



**WOMEN'S DECISION-MAKING, CHILD NUTRITION AND MOTHERHOOD:
EVIDENCE FROM SOUTH AFRICA**

BY

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DECLARATION

I declare that this thesis is my original work, except where acknowledged in the text. I hereby submitted this thesis for the Degree of the Doctor of Philosophy in Economics, University of the Witwatersrand, Johannesburg.

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Signed 

Date: September 2021

DEDICATION

I dedicate this thesis to the God Almighty for His faithfulness and divine assistance. To Afolake Adediran my wife, our sons—Israel Miracle Adediran (the first) and Isaac Divine Adediran (the second) as well as my siblings.

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ABSTRACT

The thesis comprised three main essays. These are issues affecting the degree of equality in economic opportunities and the dynamics of earnings inequalities within the labour market. The inferences made about women's decision-making and their varied labour income due to the number of children given birth in South Africa.

First, much of the existing literature contends that income is a key determinant of household decision-making. Yet the causal connection between income and household decision-making is difficult to ascertain, given the obvious endogeneity bias that may arise from reverse causality and omitting (unobserved) confounding variables correlated with income and the household decision-making measures. Thus, this study exploited the exogenous variation in household income and their decision-making. This is based on a unique natural experiment in South Africa using age discontinuity in eligibility for Old Age Pension (OAP) income transfer- to identify the causal effect of income on household decision-making. Using a regression discontinuity design (RDD), the study found that women's decision-making responded to changes in income from OAP transfer more than that of men. More so, the OAP transfer influenced women decision-making by 12% points for the recipient more than non-recipient. The results from the quantile treatment effect confirmed that the OAP income transfer effect is heterogeneous across the distribution of household decision-making. The study suggested that women should be used as a channel of distribution of social grant (in development programmes) to reduced inequality and achieve gender equality.

Second, women's decision-making is a phenomenon in children's nutritional outcomes. This study investigated the causal effect of women's decision-making on child nutritional outcomes using a panel dataset from the South African National Income Dynamic Survey (NIDS) from 2014/15 to 2017. The child's nutritional outcomes comprised three anthropometric measurements, which included weight-for-height, weight-for-age and height-for-age. The study used variables, which includes daily expenditure, large purchases, where children attended school, who lived with the family and where the household lived to creates a decision-making index using Multiple Correspondence Analysis (MCA). A fixed-effects estimator was used to control for time-invariant components. Using a fixed effect estimator showed that the causal effect of women's decision-making on the child's nutritional outcomes was inconclusive. However, the alternative selected

econometric strategy (control function approach) control for endogeneity issues. Using this approach, the findings suggested that women's decision-making had a significant positive effect on the child's nutritional outcomes. The result showed that women's decision-making had different effect on the improved child's weight-for-height (63.2%), child's weight-for-age (51.9) and child's height-for-age (70.6%). The policy implication from these findings indicate that the role of women's empowerment is important and could significantly help in achieving better child nutritional outcomes. Overall, the findings underscore the need to account for human capital gains and the evaluation of policies that ameliorate gender inequality and child's health and well-being.

Third, this study investigated the effects of the number of children on the distribution of mother's labour income. The study used a panel data of five waves from the South Africa National Income Dynamic Survey (NIDS) and employed a quantile regression. In the analysis, the study employs the Heckman selection model to correct for sample selection bias that may arise from endogenous labour market participation. The study revealed that both the cumulative effects of the number of children and the presence of preschool-age children negatively affected the mothers' labour income after controlling for sample selection bias. Further, the study found that women's decision-making had a significant positive effect on the labour income of those who are higher income earners. In line with this finding, the study suggests work-family policies such as allocating a daycare centre near the mother's workplace. This could have a positive shift on the mother's labour income through increased time allocated for work.

