second types of studies, emphasize the role that pension income plays in subjective or mental well-being of the individual. A review of the relevant literature shows that various methodologies have already been utilized but because most econometric models suffer from external validity, it is important that a domestic level study like that of South Africa, be matched with domestic data. Previous empirical work on the subject is presented in the following paragraphs.

Cheng, Liu, Zhang and Zhao (2016) carried out an analysis of the health implications of social pensions in china. Using a natural experiment made possible by the New China Rural Pension scheme (NRPS), they estimated the causal impact of the change in income, by employing fixed-effects model with instrumental variable correction. Their model incorporated estimates on both objective and subjective well-being measures and the results revealed that, enrolling for pension grant from the NRPS had a beneficial impact on physical health. The effects on health were also compounded by the fact that, pension recipients significantly improved their perceived economic status relative to others in the locality. Their results further revealed, that grant income greatly contributes to the cognitive function and psychological well-being of the rural elderly while also reducing mortality by 6 percentage points over a 3year span (Ibid., p.30).

Sometimes, differences in characteristics between treated groups or those with grant income and those without, warrant appropriate econometric methods that account for self-selection. A study by Garroway (2013) investigated the question of how much small old age pensions and widows' pension help the poor in India. Because poverty is a multidimensional concept, his analysis was based on the effects on household income and consumption. He made use of data from the 2005 Indian Human Development Survey on household income and consumption which consisted of 1520 individuals who were over the age of 59 years old. To measure the effects on the desired variables, he employed a quasi-experimental design where assignment to treatment is based on randomization. Due to the absence of randomization, he then employed a propensity score matching estimator to create an appropriate counterfactual group. From his analysis it was found that, out of those who received the widow's pension, poverty was reduced by 2.7 percentage points, would further reduce poverty by 3.6 percent and increase consumption by 70 rupees per capita if all widows received it (Garroway, 2013 p. 25)

Another approach frequently found in the literature, is to estimate panel model regressions and comparing estimates across various countries rather than only focusing on the within country effects. An example of such a paper is that carried out by Duval (2003) for the OECD countries and Dethier, Pestieau, and Ali (2011) for the Latin American countries. Since the Dethier et. al., (2011) paper was based on pension effects on old age poverty which has already been reviewed on a previous study, we hereby present that based on the OECD countries. The paper examined the impact of old age pension systems and other social transfers on the retirement decisions of elderly males within these countries using panel data set for these countries over the period 1969 to 1999. It separated all aged men who were those considered to be 55 and over into 3 distinct age groups thus classifying them into men between 55 to 59, 60 to 64 and those over 65 years old. The paper did not explicitly focus on pension grant per se, but on the implicit marginal tax rate of working continually for extra 5years. Employing panel data macro econometric models, the results reveal that, knowing the cumulative amounts of pension income from working as well as the amount of a generous social grant to be soon received, enables male elderly workers to anticipate their retirement decision. The tendency of reducing labor force participation rate was high for continental European countries than for Japan, Korea and Nordic countries.

The effects of pension income on wellbeing have also been studied for persons related to the main grant recipient such as children. Within these studies, outcomes such as nutrition, health status and educational enrolment rates of immediate family members have taken center stage. A multidimensional impact study testing similar outcomes is Tewodros and Daniel (2014) who's work focused on a small remote area of Tanzania and aims towards pension coverage for the entire country. Although there was no pension grant in Tanzania at the time, a small non-governmental organization had been operating a comprehensive support programme for the old on the basis of pensions and child support. Elderly persons received a small amount of about USD 7.5 and an extra USD 4.4 for every child. The study employed a combination of household surveys, structured interviews, focus group discussions and case studies to arrive at the following conclusions:

Most of the elderly people attested that, they no longer begged and did not have to sell their assets due to desperation. They also reported lesser incidences of diseases and overall, the grant was an important source of income which for some individuals, made up to 80% of all incomes. In summary, the grant aided significantly in reducing poverty.

The relationship between pension transfer and household outcomes has also been carried out for South Africa. One of such pioneering study for the country is Esther Duflo (2000) studied the impact of the South African old age pension on child health. Her paper used the single cross section of 9000 South African households conducted in 1993 and the identification strategy, relied on the use of height for age and weight for age as instrumental variables for accumulated gains in child nutrition. The main conclusion arrived at, indicates that pensions had more beneficial effect on girl's nutrition than boys especially when the pension recipient was a woman or maternal grandmother.

On the effect on children's education, majority of the studies in South Africa, find that school attendance significantly improved with grant take up of children (Williams, 2007; Leibbrandt et al., 2010, DSD, SASSA and UNICEF, 2012). An exception to these are studies by CASE, (2008) and Coetzee (2011). Coetzee (2013) estimated the impact of child support grant on health nutrition and education. she employed propensity score matching methods on NIDS data for 2008 and her results did not find any convincing evidence of improvements on any of the outcome variables. Narrowing down to the specific contribution of pensions, studies by sienaert (2008) reached the finding that labor force participation rate and employment experienced modest declines while the study by Legido-Quigley (2003) indicates that, pension grants enabled the elderly to become independent and economically active although the grant failed to reduce poverty levels for families affected by HIV/AIDS.

The previous paragraphs have shown that, no matter the econometric methodology used, there is almost universal acceptance that, social grants and pensions have proven beneficial in alleviating the economic circumstances of the elderly poor and have even extended benefits to their immediate family members such as children. The second type of studies are those that examine the impact of pension grants on subjective or psychological wellbeing. There is very scanty empirical evidence on the issue, but the available papers have employed various variations of regression discontinuity models which seems to be the most appropriated estimation strategy. Commencing the reviews of these type, is the study by Bando, Galiani, & Gertler (2017) who carried out an empirical investigation into the effects of non-contributory pensions to the material and subjective well-being in Peru. To study the pension 65 programme in Peru, they collected data from the National institute of statistics and informatics and estimated a regression discontinuity design controlling for conglomerate fixed effects. Results obtained showed that, the Geriatric depression scale which was

used as the measure of subjective wellbeing, was reduced and these results were very similar to those estimated for Brazil suggesting that, outcomes for Peru can be generalized for Brazil.

Following suit on non-contributory pension programmes, Salinas-Rodrı´guez et. al., (2014) carried out both a qualitative and quantitative study on the 70 y ma´s program in Mexico using difference in difference methodology for a sample size of 6000 individuals. The two measures of subjective well-being used in their analysis were depressive symptoms and empowerment of the elderly. While the results found that, a higher proportion of the elderly became more empowered, independent and contributed to household decision regarding spending, the results did not find any statistically significant differences across the various aged groups for depressive symptoms. This is in direct contradiction with estimates from the Galiani, Gertler and Bando (2016) study for similar Southern American countries.

Moving on to the Asia, a very recent and similar study was done in South Korea by Kim (2018) who analyzed 4 waves of the Korean retirement and income study estimating a difference in difference model to examine the effect of the introduction of the 2008 Basic non-contributory pension in the country. The program positively and significantly improved life satisfaction of the elderly but further analysis by the same author showed that, these effects were short lived and would be eroded in the long term. This posed a problem for long term policy which is often more desired than short-term benefits.