Studies have confirmed that women's fertility is a key determinant of the gender income gap and inequality. Likewise, a mother's labour income is negatively impacted by the number of children or childbirth count. This shows that the responsibility of women as primary caregivers in a household is not without consequences or trade-off time. Put differently, women's potential labour capacity is likely to reduce their participation during childcare. However, the effect of childbirth count varies on the distribution of the mother's labour income. When the mothers are high-income receivers their self-esteem, self-confidence and empowerment to make personal decisions are likely to increase. Whereas women who are lower-income receivers are likely to have low potential in making personal decisions. For those who are lower income receivers and/or those who cannot be empowered, social income support such as child support grants, old age pension transfers and other forms of income inequality reduction mechanisms in South Africa may be used to support

them. Regression discontinuity design has revealed that OAP transfer improves the household decision-making. The study has found that the exogenous income has a varying effect on the women's decision-making distribution using quantile regression. The current study has found that women's decision-making empowerment has a significant positive effect on the child's nutritional outcomes using the control function approach. Therefore, parental investment in children in early childhood development is likely to enhance short and long-term health and cognitive outcomes. The findings in the study suggest the development and health policies that would enhance human development, reduce income inequality, and empower women in decision-making to improve child nutrition and health outcomes.

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CHAPTER ONE

Introduction

1.1 Background and Motivation of the Study

The lack of women's personal decision-making (or autonomy) (Debnath, 2015) and low female labour market participation (Casale, 2004) are among the national socio-economic problems in South Africa. Existing studies have defined autonomy as a decision-making state of freedom or liberty and possessing dignity, integrity, individuality, independence, responsibility, self-knowledge, and knowledge of one's interests (Dworkin 1976, 1978; Beauchamp & Childress, 1983; Gilbert, 2000; Agich, 2003). The asymmetric power relationship between men and women within the household may lead to a lack of women's autonomy. This is bi-directional because a lack of women's autonomy may lead to asymmetric power relations within the household. While noting that income is essential, some studies have suggested that other factors, such as cultural beliefs, race, and religion, are also important when women's autonomy is concerned (Basu, 2006; Lutz, 2010).

Irrespective of the country and social status, studies have suggested that gender inequality may affect women's decision-making power within the household and their inclusive growth (Rodgers & Zveglic, 2014; Cabeza-Garcí et al., 2018). It is important to note that the lack of autonomy and low female labour market participation is linked to a woman's number of children (Contreras et al., 2005; Sorsa et al., 2015). In addition, women who participate in the labour market receive a low income as a result of gender discrimination against women (Baah-Boateng, 2012). More so, existing studies have found that the number of children hurts women's labour income (World Bank 2004; Christiansen et al., 2016).

Studies have found that women's labour market participation has been low for several reasons, one of which is lower educational attainment (Brooks-Gunn et al., 1993; Barnett et al., 2004). Also, subject to women's labour participation, they earn less relatively compared to men in the labour markets (Bhorat & Goga, 2013; Cabeza-García et al., 2018) due to labour market discrimination (Baah-Boateng, 2012; Ismail & Jajri, 2012), lower human capital endowment (Aizer & Currie, 2014; Klemp & Weisdorf, 2019) or both. The consequences of these structural features of the labour market include lower-income earnings (invariably, it may lead to poverty) and related

ramifications among the women subpopulation of a country. Lower-income earnings, among other things, reduce women's personal decision-making or autonomy within households. One cannot overemphasise the effect of a lack of or lower labour income on a household's welfare. For example, a conceptualised cycle of income inequality effects (see Figure 1.1) shows that those who have low educational attainment as a result of income inequality (Breen & Chung, 2015) have fewer chances to participate low in the labour market (Totouom et al., 2018; Gashi et al., 2019). On that trajectory, low labour participation may lead to little or no labour income (Kuhn & Ravazzini, 2017), and a lack of access to labour income (Angel-Urdinola & Wodon, 2010; Roy et al., 2017) may lead to a lack of decision-making.

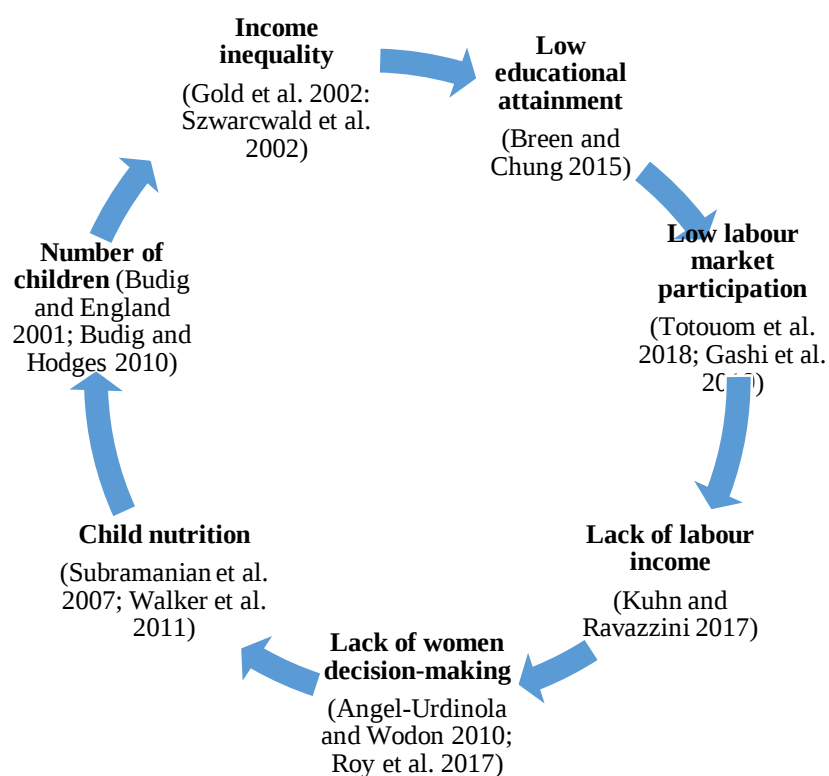


Figure 1.1 Cycle of income inequality effect from a mother to a child: Compiled by the Author

Notably, the lack of women's decision-making could spill over to child outcomes such as nutrition, which may lead to low cognitive ability (Dewey & Begum, 2011) and school dropouts (Fitzpatrick et al., 2015). It follows that the nexus between women's decision-making and children's nutritional outcomes (Carlson et al., 2015) represents a channel through which human capital inequality may be transmitted (Subramanian et al., 2007; Walker et al., 2011). Furthermore, an increase in the

childbirth count might negatively affect the mother's income (Budig & England, 2001; Budig & Hodges, 2010). Furthermore, fertility undermines women's labour supply for market activities. Typically, the responsibility of childbearing and care falls more on women as the primary caregivers than on men. Consequently, being a caregiver may reduce the working hours (World Bank 2004; Christiansen et al., 2016; Erosa et al., 2016) in labour participation.

Factors that influence procreation behaviour, especially in Sub-Saharan African countries, could be social norms, household income, professional status (Atake & Ali, 2019), and a lack of information on family planning, among other factors. An increase in the cumulative number of children without adequate childcare provision to nurture children from the early stages of development, facilitated by mothers or household income, may cause malnutrition and affect children's cognitive development. Globally, undernutrition has affected an estimated 22.0% stunted, 6.7% wasted, and 5.7% overweighted in the joint report by UNICEF, WHO and World Bank (UNICEF, 2021). One of the published reports on children's malnutrition has estimated the prevalence of stunting and wasting to be about 29% and 0.9% in 2019 for Southern Africa (UNICEF, 2020). Southern Africa is one of the highest UNICEF regional malnutrition distribution next to South Asia. Existing studies in the case of South Africa have reported that children are among those most affected by malnutrition (Zere & McIntyre, 2003; Vorster, 2010).

Against this backdrop, this thesis's three related empirical research studies examined the causes, spillover effects, and consequences of income inequality among women in South Africa.

First, it sought to investigate the effect of income transfer (social income transfer scheme) on women's decision-making. Existing studies have revealed that women are more affected by household poverty and inequality in South Africa (Leibbrandt & Woolard, 1999; Schotte et al., 2017). For example, in South Africa, the proportion of poor females (38.1% in 2011 and 41.7% in 2015) is higher than the average of the country's entire population (36.4% in 2011 and 40% in 2015), as stated by Stat. SA (2017). In effect, the study revealed that an alternative income source, such as an income transfer programme (e.g. old age pension¹ [OAP] transfer), could reduce income inequality and improve women's decision-making. A strand of the literature has revealed that OAP transfer is likely to positively influence household decision-making (Ambler 2016). However,

¹For detailed information, see South African Government (2019). Information on the OAP retrieved from: <https://www.gov.za/services/social-benefits-retirement-and-old-age/old-age-pension>

whether OAP transfer has a heterogeneous causal effect on household decision-making has remained to be investigated yet.