In South Africa most of the previous papers have not explicitly investigated the impact of pension grant on subjective well-being of the elderly but have however studied general income effects on economic well-being (Ada Ferrer-i-Carbonell, 2002; Williams, 2007; Leibbrandt et al., 2010). Others have assessed the impact of other variables on subjective well-being not necessarily pension income (Headey, 2004; Kingdom & Knight, 2006b and Posel & Casale, 2011) and there is little or no evidence on the specific impact of the old age pension grant on subjective well-being. The closest study we find about pension income and subjective wellbeing is Schatz et. al., (2012) which is not enough to reach conclusions on the South African scene because the results from the paper suffers from insufficient methodologies which introduce biases in the estimates. Schatz et. al., (2012) used the World Health Organization's study of ageing and adult health survey for 2006 and 2010. The aim of the study was to track changes in subjective well-being for men and women that are linked to pension receipt between the period under investigation. To estimate the effect of the programme, they employ single dichotomous logistic regressions on 4 measures of subjective well-being: sad,

worry, dissatisfied and unhappy. Results from the study indicated that overall, women were more likely to report poor wellbeing across the entire range of indicators of subjective wellbeing. The study also reached different conclusions when results from the 2006 data are compared to those of the 2010 data. The 2006 data had found that, the probability of scoring as "poor" increased with age for women than for men but the same relationship was not consistent in the 2010 data.

An objective critic of this paper finds that, it suffers from several methodological issues which result in biased or inconsistent estimates. The first of these problems relates to the data used in the study. In the 2006 data, there was no direct measure of pension receipt leading the authors to rely on age eligibility requirement to indicate that the grant was received. This is a huge problem because the South African old age pension has age, income or wealth thresholds which must be met for an individual to qualify. Therefore, attaining the legal age of 60 years old does not necessarily imply that the individual qualifies and receives the grant. Consequently, they admit that, their results represent intent to treat and not necessarily average treatment on the treated effects. The second problem has to do with the model implemented. The simple logistic regression only estimates the probability of an outcome given a covariate and these relationships do not necessarily mean they are causal

Within this study therefore, we make several improvements due to the availability of the superior National income dynamics household survey data set which contains more detailed information on actual grant recipients and income levels. A combination of these variables produces appropriate treatment and control groups for estimation of programme effects within a quasi-experimental setting which produces average treatment on the treated estimates that a causal. It is for these reasons that we strongly believe this study makes an original contribution and fills the gap in the literature.

3. CONCEPTUAL FRAMEWORK

A key issue in the literature, has been to define and measure subjective well-being. Within the cardinal approach, it is assumed that individuals are utility maximizers or in simpler words, people only make decisions that makes them happy. This cardinal approach has been challenged by skeptical economist who do not believe that revealed preferences are equal for different individuals and thus suggest that, a better measure of subjective wellbeing should in addition to objective measures take into consideration what individuals have to say about their overall happiness and satisfaction with life (Bratu, 2011). As already cited in the literature review, many empirical studies

have now embraced the self-reported measure of subjective well-being which is also employed in this paper.

Subjective well-being has many determinants or correlates and a few of those that have featured in more papers are now discussed in the following paragraphs.

Most studies consistently affirm a positive and statistically significant relationship between income level and subjective well-being (Herrera, Razafindrakoto, & Roubaud, 2006; Hinks & Davies, 2008; Inkeles, 1960; Powdthavee, 2005a). The bell-shaped curvilinear relationship found in most studies, suggests that income is subjected to the law of diminishing returns. This means that as income rises, each successive unit contributes less to happiness. Related to income, is how to measure an individual's relative standing and how to choose the appropriate references group. Various measures have been used including the mean or median income (or expenditure) of the country, district, local neighborhood, race or ethnic group (Posel and Casale, 2010: 2). it has been recognized that individual utility or welfare functions may be interdependent, and that relative or comparison income may play an important role in determining well-being. Subjective well-being is predicted to be diminished by the higher income of relevant others, through feelings of relative deprivation or reduced status (Posel and Casale, 2010: 5)

Health status has also been noted as one of the most important determinants of subjective wellbeing and its significance is usually stronger than other variables such as income, education and unemployment (Gerdthman & Johannesson, 2001). The literature also suggests that the causal relationship between self-reported health and subjective well-being may be bidirectional (Diener& Seligman, 2004). That is, good health causes higher perceptions of subjective wellbeing while high subjective wellbeing causes good health. There are multiple ways to measure health; however, most objective measures of health, such as a physician's observations and diagnoses, are not as strongly correlated with wellbeing as more subjective measures, such as a self-report of overall health status (Diener et al., 1999).

In terms of gender, Meisenberg and Woodley's (2015) review of the literature on gender and life satisfaction suggests that while studies found women "had higher subjective well-being than men until the early to mid-1980s" women "have reported lower life satisfaction than men since at least the late 1990s" (Meisenberg and Woodley 2015: 1540). There also seems to be substantial variation across countries. Particularly, some studies find that women are happier in developing countries than in industrialized countries (Vieira Lima 2013) while others conclude that women have higher levels of subjective well-being overall.

Results from previous studies such as Blanchflower & Oswald (2004) and Myers (1999) provide evidence that, married persons have higher subjective wellbeing than persons who are either separated, divorced or widowed. Also, the death of a partner is very likely at the retirement age and a very important source of variation in life satisfaction which is expected to negatively impact on subjective wellbeing.

Education is usually a significant predictor of well-being but just like most socioeconomic factors, it only accounts for a small portion of the variation in subjective well-being (Throop, 2011). Education's impact on subjective wellbeing is inconclusive as highly educated individuals do not always report higher wellbeing. Most studies such as Ravallion & Lokshin (1999: 19) only find a small positive impact which disappears when other variables are controlled for (Knight et al., 2009: 647).

Evidence on the impact of engaging in religious affiliations have produced consistent positive and significant impacts on life satisfaction (Clark & Lelkes, 2005; Hayo, 2004). Religious people are generally happier than non-religious people, irrespective of their faith.

4. ECONOMETRIC METHODOLOGY

Due to the ordinal nature of the dependent variable which is life satisfaction, nonlinear (Logit) models with fixed effects are usually applied. Linear models assume the cardinality of subjective wellbeing scores which would imply that the distance between response categories is equal. For example, a person who responded with a 6 on the life satisfaction question is "twice" as happy as someone who responded with a 3. It is very difficult if not impossible to verify this assumption but authors such as Salvatore S. Mangiafico in his 2016 book titled "Summary and Analysis of extension program Evaluation in R" has suggested that ordinary least squares may be used with numerically labelled scales which have more points usually 10 and above. This is the basis upon which we assume that the distance between the scales are equal and employ OLS as a first step in predicting variables on life satisfaction.

The causal impacts of the old age grants on subjective wellbeing will be measured in this paper using a quantitative impact evaluation study. The strategy incorporates a quasi-experimental design and overcomes differences in (un)observable characteristics between program participants and non-participants. (Wapenaar, 2017:24). In doing this, the estimation procedure does the most to eliminate the problem of sample selection bias– the possibility that those who are eligible or who take up the

grant are systematically different from those who do not qualify (White and Sabarwal, 2014). This framework along with robustness checks, establishes an argument for causality.

Various models are estimated, each increasing in sophistication and robustness by improving in capacity to account for potential biases of the treatment estimate generated by confounding factors, endogeneity and non-random self-selection into treatment (Mulcahy & Kollamparambil, 2016). There are various sources of bias associated with micro data estimation of the effect of income in life satisfaction equations. For example, Powdthavee, (2009) states that, if we neglect unobserved heterogeneity which may be correlated with both income and life satisfaction will result in what psychologists called a "personality bias" on the obtained estimates. Kivimäki, Vahtera, Thomson, Griffiths, Cox, and Penti, (1997) find that, people who are more extroverted are more likely to be happier which might cause them to be more productive at work earning them more income and thus leading to an upward bias in the estimates. The methodologies employed in this paper, all take into consideration the panel structure of the data, controlling for individual-specific effects and time invariant unobservable characteristics. These models are presented in the following sections.

Model 1

To account for the socio demographic and socio-economic factors that determine life satisfaction, we employ an ordinary least square regression (OLS) which is modelled as follows:

$$y_{it} = \beta_0 + \beta_1 SOAP_{it} + \delta x_{it} + \varepsilon_{it} \quad [1]$$

Whereby, $y_{i,t}$ is life satisfaction, $SOAP$ is a dummy 1 for receiving pension income and 0 not receiving pension. x_{it} is a vector of explanatory variables explaining individual i.

Within the panel data structure, people are measured repeatedly over a period, and we would expect some year-to-year correlation with a given individual. Thus, it could benefit from a model with latent person-level effects that can more adequately account for the correlation within the same individual.

Model 2

To adjust for the problems associated with year to year correlation within the individual, we can use fixed or random effects models. In fixed effects models, it is assumed that the group means are fixed whereas in random effects models, the model parameters are random variables. These differing assumptions necessitates a test, which can ascertain which of the two models is more appropriate. A

Hausman test for fixed vs random effect was employed and it concluded that a fixed effect model should be estimated which is specified as:

$$\ddot{y}_{it} = \ddot{x}_{it}\beta + \ddot{\mu}_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad [2]$$

$\ddot{y}_{it}, \ddot{x}_{it}\beta, and\ \ddot{\mu}_{it}$ are the time-demeaned variables.

This model requires that, the variable of interest which is receipt of grant, be time variant otherwise time demeaning the variable will eliminate it from the model. This was checked for and some information on transitions with regards to receiving SOAP is included in the appendix. The transition matrix shows that on average, as we move from period 1 to period 4, more people receive the SOAP indicated by increasing numbers of grant recipients and decreasing numbers of those who had not been receiving the grant. Fixed effects models can therefore be employed although such models do not estimate the coefficients of time invariant variables necessitating other estimation strategies.

Model 3

The third model employed is the difference in difference (DiD) regression discontinuity approach which attempts to mimic an experimental research design using observational data. It permits analysis on the change in differences between treated and control groups that existed before the implementation of a program policy known as the pretreatment period and the differences that arise between the two groups because of unobserved individual factors and local level factors that do not change between baseline and follow up period (Salinas-Rodríguez et al., 2014).

The starting point for this quasi experimental design is the identification of treatment[4] and control groups. To do this, we separate high income earners who do not qualify for SOAP from low income earners. Individuals in the treatment group consists of all elderly persons aged[5] between 60 to 64 years and who's dummy variable for receiving pension equals 1. That is, they are currently receiving the grant. They had two initial periods without grant income proceeded by two post periods with grant income. On the other hand, we have the control group that are never exposed to treatment or who do not qualify for SOAP. Control group A is composed of individuals who are 55 to 59 years

[4] In this study, treatment refers to taking up the grant (SOAP).
[5] Ages are separated into 5year intervals to capture effect of recent grant take-up.

old having a monthly income of less than 12300 Rands which is the government threshold at or below which, couples qualify to receive SOAP (SASSA, 2016/2017).

The literature suggests there is a possibility that individuals who are a few years away from qualifying for the grant might behave differently in anticipation of this new income source which can possibly bias our estimates (Salinas-Rodriguez et al., 2014). It is for this reason that we estimate 2 separate models for anticipation effects. The first is model 3-1 which captures effects of behavioral changes related to the expectation of receiving SOAP and makes use of control group A. While the second (Model 3-4) measures anticipatory effects of retirement without SOAP warranting the use of control group C consisting of persons aged between 55 to 59 years with monthly incomes greater than 12300 Rands who will qualify for retirement but not the grant. Based on Wooldridge (2012), the DiD model for estimating treatment effects is specified as follows:

$$y_{it} = \beta_o + \beta_1 Post_{it} + \beta_2 Treat_{it} + \beta_3 (Post_{it} * Treat_{it}) + \beta_4 X_{it} + \mu_1 + \varepsilon_{it} \ldots\ldots\ldots \text{[3]}$$

Where Y_{it} is life satisfaction for individual i at time t. $Post_{it}$ is an indicator variable that takes a value of 1 if the measurement of individual i is in the post-program period or 0 if it is in the baseline period. $Treat$ represents an indicator variable that takes the value of 1 if individual i belongs to the treatment group or 0 if he or she belongs to the control group , while the interaction term $(Post_{it} * Treat_{it})$ measures program impacts with the simple DiD estimation, X_{it} is a vector of time varying covariates , μ_1 represents individual level fixed effect, and ε_{it} is the error term. Equation [3] is employed in the estimation of these models but it is however adjusted for the different control groups. The Treat variable depends on the impact we desire to measure at any point. That is, models 3-2 and 3-3 replaces Treat with control group A and C respectively to capture anticipatory effects.

$$y_{it} = \beta_o + \beta_1 Post_{it} + \beta_2 OAP_{it} + \beta_3 (Post_{it} * OAP_{it}) + \beta_4 X_{it} + \mu_1 + \varepsilon_{it} \ldots\ldots\ldots\ldots \text{[Model3]}$$

$$y_{it} = \beta_o + \beta_1 Post_{it} + \beta_2 ControlA_{it} + \beta_3 (Post_{it} * ControlA_{it}) + \beta_4 X_{it} + \mu_1 + \varepsilon_{it} \ldots \text{[Model3-2]}$$

$$y_{it} = \beta_o + \beta_1 Post_{it} + \beta_2 ControlC_{it} + \beta_3 (Post_{it} * ControlC_{it}) + \beta_4 X_{it} + \mu_1 + \varepsilon_{it} \ldots \text{[Model3-3]}$$

A variant of the DiD model shown on table 5.1 as model 3-1 involves propensity score matching methods which attempt to mimic randomization by creating a sample of units who received the treatment comparable on all observed covariates to a sample of units that did not receive the treatment. This is done by collapsing the different observable covariates into a single balancing score $0 < P(T=1|X) = P(X) < 1$ for everyone representing the likelihood of treatment. The individual

scores can be estimated using a probit or logit regression. The user written command for STATA known as DIFF was used to run the regressions and options allowed included a Gaussian kernel weighting and common support which ensured that only very similar controls were included. The impact of receiving pension income is obtained by comparing the average life satisfaction of individuals in the treatment group against their match in the control group.

To ensure that difference in difference model produces valid results, the parallel trend assumption must be tested. Parallelism requires that, the conditional pre-treatment trends in the dependent variable should be equivalent for the treatment and control groups (White & Sabarwal, 2014). This was tested using regression and the results are shown on table 3.1 below.

Table 3.1: Parallel Trend Assumption Result
Quasi-Experimental Sample

Variable	**Coefficient**	
Time	-0.0711	[0.109]
D1	0.1964	[0.219]
D3	0.0131	[0.138]
D4	0.561***	[0.125]
Married	0.160	[0.112]
Bereaved	0.0631	[0.128]
years of schooling	0.037***	[0.010]
Health	0.0826**	[0.040]
Male	0.0025	[0.098]
Medical Aid	0.2987*	[0.177]
Income step	0.614***	[0.049]
income per capita	0.047***	[0.012]
income per capita sq.	-0.1012***	[0.024]
Religion	0.4572***	[0.068]
Crime	-0.0373	[0.031]
household size	0.0266	[0.014]
Wald test Probability> Chi2	0.0000	

Note: ** p<0.10; **p<0.05; *** p<0.01*
Standard errors in brackets

The method of testing the parallel trend assumption adopted is that developed by Pichke (2005:7). The test interacts the treatment variables with time dummies for each period excluding the

interaction of the last pretreatment period. Since we have 4 periods[6] in this study, we include the interactions for period 1, period 3 and period 4 leaving out period 2 which serves as the baseline period. On table 3.1, these interactions are given as D1, D3 and D4 and to know if the pretreatment outcome trends are the same, the estimated coefficient for D1 should [7]not be statistically significant. This means that the difference in differences between the two groups is not statistically different in the pretreatment period. The test can also include covariates to improve the precision of the estimates as well as lags[8] to indicate how the treatment effect changes over time. On the table, the coefficient of D1 has no asterisk implying insignificants at all three levels while that of D4 is statistically significant at all three levels. We therefore conclude that the treatment and control groups had similar outcome trends prior to the treatment and that any changes experienced between treatment and control after the treatment period, is due to receiving the grant.