Second, it ascertained whether women's decision-making, in turn, improved children's outcomes, using three anthropometric measurements of child nutrition (weight-for-height, weight-for-age and height-for-age). Majlesi (2016) found that an improvement in women's autonomy can improve child health. However, persistent low female labour force participation may affect child development when the mother or women lack income and personal decision-making. The labour market in South Africa favours men to the detriment of women (Grün, 2004; Burger & Jafta, 2006). For example, from the Quarterly Labour Force Survey, the unemployment rate was 29.5% among women and 25.3% amongst men in the second quarter of 2018². The second paper of this thesis has the potential to fill a gap in the literature and contribute to the empirical studies of the effect of women's decision-making on child's nutritional outcomes in South Africa.

The third paper of this thesis sought to investigate the effect of women's fertility – more specifically, having many children and children aged below six - on their labour market income distribution. Studies have found that those with a break in labour participation or an interruption in a career path due to childcare responsibilities are likely to fall in potential capacity or stock of human capital (Gangl & Ziefle, 2009; Pacelli et al., 2013). The effect of the number of children on mothers' labour income indicated in the literature suggests that labour income varies relative to the variation in labour participation. However, some studies, based mostly on developed countries, have estimated the effect of the birth count on labour income using cross-sectional data. This study used a panel dataset that allowed correction for sample selection bias in the study of the effect of the number of children on mothers' labour income in South Africa. In general, the thesis investigated the causes, consequences, and implications of the lack of women's decision-making and female labour participation within South African households and the ultimate link to the child's nutritional outcomes.

² For further details, see Statistics South Africa, 2018, Quarterly Labour Force Survey, Quarter 2.

1.2 Objectives of the Study

The main objective of this study was to establish the extent to which income (unearned from the labour market) may improve women's decision-making, child nutrition, and fertility decisions (that is, the number of children). Specific objectives of the study included the following:

- i. To investigate the effect of OAP transfer on household decision-making
- ii. To examine the effect of women's decision-making on child's nutritional outcomes
- iii. To investigate the effect of the number of children on a mother's labour income

In alignment with the above objectives, the research questions for the three essays in this thesis included the following:

- i. Does the OAP transfer affect household decisions making, and where does the effect of OAP transfer lie in the distribution of household decision-making?
- ii. What is the effect of women's decision-making on child nutritional outcomes?
- iii. Does the number of children affect the distribution of the mother's labour income?

1.3 Data

The three analyses rely on the South Africa National Income Dynamics Survey (NIDS). The NIDS is a nationally representative survey that covers the period 2008 to 2017 that is Wave 1 to 5. According to the NIDS report by Argent 2009 and Leibbrandt et al. (2009), "the NIDS survey in 2008 was the first nationwide panel study to record the dynamic structure of a sample of households in South Africa and deviations in their education, health, incomes, expenditure, assets, income and other measurements of well-being. The Southern Africa Labour and Development Research Unit (SALDRU) at the University of Cape Town's School of Economics was the first to collect the NIDS dataset. The plan of NIDS predicted data collection every two years." The study will discuss relevant datasets in each essay.

1.4 Contributions of the Study

The thesis contributes to the related empirical literature on women's decision-making, child nutrition and motherhood in South Africa. Chapter 2 of the study evaluates one of the implemented

development policies to reduce inequality in South Africa. Evaluating one of the social policies, the OAP transfer, in South Africa provides information regarding the programme's effectiveness to policymakers and scholars. Ambler (2016) assessed the effect of the OAP on household decision-making using the natural experiment approach (regression discontinuity design). Her study found that, on average, OAP transfer positively influences women's decision-making. This study differs from the one by Ambler (2016); rather than considering the average effect, the current study showed that the OAP transfer has a varied effect on the decision-making of the recipients. This study used quantile regression and complement with quantile treatment effect to unpack the effect of OAP transfer on household decision-making and ascertain the heterogeneity of this effect on the distribution of decision-making quantiles.

Chapter 3 of this thesis considers the effect of women's decision-making on children's nutritional outcomes using a dynamic panel dataset from the NIDS 2014/15 to 2017. The study selected the weight-for-height and weight-for-age, which are the short-term measurement of child nutritional outcomes and the height-for-age indicator, which measures the long-term nutritional deficiencies. Deprivation or deficiency in these nutritional measures may inhibit early childhood development. The study controlled for clustering error, attrition, and time-invariant confounding factors and treated endogeneity issues in the study of women's decision-making and children's nutritional outcomes. The methodology employed in the study includes the fixed-effects estimator and the control function approach (CFA). Remarkably, the study revealed that women's decision-making has a significant positive and heterogeneous effect on the child's nutritional outcomes.