5. DATA AND VARIABLES

The empirical analysis done in this paper, makes use of the National Income dynamics study (NIDS) data conducted by the Southern Africa Labour Development Research Unit (SALDRU). It is the first national panel study to document the dynamic structure of a sample of household members in South Africa. A total of 29 733 core sample members are tracked from 2008 to 2015, allowing for analysis into key changes in peoples' experiences of their incomes, expenditures, assets, access to services, education, health and other dimensions of well-being (Leibbrandt et al 2009).

The baseline study was conducted in February 2008 with the data and report released in July 2009 and since then, successive waves of the NIDS data have been published on average every two years. This paper analyzes all four waves that have been released by matching respondents across waves using unique identifier pid through merging. The data is captured in various questionnaires containing individual, household and derived level variables with the individual questionnaires sub divided into a section comprising adult and children responses. of relevance, is section M5 of the adult questionnaire which deals with the question of how individuals rate their own current level of satisfaction with life- the dependent variable in this study.

[6] 4 waves of the NIDS data have been released implying that we have 4 periods and treatment was taken to begin from period 3

[7] On table 3.1, the dependent variable is life satisfaction.

[8] Period 3 and Period 4 are also known as lags although they are mere interactions of the treatment variable with time.

It is important that panel studies constitute a representative sample of a total population and in deciding which households to be included in the baseline wave, the study employed a stratified two stage cluster sample design. In the first stage, 400 primary sampling units (PSUs) were selected from Stats SA's 2003 Master Sample of 3000 PSUs based on a probability of being selected according to geography (Leibbrandt et. al., 2009). Individuals are thus weighted in accordance with this probability, correcting for potential over or under-concentration of observations within a certain locality (Mohadjer et. al., 2013).

Overtime, systematic non-responses and attrition would result in some cohorts of the population with specific characteristics being misrepresented. It is almost inevitable that subjects will be lost due to mortality, changing addresses, emigration, or simply because they get tired of responding to the questionnaires. In addition, there is also evidence that old age itself and cognitive impairment are important reasons for refusal. The NIDS data accounts for this problem by using panel weights to estimate the likelihood of an individual remaining present throughout the survey periods. These weights are also used throughout the analysis in this paper to ensure that samples represent the population.

The difficulty of any panel dataset is the threat of attrition such as the case with NIDS wherein the second wave, only 78% (22000) of the originally sampled individuals were reinter viewed even after a second phase of the data was collected in an attempt to correct for non-response (Hall, 2016: 9). In general, the distribution of life satisfaction scores is similar whether weights are applied or not and it is important to note that, none response is due to greater life satisfaction over time as we would expect (Kannemeyer, 2016:5). However, if non-response is due to death of an elderly respondent, then their average life satisfaction is expected to be lower than the average life satisfaction of the surviving elderly respondents in the previous wave. This is so because aging is known to be linked to illness which negatively affects life satisfaction. In terms of age, the highest rate of attrition was for CSMs over 65 years of whom 44% died between waves 1 and 2 (Hall, 2016: 9). Attrition was also high for those in the wealthiest quantile mostly due to refusal. The good news for this study is that, it focuses on the analysis of mostly less well-off elderly individuals between the ages of 55 and 64 years.

The primary or full data set that has been described above, includes many variables and observations that are not important for this study. Out of it therefore, a quasi-experimental sample has been

obtained containing variables and observations specific to this research and are used to estimate the causal relationships of interest.

The dependent variable in this study is subjective wellbeing which is measured as the level of satisfaction with life that an individual currently experiences. Studies that capture individual life satisfaction are more advantageous than those that ask a respondent to report on the level of happiness of the household. Within the adult questionnaire of the NIDS data set, question M5 asks all adults fifteen years and above to rate the current level of happiness on a scale of 1 to 10 where 1 represents very dissatisfied and 10 represent very satisfied with current life.

A good number of respondents refused to answer the life satisfaction question or admitted that they do not know what level to report. This potential for measurement error due to the subjective nature of the variable is apparent, yet insofar as the measure is employed as the dependent variable, attenuation bias is of no concern. It is assumed that should measurement error in life satisfaction exist, it is random in nature and not a function of measurable characteristics (Wapenaar, 2017). The broad nature of the life satisfaction is such that, there are many other variables that can potentially affect it thereby justifying its use as the dependent variable in the multi variate analysis performed in the sections that follow.

Various independent variables are also employed in the different estimations. In the ordinary least square regressions and fixed effects models, the target variable is the state old age pension (SOAP). As already mentioned, the SOAP grant in other countries such as in Korea, roughly equals the shortfall of elder person's own income and the poverty line. In South Africa however, Statistics South Africa published the food poverty line as R531 for April 2017. The old age pension grant which is currently R1600 per month is more than three times that value. It represents a sizable source of income for the elderly and thus, is expected to produce positive and significant impacts on life satisfaction. The NIDS data adult's questionnaire provides alternative indicators of the variable. In one instance respondents are asked to state if they currently receive the old age pension grant while in another, the actual amount of grant received is stated. The preferred approach in capturing the variable, is to create a dummy which equals 1 if the elderly person receives SOAP.

The SOAP represents the main income variable but measures of absolute as well as relative income were also included. The measure of absolute income was constructed as total household monthly income divided by the household size (per capita income). This is a better indicator of the actual

amount that an individual is left with after making contributions to family members as is usually the case with most African families. We also include the square of per capita income to capture the quadratic relation that exist between income and subjective wellbeing as suggested in the literature. Both per capita income and its square are divided by 1000. On the other hand, the measure of relative income is directly observable in the NIDS data. All adults are asked to assess their relative economic rank in South Africa by identifying their position on a six-rung ladder from poorest (1) to richest (6).

Due to the multi determinant nature of the dependent variable, other explanatory variables have been included in the various models in accordance with factors that determine life satisfaction in the literature. These covariates of life satisfaction have been classified as Individual, household or societal characteristics.

With regards to individual characteristics we include health status and gender. perceived health status is measured subjectively and ranked as excellent (5) very good (4) good (3) fair (2) and poor (1). Gender is included in the estimations as a dummy variable, one for being a man and zero otherwise. It is expected that, men should have lower levels of life satisfaction compared with woman.

Social relationships have been said to positively impact subjective wellbeing and societal variables have been derived and included in the models. These are: Marital status, religious affiliations, years of schooling, crime in society and whether the individual has a medical aid.

Marital status is obtained from the adult questionnaire where responses were classified as married, living with partner, widow/widower, divorced/separated and never married. We collapsed these response categories by creating a dummy variable equal to one if the individual is currently married or living with partner and zero otherwise. Also, the death of a partner is very likely at the retirement age and a very important source of variation in life satisfaction. We therefore used the widow/widower response category to create another variable called 'bereaved' which was coded as 1 if the individual was a widow/widower and zero otherwise.

There are various ways the Education variable could be constructed but to give a simple and clearer measure, the various levels of education are converted into a single continues variable measuring the total number of years of schooling the individual has obtained. Because education has both economic and none economic benefits, it is assumed years of schooling will result in positive impacts on life satisfaction.

Importance of religious activities in the NIDS data set is categorized as not important, unimportant, important and very important. Out of these 4 categories, a dummy variable is coded as 1 if the individual finds religious activities important or unimportant while it is zero if not important or unimportant. How safe individuals perceive their societies to be also ultimately impacts on their happiness. If they feel their neighborhood is unsafe and there are constant theft and burglaries, this is expected to impact negatively on subjective wellbeing. These are captured by the variable "Crime".

There are many household characteristics that we can expect to impact on individual subjective wellbeing but in this study, we focus on the household size. In South Africa and most African countries, it is not unusual to find extended family members living with a bread winner who must support them financially, so they can be able to meet daily needs. Besides the heavy financial burden of extended family, frequent quarrelling and fighting are more prevalent in larger families and these are expected to negatively affect life satisfaction of the individuals within the household.

5.1. Descriptive statistics

The panel weighted means and standard deviations for the variables included in the models are shown on table 4.1 below. These have been separated into cohorts who receive old age pension and those that do not. This is done to illustrate observable differences in the covariates between the treatment and control groups.

Table 4.1: Summary statistics of Societal, Individual and Household Characteristics (Panel Weighted)

Variable	Sample	Observations	Mean	Std. Dev.
Old Age Pension	Full	2931	0.258	0.438
Marital Status (Married)	Treated	1123	0.265	0.442
	Control	1808	0.373	0.484
Bereaved	Treated	1123	0.158	0.365
	Control	1808	0.165	0.372
Health status	Treated	1117	3.044	1.102
	Control	1788	3.141	1.146
Medical Aid	Treated	1123	0.061	0.239
	Control	1808	0.157	0.363
Income Step	Treated	1112	2.386	0.896
	Control	1763	2.499	0.992
Income Per Capita	Treated	1123	1.955	15.340
	Control	1808	2.247	4.841
Importance of Religion	Treated	1115	3.466	0.652
	Control	1786	3.439	0.675
Crime	Treated	1121	3.125	1.459

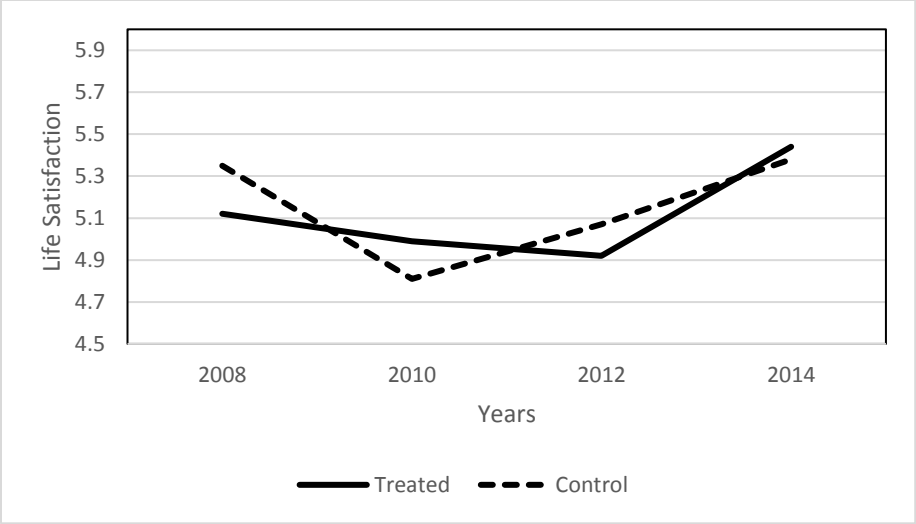
	Control	1797	2.963	1.443
Individual Characteristics				
Life Satisfaction	Treated	1117	5.175	2.340
	Control	1791	5.157	2.439
Male	Treated	1123	0.269	0.444
	Control	1808	0.345	0.475
Household Characteristic				
Household size	Treated	1123	5.226	3.313
	Control	1808	4.820	3.175

Note: Treated are Elderly aged 60-64 with monthly income less than 12300
Controls are Elderly aged 55-59 with monthly income less than 12300

Column 4 of table 4.1 shows that out of the 2931 individuals that are included in the primary sub sample, a little under 26% of them are receiving the old age pension. Individuals who receive OAP are less likely to be married than individuals who do not receive that grant. This might suggest that, upon reaching the retirement age in South Africa, more couples tend to become single. A reason for this could be due to lost income when people retire which may cause marital conflict and separation. Individuals who are currently on pension income are less likely to be bereaved, have lower perceived health status, unlikely to have a medical aid, rate themselves in the lowest income steps and have the lowest per capita income. They are however, the most likely to find importance in religious activities, experience more theft and burglary represented as crime on the table which might be because they do not have the necessary income level to acquire the assets that reduce the probability of being affected by crime such as own vehicle or electric fences.

Concerning individual and household characteristics, pension recipients have a higher rating of life satisfaction represented by a mean of 5.17 which is just slightly above the mean of the life satisfaction scale. They also have larger household sizes.

Figure 3.1: Mean Life Satisfaction by Wave.



Source: Author's Calculation

Figure 3.1, shows a plot of the mean values of life satisfaction against the wave for which the data was collected. The broken line represents the values for those who do not receive old age pension while the unbroken line indicates the values for those who receive pension. From the figure, it can be inferred that the pattern in life satisfaction of the two groups follows similar trend but may have been extensively influenced by the 2008 global economic recession which severely impacted the economy. A research presentation by Kganyago (2012), which examined the extent of the crisis on various sectors of the economy revealed that, sustained rise in food prices or inflation pushed the reserve bank to respond by increasing the policy rate from 7% to 12 % between May 2006 and June 2008, sharply worsening the financial position of households and corporates that had increased debt holding before 2007. Household debt rose starkly from 54.5 percent in 2003 to 82.3 percent by 2008 which is a sign that the period was associated with more stress, worry and general dissatisfaction. Improvements in the mean life satisfaction witnessed from 2010 is in line with stronger economic performance in the same period that gave way for more volatile real economic outcomes. Although the crises suggest that there was a dip in outcomes between 2008 and 2010, it does not introduce fears that the estimates will be biased because both treatment and control groups were equally affected.

6. RESULTS

This section, presents the quantitative findings shown on table 5.1 below. Model 1 estimated a simple ordinary least square while model 2 accounted for fixed effects. Within these two models, the

variable of interest is old age pension which has a positive coefficient of 0.351 and was statistically significant in model 1 at the 1% level of significance. Accounting for fixed effects in model 2 we experience a reduction of the coefficient to 0.261 statistically significant at the 5% level. These first two basic results indicate that, receiving old age pension contributes positively to the life satisfaction of the elderly but preceding the FE transformation, there existed an upward bias in the life satisfaction variable induced by omitted variable associated with time invariant unobservables and self-selection biases that inhibit consistent and efficient estimates (wapenaar, 2017).

Turning focus to model 3 and 3-1 which are the simple DiD and DiD combined with propensity score, the old age pension variable is dropped, and the new variable of interest becomes Treat*Post. These models fair better than the first two at estimating robust coefficients because they eliminate those confounding factors which cause biased estimates. The coefficient of the Treat variable in the DiD model is insignificant confirming that there are no signs of structural differences in outcomes for the treatment and control group. However, we make use of the DiD propensity score matching method to balance out any such differences if they exist so that more precise estimates can be obtained. Comparing coefficients from these two models, it is seen that standard errors from matching are smaller while estimates from both models are almost identical implying that, model 3-1 has to an extent, corrected for biases and self-selection into treatment. The coefficients of interest in the baseline DD models are positive and statistically significant meaning that, receiving SOAP increases life satisfaction by an average of 0.047 points on the 1 to 10-point life satisfaction scale within these models.