Chapter 4 of the thesis contributes to the empirical literature on the effect of the number of children on a mother's labour income using all five waves of the South African NIDS panel dataset. There is a paucity of studies in the South African context regarding these phenomena. A strand of the literature in America has examined a variation in the motherhood penalty across women's wage distribution (Budig & Hodges, 2010), even in the case of Poland (Cukrowska-Torzewska, 2016). However, it has failed to explore sample selection bias. The current study investigated the effect of the number of children on mothers' labour income using quantile regression, accounting for income inflation and correcting for sample selection bias. The results revealed that the cumulative effect of the number of children explains a large negative effect for those who are low-income

receivers. The results also show a substantial effect on the upper-income earners when the children were younger (of preschool age).

1.5 Thesis Outline

The remaining chapters of this thesis provide detail on three essays. Chapter 2 assesses the effect of the OAP on household decision-making. Chapter 3 consists of a study that examines the effect of women's decision-making on a child's nutritional outcomes. In chapter 4, the study investigates the effect of the number of children on the distribution of a mother's labour income using quantile regression with corrections for sample selection bias. Finally, chapter 5 presents the conclusion of the study.

CHAPTER TWO

The Effect of Old Age Pension Transfer on Household Decision-Making in South Africa

2.1 Introduction

Women's decision-making empowerment is a central theme in development studies discussions. Women's decision-making empowerment is the ability to make choices or decisions within the household independently of their partners (Dasgupta & Goldar, 2006; Anderson & Eswaran, 2009; Self, 2015). The literature has established that women's decision-making empowerment can be influenced by cultural beliefs, race and religion (Basu, 2006; Lutz, 2010). For instance, African cultural beliefs favouring patriarchy (Makama, 2013; Adisa et al., 2019) could limit women's decision-making empowerment. Within the scope of women's decision-making empowerment, there exists substantial empirical evidence that relates it to other factors such as educational attainment (Blanden & Gregg, 2004; Lindahl, 2011), labour market participation (Ntuli, 2007) and health (Bloom et al., 2009; Mumtaz & Salway, 2009; Aguero & Mark, 2011; Cornish et al., 2021). Furthermore, inadequate income and gender inequality within the household (Amate-Fortes et al., 2021) are major concerns because asymmetric power relations may lead to a lack of decision-making ability, especially for women. In other words, income inequality is a crucial indicator of relations asymmetric power within the household (Arber, 1999; Albertini, 2008). The existing studies (see: Bhorat and Goga, 2013; Cabeza-García et al., 2018) have revealed that women lack decision-making empowerment within the household due to disparity in labour market opportunity and earnings, where women earn less than men.

It is noteworthy in the literature that South Africa is one of the unequal economies in the world (Keeton, 2014; Govender, 2016). For instance, Statistics SA (2019) reported that South African females earned about 27% less than males in 2018. Also, when we compare income on a gender basis, females are poorer than their male counterparts. For example, the proportion of females that are poor (38.1 in 2011 and 41.7 in 2015) is higher than the average of the entire country's population (36.4 in 2011 and 40 in 2015) (see Stat. SA 2017). Studies have suggested that income inequality may affect women's decision-making and inclusive growth (Rodgers & Zveglic, 2014; Cabeza-García et al., 2018). Notwithstanding this, studies have suggested that income in the hands of women is more likely to affect household welfare (Posel, 2001; Duflo, 2000; Afridi, 2012)

positively than in the hands of men, and it is hypothesized. This is aside from the fact that households where females are heads might be larger than households headed by males in South Africa (Posel, 2001; Dungumaro, 2008; Posel & Rogan, 2009). However, a recent study has revealed that social intervention (income in women's hands) increases the empowerment of women themselves, but not the household welfare or children's health (Ambler et al., 2021).