Regarding the societal variables, the biggest and most significant contributor of life satisfaction to the elderly is the income step of the individual which shows how they rank themselves in relation to others based on income level. The variable is statistically significant at the $p<0.01$ level in all models estimated which implies that the life satisfaction of elderly persons is significantly influenced when they compare themselves to others.

As expected, income tends to increase retirement satisfaction. The DiD coefficient of income per capita is positive and statistically significant at the 1% percent level. However, the marginal effects are small with a 1000 rands increase in per capita income, only contributing some 0.047 points increase in life satisfaction on the 1 to 10-point scale.

From theory, it is understood that as income increases, subjective well-being follows suit for low income levels. As income keeps rising, we get to points where it only has small marginal or no effects on subjective wellbeing and thereafter, more income may lead to reduced subjective well-being. The second order polynomial of absolute income was included to capture this effect of rising income. As seen on table 5.1, the fact that the coefficient of income per capita is positive and that of income per capita squared is negative tells us that, life satisfaction follows the theoretically hypothesized inverted U-shaped for the income variable with life satisfaction increasing as income increases, reaching a maximum and then dropping thereafter.

Life satisfaction of elderly persons with a medical aid is also higher and significantly different from those who do not have a medical aid scheme. A related variable is the health status of individuals which also positively increases SWB. Health status, years of schooling, importance of religious activities, income per capita and income step are the four variables that produce consistent positive and significant effects on life satisfaction in at least five of the six models that were estimated. There are indications from these models that married people are happier than un married persons, but this relationship could not be confirmed statistically due to the estimate being insignificant. Also, the coefficient of bereaved is negative in all models but the fixed effect model. This suggests that losing a partner reduces subjective wellbeing, but this relationship could not also be confirmed statistically.

Gender which is the lone individual characteristic included in the model produced positive but insignificant estimates in five of the six models estimated. We cannot therefore conclude that the grant contributes more to male SWB than women. Lastly, household size increases subjective wellbeing by an average of 0.027 points and this relationship sheds light on the supportive role of South African households.

Table 5.1: Life Satisfaction Results from all Models

			Program Effects		Anticipation Effects	
Variables	**Model 1**	**Model2**	**Model3**	**Model3-1**	**Mode3-2**	**Model3-3**
Societal Characteristics	OLS	FE	DID	DID-PSM	DD Control A	DD Control C
Old Age Pension (SOAP)	0.351***	0.261**				
	[0.097]	[0.124]				
Post			0.308***	[0.308]	-0.114	-0.025
			[0.105]	[0.104]	[0.123]	[0.113]
Treat (SOAP)			-0.162	-0.162	-0.195	-0.166
			[0.183]	[0.179]	[0.143]	[0.212]
Treat*Post (DD)			0.470**	0.470**	0.082	-0.053
			[0.211]	[0.207]	[0.188]	[0.147]
Marital Status (married)	0.030	-0.273	0.045	0.045	0.034	0.037
	[0.096]	[0.144]	[0.100]	[0.101]	[0.100]	[0.100]
Bereaved	-0.030	0.032	-0.078	-0.078	-0.079	-0.075
	[0.120]	[0.172]	[0.121]	[0.121]	[0.122]	[0.122]
Health status	0.082**	0.051	0.083**	0.083**	0.084**	0.081**
	[0.038]	[0.052]	[0.038]	[0.039]	[0.038]	[0.038]
Medical Aid	0.335**	-0.279	0.337**	0.337**	0.306	0.314**
	[0.164]	[0.305]	[0.160]	[0.165]	[0.160]	[0.160]
Years of Schooling	0.038***	0.083*	0.036***	0.036***	0.033***	0.034***
	[0.010]	[0.050]	[0.010]	[0.010]	[0.010]	[0.010]
Income Step	0.614***	0.304***	0.625***	0.625***	0.625***	0.626***
	[0.048]	[0.087]	[0.048]	[0.048]	[0.048]	[0.048]
Income Per Capita	0.045***	0.027	0.047***	0.047***	0.000***	0.050***
	[0.014]	[0.023]	[0.014]	[0.014]	[0.014]	[0.014]
Income per Capita squared	-0.096***	-0.062	-.101***	-0.101***	-0.094***	-0.105***
	[0.028]	[0.045]	[0.029]	[0.027]	[0.029]	[0.029]
Importance of Religion	0.466***	0.304***	0.483***	0.483***	0.486***	0.484***
	[0.063]	[0.086]	[0.063]	[0.067]	[0.063]	[0.063]
crime	**-0.047**	**0.041**	**-0.049***	**-0.049**	-0.047	-0.047
	[0.029]	[0.041]	[0.014]	[0.030]	[0.029]	[0.107]
Individual Characteristics						
Gender (male)	0.019	.	0.016	0.016	0.001	-0.002
	[0.998]	.	[0.094]	0.093	[0.093]	[0.094]
Household Characteristic						
Household size	0.014	-0.029	0.027**	0.027**	0.028**	0.027
	[0.095]	[0.039]	[0.014]	[0.014]	[0.014]	[0.014]
R-Squared	0.154	0.122	0.15	0.15	0.15	0.15
Number of Obs.	2851	2851	2849	2849	2851	2851

*Note: * p<0.10; **p<0.05; *** p<0.01*

Standard Errors in brackets below coefficients

Model 1 is OLS model; Model2 is Fixed Effects; Model 3 is simple DiD; Model 3-1= DiD propensity score matching;

6.1. Anticipation Effects

There is a significant amount of literature which suggests that, elderly persons who are close to meeting the criteria for receiving old age pension might modify their behaviors in anticipation of the income. This extra source of bias if not checked, could possibly influence the magnitude of the estimates. The advantage of the methodology employed in this study is that, it allows us to test for the presence or absence of these anticipatory effects.

To do this, Model 3-3 and 3-4 estimate the same difference in difference regression, but with the inclusion of control group A and group C respectively. That is, individuals who are between the ages of 55 to 59. If anticipation effects are present in the model, we would expect to have positive and statistically significant coefficient for Treat*Post in model 3-3 while the same variable should be negative or insignificant for model 3-4. This is so because, control group A constitutes those cohorts that will soon qualify and start receiving the grant while those in control group C will experience a shock in income on retirement that should negatively impact on subjective wellbeing.

Results from the two models shown on the last two columns of table 5.1 for the coefficient of interest, are both not statistically significant. This means that, in the absence of the program, there are no changes in behaviors due to an expectation of receiving the grant.

6.2 Robustness Checks

As noted in a previous section, due to the ordered nature of the dependent variable, the standard regression technique to use is ordered logistic or probit regression. The ordinal probit assumes the existence of a continuous, unobservable latent variable (Y*) which determines the likelihood of observing a given level of the dependent variable (Borooah, 2002). For the ordered logistic regression model, the dependent variable is life satisfaction with categories ranging from 1 to 10 which we collapse into three categories. The variable equals 1 (not satisfied) for all life satisfaction responses less than 5, equals 2 (satisfied) for responses 4-7, and equals 3 if the life satisfaction rating is greater than 7. The model for an ordinal dependent variable Y with M category the model can be written as:

$$p(Y_i > j) = g(X\beta) = \frac{\exp(\alpha_j + X_i\beta)}{1 + [\exp[\alpha_j + X_i\beta)]}, j = 1,2, \dots, M - 1$$

It should be noted that, all the beta coefficients are the same for all levels of the dependent variable (for j=1,2…, M-1).