Understanding the causes and consequences of inequality within the household is essential. One of the consequences of gender inequality may be a persistent inferiority complex and a reduction in the potential to contribute to household decisions. The reality is that women are voiceless (Ifechelobi, 2014) and unable to make personal decisions in the household. Notwithstanding, gender inequality does not stop within households. As mentioned earlier, it also happens as discrimination against women (Mohapatra, 2012) in the labour market. It is equally unsurprising that gender inequality is not allotted to the age cohort. It occurs in all ages, cultures, and religious beliefs (Wood, 2019). Moreover, a strand of the literature has revealed that gender inequality may negatively affect women even at age 60 (Bennett & Zaida, 2016).

While in development studies, it may be naïve to underestimate the economic production capacity of women, both young and elderly development economics. As younger women could be mothers and participate in labour or economic activities, older women could also be caregivers and earn income from labour or non-labour activities. However, women are vulnerable to a socio-economic imbalance in society; the elderly are more vulnerable than the younger (Andrew et al., 2008; Bennett & Zaidi, 2016). The greater vulnerability of females to lack of income (Cohen & Reid, 1999; Andrew et al., 2008) makes the focus of this study more important from a policy perspective. Government policies (in the form of generous social grants) have mainly focused on reducing poverty and inequality (Neves et al., 2009; Surender et al., 2010). However, there is a paucity of studies on the effect of non-labour income (or exogenous shock) on the household dynamics in the South Africa case.

Despite the importance of understanding why women lack decision-making empowerment and the pursuit of gender equality by policymakers, still, there has been a paucity of studies on the heterogeneous effect of OAP transfer across the distribution of women's decision-making empowerment in South Africa. Interestingly, the South African government has designed the Old Age Pension (OAP) transfer, a non-contributory income, to improve the living conditions of the underprivileged elderly in society (Duflo, 2000; Tondini et al., 2017). The main requirements to

be an eligible beneficiary of OAP are age and a means test³. Ambler (2016) suggested that a means test might not be mandatory for most South African blacks; however, the age of eligibility is compulsory. Initially, women were eligible at age 60 and men at 65. However, in 2008, South Africa passed a law equalizing the eligibility age for men and women, which led to setting this uniform threshold to 60 years in 2010 (Standish-White & Finn, 2015).

Ambler (2016) notes that OAP transfer has positively influenced household decision-making. There is an increase in women's decision-making more than that of men, which explains the improvement in household-level effects similar to Ambler's 2016 finding. This current study follows the same school of thought; hence, the study-identified women with a male living within their household support the literature that a male within the household tends to influence the household decisions (Yusof & Duasa, 2010). Ambler argued that the administration of the South African national income dynamic survey (NIDS) dataset is well coordinated and less likely to report the wrong age for eligible OAP recipients. Notwithstanding this, the current study performs at least a manipulation test, which is one of the essential validation tests in the empirical application of regression discontinuity design.

This current study is unique because the study investigates the heterogeneous effect of OAP across the distribution of household decision-making empowerment in the South African case using a quantile treatment effect. The results show that OAP income does not significantly affect household decision-making in the lower part of the decision-making distribution. The study suggests a policy recommendation that could support women's economic empowerment in the study's concluding remarks. The rest of this paper is organized as follows. Section 2.2 presents a literature review. Section 2.3 consists of methods and data, followed by the results and interpretation in Section 2.4. Section 2.5 discusses the findings, and Section 2.6 concludes the study.

³ The requirement for a means test is as follows: an individual household must not earn more than R172560 for married persons or R86280 for a single person to be a beneficiary. In addition, the assets must not be worth more than R455200 for a married couple or R1227600 for a single person. Since, a means test is compulsory for administrative purposes, the question is that can individual be into treatment without it. Further, OAP may increase for the beneficiaries from R1860 at age 60. For age 75 and above, beneficiary will receive R1880. For more detailed information see: South African Government (2019) Old age pension retrieved from the website: <https://www.gov.za/services/social-benefits-retirement-and-old-age/old-age-pension>