Subsequently, the single estimated coefficient value of a given explanatory variable is representative of the probability of increasing one level in the dependent variable regardless of what the level of the dependent variable may be (Wapenaar, 2017).

A key assumption of the ordered logistic regression model is that the parameters do not differ across the categories of the dependent variable. This is often referred to as the parallel lines assumption and if confirmed, the assumption is evidence that the measurable distance between each of the levels of the dependent variable are equivalent (Borooah, 2002). The assumption was tested using gologit2 LR test as well as gologit2 Wald test and the full results have been included in the appendices. From the LR test, the probability > chi^2= 0.4252 indicating that none of the variables violates the parallel lines assumption while the probability > chi^2 from the Wald test is 0.5143 again confirming that all the variables in the M-1 equations are all equal to zero which again means parallel lines assumption holds and predicted probabilities can therefore be estimated.

Table 5.2, model 4 represents estimates derived from the ordinal logistic difference in difference model.

Table 5.2: Ordinal Logistic Regression Results-Robustness Checks

	Model 4	Pseudo R2
Treated*time	0.653*	
	[0.374]	
Predicted Probability		0.0824

Note: Robust standard errors reported in brackets

On Table 5.2, the coefficient of interest is that of treated*time. It is positive and statistically significant at the 10% level which indicates that, the probability of rating a life satisfaction of 2 for example as opposed to rating 1, did increase for the treated group in comparison with those in the control group or those who never received pension income. This result serves to confirm those from the ordinary least square models and the general conclusion arrived at is that, receiving SOAP increases subjective well-being.

6.3 Discussion

At the beginning of this study, it was hypothesized that, how the elderly currently perceive their lives could be impacted as a result of receiving the grant although the sign and magnitude were uncertain given the literature reviewed on section 2. The analysis carried out in the previous section arrived at several conclusions the most important being the relationship between the OAP grant and life satisfaction which can be read off the empirical evidence presented on table 5.1. The significance of this finding relates to the fact that, of all the difficulties that older persons face, being happy with life is crucial as it has significant ramifications on the other aspects of the individual's mental health and on family dynamics. Although it is difficult to maintain happiness overtime because there are many variables that impact it, the study has shown that the grant plays a positive role which may go a long way to improve other dimensions of psychological health such as depressive symptoms which has been indirectly linked to mortality and disability- all variables that can only be quantified in the long run (Salinas-Rodriguez et. al., 2014). A reason why the author of this study did not measure the impacts on economic wellbeing is because receiving the SOAP represents improvements in economic situation and we therefore have a situation where the indirect impacts on life satisfaction can also be generalized for economic wellbeing. If we go by this simple logic, it will suggest that the grant will also positively affect nutrition and eventually health outcomes of the elderly that will ultimately reduce mortality and disability.

One of the challenges that the elderly also face is heavy dependence on children for financial support which might lead to adverse outcomes if not remitted on time especially in emergency situations often caused by sickness. Although not directly measured in this study, we may deduce that the grant plays a positive and significant role in empowering the elderly as they are certain and can anticipate when exactly they will receive the income. They can therefore act based on the certainty of their income source. For example, in times of sickness, the old may be confident to get small loans or borrow food stuffs from neighbors and not default on their debt. All these go a long way to reduce stress associated with poverty and uncertainty of income. Another point relating to empowerment is increased participation of the older group in daily household decision making and contributing to community development. The grant gives a sense of ownership of the source of income which implies that, the elderly takes active part in the daily running of the household while they also use their good judgment acquired over time to influence societal projects given that they can now afford transport expenses to community meetings and pay levies. These implied

empowerment effects translate into a feeling of worthiness especially relating to children and grandchildren who may still be heavily reliant on them.

Adding to the impacts of the SOAP, the results of the study also reveal several crucial correlates of subjective well-being three of which will now be discussed. Since the work of Easterlin (1974), it is expected that relative income will be stronger than absolute income at explaining life satisfaction and the models employed correctly find stronger effects for relative standing. If relative standing matters more for subjective well-being, we can find that income inequality can lead to reduction in life satisfaction especially for a highly unequal society like South Africa. A puzzle within this study therefore shows that, falling behind others within the country has a greater and positive effect on the assessment of own happiness. Most of the empirical evidence on this subject find significant negative relationship (Leibbrandt, 2015 and Posel & Casele, 2011) but studies that establish a positive effect are very rare if not inexistent. The question that ponders the mind, is why would individuals become happier perceiving that their income levels falls short of the comparison group? This question might have been answered if we could incorporate a variable capturing wealth of household which unfortunately could not be done because the variable was only measure in wave 2 and wave 4 requiring an entirely new experimental design setup.

Two very important finding from this study are the impact of self-reported health and the importance of religious activities. With regards to health, it is seen that the variables consistently produce large positive and significant effects on life satisfaction in most of the models estimated. However, it must be emphasized that, the magnitudes of the estimated impact of health on life satisfaction may be overstated because both self-reported health and self-reported happiness are subjective measures heavily influenced by the characteristics of the individual such as personality traits (Frame, 2013). As an example, pessimistic individuals are likely to give a more negative outlook on their health than their counterpart optimistic individuals who would usually have a more positive valuation of life. Looking at the estimated impacts of the importance of religious activities, the variables also produces large positive and significant estimates at as narrow as the 1% level of significance in all but one of the models estimated. This is in line with Some developmental psychologists and theologians who have posited that religion and spirituality more broadly creates a sense of meaning and coherence in one's life that becomes especially important during the final stages of human development (Fowler, 1981; Tornstam, 1997a). When the measured impacts of religious importance and health are compared to economic measures such as income per capita, it is

seen that, subjective wellbeing measures better predict life satisfaction of the elderly than economic wellbeing.

7. CONCLUSION

This paper investigated the relationship and measured the magnitude of the impact that the SOAP grant on subjective well-being of the elderly in South Africa. The literature review indicated that, the relationship between income and economic wellbeing has been sufficiently researched both for other countries and south Africa but the literature lacks studies on the specific role that the SOAP plays in subjective well-being of the elderly in South Africa. A wide range of estimation strategies have been employed the most common being the ordinary least square regression controlling for fixed effects which most often, do not measure causality but correlation relations. In this study, various models were employed increasing in sophistication and using the panel structure of the data with robustness checks also performed. Results from these models established that, qualifying and receiving the grant positively and significantly contributes to an individual's happiness and it is critical for these vulnerable groups without which they might not be able to survive. A minimum amount of income contributes significantly to happiness, irrespective of its source. There is no anticipation effect observed and SOAP does not contribute more to well-being as compared to other sources of income. Therefore, for those without other means of income SOAP is critical in uplifting their wellbeing to that of elderly with a source of income. SOAP can therefore be said to be an equalizer of wellbeing among the elderly.

7.1. Limitations and Future Research.

A couple of limitations are noted in this study. The first relates to the methodology employed which is a regression discontinuity approach used to form the comparison group. This implies that, the estimates represent effects only for the group of elderly persons between 60-64 and further studies need to be conducted to measure the impacts of the grant on other age groups such as those greater than 64 years. Second, the study was a little too narrow in the sense that, it strictly focused on the effect of the grant on only one measure of subjective well-being. The author realizes that, since life satisfaction is self-reported, it would have been more robust to use an alternative measure of individual happiness to make comparisons. Related to this point, the study did not also measure the impact of the grant on economic well-being. It was mentioned at the beginning that, from the estimated impacts of the OAP grant, other outcomes can be deduced as have been done on the

previous paragraphs of this section. However, it would have been more interesting to use the strengths of the data set combined with the robustness of the methodology to conclude rather than deduce subjective wellbeing and economic well-being correlates. Again, the results made no attempt at a cross country analysis and only focused on South African data. It is cautioned that the results from this study lacks external validity.