2.2 Literature review

The review of the literature focuses on both the theoretical and empirical studies of women's decision-making empowerment. The theoretical literature on household decision-making has its bedrock in intra-household bargaining power (Becker, 1981; Guvuriro & Booysen, 2021). Household decision-making could hinge on two models, the unitary model (about a single decision-maker) (Antman, 2014) and the collective model (bargaining model) (Fortin & Lacroix, 1997; Mattila-Wiro, 1999). Becker's (1981) unitary theory argues that household decision-making relies on the discretion of the leader, which may be to the detriment of other household members⁴. The collective bargaining model takes into account the preferences of individual members of the household when they make decisions (Chiappori, 1997). Guvuriro and Booysen (2021) study the intra-household model from the standpoint of four theoretical approaches, namely the unitary model⁵, the collective bargaining model⁶, the cooperative bargaining model⁷ and the non-cooperative bargaining model. In other words, the cooperative bargaining model describes the coming together of individuals to form a household where each member has a mutually exclusive benefit (Lundberg and Polla, 1994). Based on the collective bargaining household model, the study examines equity and efficiency in allocating resources (Manser & Brown, 1979). Thoughtfully, the decision-making is likely influenced by a change in the bargaining power (that is, income) (Ambler, 2016). The study uses household information where females and males live together in the same household.

Some empirical studies in South Africa have investigated the impact of income transfer on child health and nutrition (Duflo, 2000); child's education outcome (Standish-White & Finn, 2015); wellbeing (Lloyd-Sherlock et al., 2012; Schatz et al., 2012; Etinzock & Kollamparambil, 2019); health status (Case and Jensen 2007; Gordon & Miller, 2012); labour supply (Ranchhod, 2006; Posel et al., 2006); and quality of life (Ralston et al., 2019). Also, Hamoudi and Thomas (2014) study the impact of OAP on household economic decision-making. Their study used a dataset from the Demographic and Health Survey (DHS) 1998 and controlled for endogeneity using an

⁴ Bergmann (1995) and Pollak (2002) view Becker's theory as having unrealistic conclusions in his paper titled "Becker's Theory of the Family: Preposterous Conclusions," and other feminist economists come to a similar conclusion.

⁵ For more detail see Becker (1981)

⁶ For detail see Chiappori (1992)

⁷ See McElroy and Horney (1990) for more detail

instrumental variable (i.e. the presence of a family member that is age-eligible to receive OAP) that can determine pension recipient. The study revealed that OAP place adult in the extended family differently depending on education level and height. Their study revealed that pension recipients could provide for their needs and accommodate their extended family, who are likely to be uneducated and shorter in height. The co-resident is common in South African society, similar to the pronounced traditional African culture. Existing studies have improved our understanding of the importance of OAP transfer. However, there is a paucity of studies on the causal effect of OAP on the distribution of household decision-making in the South Africa case.

Empirically, there is no generally accepted position on the effect of non-labour market income or cash transfer on women's decision-making. Adato et al. (2000) examine the impact of PROGRESA (cash transfer) on women's decision-making in Mexico, focusing on the married household. Using a multinomial logit estimator, the study finds that a cash transfer has an insignificant effect on women's autonomy in poor households. Nonetheless, the PROGRESA improves women's decision-making on child clothing and schooling. The study also argued that education might increase women's autonomy. Hagen-Zanker et al.'s (2016) study on developing countries revealed that a cash transfer increases women's empowerment.

Another study in Mexico by Handa et al. (2009) evaluated the effect of Progresa transfer, and household earned income on women's autonomy. The study employed wave 1 (ENCEL 98M) and wave 3 (ENCEL 99M) dataset and a fixed-effects estimator to remove unobserved characteristics that may affect income and spending decision that is fixed over time. The study found that Progresa transfer significantly improves women's autonomy, i.e. ability to spend their extra cash. Whilst income reduces women's decision-making. Women's labour participation was exceptionally low. Hence, men's labour participation increased the household income. Most household income is in the control of men, which may reduce women's contribution to household decision-making. Remarkably, there is an increase in household spending due to the income effect and not because of the Progresa transfer. Hence, this current study includes household income because the OAP transfer may not be the only source of household income, and possible control by males may affect women's decision-making.

Furthermore, cash transfer in Kenya significantly influences women's decision-making in the main household budget (Merttens et al., 2013). Similarly, Molyneux (2006) found that government

social grants (called Oportunidades) influence the household's welfare but give women little empowerment in the case of Mexico. The study points to the fact that the condition for receiving the cash transfer does not favour women's labour market participation; somewhat, it limits their freedom to participate in a paid job. Similarly, with a focus on decision-making, the study by Peterson et al. (2009) investigates the impact of cash transfer on female autonomy using a logistic regression model. The findings show that a social grant has increased women's autonomy. While the decision to use contraceptives has increased among women with a low level of autonomy, the decision decreased or reduced the use of contraceptives for women with a higher autonomy.