The study proposes that, future research on this subject should be carried out for other age groups such as those above 64 years old to understand how the impact of the grant fades away with the amount of time the recipient has been earning the income. It also recommends that, future studies be more detailed in terms of disaggregating the impacts of the various correlates. For example, in this study, a more detailed analysis could have been carried out by disaggregating the years of schooling and income per capita into different educational and income brackets. Finally, a comparative study between South Africa and similar countries needs to be done so that some degree of external validity can be achieved. The robustness of the results ensures that it can be used to advice public policy. Previous studies have ascertained that, the old age pension grant is playing a central role in poverty and income inequality reduction but if policy's main goal is to improve subjective well-being or happiness of the elderly, it should focus more on expanding crucial services such as health care.

APPENDICES

Table 4.2: Description of Explanatory Variables

Variable	Source	Description	Type
Life Satisfaction	NIDS	The measure of subjective well-being rated on a scale of 1-10 where 1 is very dissatisfied and 10 is very satisfied *For ordinal logit model, Y=1 if life satisfaction <5 Y=2 if life satisfaction>4 and life satisfaction<8 Y=3 if Life satisfaction> 7	Continues
State old age pension(SOAP)	NIDS	Indicator variable for receiving SOAP X=1 for receiving pension and 0 otherwise	Dummy
Marital Status	NIDS	Indicates of the respondent is married or single X=1 if married or living with partner X=0 if widowed, divorced/separated or never married	Dummy
Bereaved	NIDS	Indicates death of spouse X=1 if widow/widower and 0 otherwise	Dummy
Health status	NIDS	Measure of self-reported health. X=1 if rated as poor, X=2 if fair, X=3 if good, X=4 if very good and X=5 if Excellent	Discrete
Medical Aid	NIDS	Indicator Variable for Having a Medical Aid X=1 if Yes and 0 if NO	Dummy
Income step	NIDS	Measure of relative standing on a scale of 1 to 6 X=1 if rating =1…X=6 if rating =6	Discrete
Income Per Capita	NIDS	Measure of income per person calculated as (total monthly household income divided by household size.)/1000	Discrete
Importance of religious activities	NIDS	X=1 if not important, X=2 for unimportant, X=3 for important and X=4 for very important	Discrete
Crime	NIDS	Measures the frequency of theft and burglary in the neigbourhood. X=1 if it never happens, X=2 if very rare, X=3 if not common, X=4 if fairly common and X=5 if very common	Discrete
Male	NIDS	Shows the gender of the individual X=1 if male and) otherwise.	Dummy
Household size	NIDS	Measure of the number of persons living with the SOAP recipient	Discrete

Transition Matrix

	Period1	Period2	Period3	Period4
Received OAP	96	91	434	502
Did not receive OAP	422	440	436	433
Transitioned		-5	343	68

Parallel Lines Testing Using Wald's gologit2 LR Test

```
. quietly gologit2  lifesatordinal treatuma time treatedpost  married bereaved schyrs health male medicaid incomeperc
> comepercapitasq relincome religion hhsize crime, npl sto(gologit)

. quietly gologit2  lifesatordinal treatuma time treatedpost  married bereaved schyrs health male medicaid incomeperc
> comepercapitasq relincome religion hhsize crime, pl sto(ologit)

. lrtest gologit ologit, stats

Likelihood-ratio test                                 LR chi2(15) =     15.37
(Assumption: ologit nested in gologit)                Prob > chi2 =    0.4250

Akaike's information criterion and Bayesian information criterion
```

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
ologit	2849	-2968.95	-2760.489	17	5554.978	5656.208
gologit	2849	-2968.95	-2752.803	32	5569.606	5760.157

Note: N=Obs used in calculating BIC; see **[R] BIC note**

Parallel Trend Testing Using gologit2 Wald's Test

```
. quietly gologit2  lifesatordinal treatuma time treatedpost  married bereaved schyrs health male medicaid incomepercapita in
> comepercapitasq relincome religion hhsize crime, npl sto(gologit)

. test [#1=#2]

 ( 1)  [1]treatuma - [2]treatuma = 0
 ( 2)  [1]time - [2]time = 0
 ( 3)  [1]treatedpost - [2]treatedpost = 0
 ( 4)  [1]married - [2]married = 0
 ( 5)  [1]bereaved - [2]bereaved = 0
 ( 6)  [1]schyrs - [2]schyrs = 0
 ( 7)  [1]health - [2]health = 0
 ( 8)  [1]male - [2]male = 0
 ( 9)  [1]medicaid - [2]medicaid = 0
 (10)  [1]incomepercapita - [2]incomepercapita = 0
 (11)  [1]incomepercapitasq - [2]incomepercapitasq = 0
 (12)  [1]relincome - [2]relincome = 0
 (13)  [1]religion - [2]religion = 0
 (14)  [1]hhsize - [2]hhsize = 0
 (15)  [1]crime - [2]crime = 0

           chi2( 15) =   14.15
         Prob > chi2 =    0.5143
```

Ordinal Logistic Regression Results

```
. ologit  lifesatordinal i.treatuma##time  married bereaved schyrs health male medicaid relincome incomepercapita religion crime hhsize [pweight=weight], nolog

Ordered logistic regression                     Number of obs   =       2359
                                                Wald chi2(14)   =     115.20
                                                Prob > chi2     =     0.0000
Log pseudolikelihood = -4649609.6               Pseudo R2       =     0.0886
```

lifesatordinal	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
1.treatuma	-.4109649	.3424305	-1.20	0.230	-1.082116	.2601866
1.time	-.3153249	.1907414	-1.65	0.098	-.6891712	.0585214
treatuma#time						
1 1	.653269	.3741263	1.75	0.081	-.0800051	1.386543
married	-.0726683	.1619456	-0.45	0.654	-.3900758	.2447393
bereaved	.040726	.1726929	0.24	0.814	-.2977458	.3791978
schyrs	.0381886	.0135354	2.82	0.005	.0116598	.0647174
health	.0503644	.058802	0.86	0.392	-.0648853	.1656141
male	.0982161	.1405375	0.70	0.485	-.1772323	.3736646
medicaid	.7469259	.1984843	3.76	0.000	.3579039	1.135948
relincome	.4487718	.0808592	5.55	0.000	.2902906	.607253
incomepercapita	.0002868	.003147	0.09	0.927	-.0058812	.0064548
religion	.2766519	.1086857	2.55	0.011	.0636319	.4896719
crime	-.0782574	.0430572	-1.82	0.069	-.1626479	.0061331
hhsize	-.0044013	.0177035	-0.25	0.804	-.0390995	.0302969
/cut1	1.76345	.4945144			.7942192	2.73268
/cut2	3.900385	.5291104			2.863348	4.937422

Ordinal Logistic Regression estimated Margins

```
. margins r.treatuma#r.time

Contrasts of predictive margins
Model VCE    : Robust

Expression   : Pr(lifesatordinal==1), predict()
```

	df	chi2	P>chi2
treatuma#time	1	3.02	0.0824

	Contrast	Delta-method Std. Err.	[95% Conf.	Interval]
treatuma#time				
(1 vs 0) (1 vs 0)	-.1331143	.0766381	-.2833223	.0170937

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