Conversely, Hidrobo et al. (2012) examine the impact of World Food Programmes (WFP) – food, cash and voucher transfer - on women's autonomy in Ecuador. The study finds that cash transfer has an insignificant effect on women's autonomy. One of the plausible reasons for the insignificant effect of the intervention might be physical and sexual violence against women. In addition, Green et al. (2015) investigated the effect of a cash transfer programme, Women's Income Generating Support (WINGS), designed to alleviate poverty and promote small enterprises on women's autonomy in the case of Uganda. Although the study found a small improvement in women's autonomy, rampant abuse against women might be one of the limitations of the programme's effect. Finally, Alcázar et al. (2016) reveal that in Peru, conditional cash transfer called 'Juntos' has a positive effect on women's economic decision-making within the household. The study employed a social science mixed-method approach. Despite the positive findings of the studies mentioned above, the study by Alcázar et al. (2016) revealed that cash transfers increased women's alcohol consumption to the extent that they are often intoxicated, which contributed negatively to women's empowerment.

Knowing African culture for what it is, she believes in patriarchy, which often reduces the decision-making ability of females. To mitigate this effect, it is interesting to investigate the impact of income in the hand of females on decision-making. This current study adds to the existing literature and improves the understanding of the effect of OAP transfer on household decision-making in the following ways:

1. Investigating the impact of OAP transfer on household decision-making using a current survey dataset is essential.

2. To know whether women's decision-making power is higher than that of men in the household, the study uses the information from households where females and older males are both present in the household.
3. The unknown question is that does income shocks such as OAP transfer have a uniform or varied effect on the distribution of household decision-making in South Africa.

2.3 Methods and Data

2.3.1 Data

In essay one, the study uses the dataset sourced from the South Africa National Income Dynamics Survey (NIDS) 2017 (i.e. Wave 5) (Dataset downloadable from <https://www.datafirst.uct.ac.za/dataportal/index.php/catalog/712/download/9901>) in the study of a causal effect of OAP transfer on household decision-making. The NIDS is representative of the population of South Africa. The current study employs key variables from the adult, household-derived, individual-derived, household questionnaire and household roster. The previous related study used NIDS 2008 (i.e. Wave 1) (Ambler, 2016), and to answer a unique question on “where does the effect of OAP lies on the distribution of household decision-making”, the current study uses Wave 5 because the respondent information is updated and tracked over time (SALDRU, 2017).

2.3.2 Identification Strategy

This section focuses on a discussion of two main variables: OAP transfer and household decision-making empowerment. In principle, to evaluate the effect of OAP on women’s decision-making empowerment, attaining the age of eligibility to benefit from the social grant is a vital identification condition. The age of OAP transfer eligibility is 60 years. The identification assumption is that assigning someone to treatment relies on the age of eligibility and otherwise is untreated (i.e. age below the age of eligibility). The conditional independence assumption (CIA) is an important concept here, especially in the study related to the treatment effect. It is assumed that the CIA will hold, which could mean that eligibility to benefit from OAP transfer is independent of outcome (that is, women’s decision-making) depending on the observed covariates. The only thing that separates them is the age of eligibility which is age 60 and, perhaps, a means test. For the

application of RD design, the study identified individual women within the age range of 50 to 80 years, following Ambler (2016) and Edmonds (2006). Ambler's (2016) study considered that age of eligibility is significant in the selection to benefit from OAP transfer since the majority may not meet the means test requirement. Hence, this current study also considers age eligibility and being a recipient as the rules of assignment into treatment. The study identified households where the older males are living with the females. Hence, the study compared those eligible to benefit from the scheme with those without the age of eligibility.

The study considers which made the main or single decision based on the household decision-making definition. There are five decision-related questions (in the adult questionnaire of the NIDS dataset), which include: who decides on day-to-day expenditure, who decides on a large-unusual purchase, who decides on where the children go to school, who decides on who is allowed to live with the household, and who decides on where the household lives. However, the study excluded variables on a decision concerning where children go to school because it was meant for households with children under school age (Ambler, 2016). More so, this study is not about child well-being like that of Duflo (2003); the direct decision about children is not included. The study uses four relevant questions with categorical responses to create an index of decision-making. It was noticed that the inclusion of where the children go to school in the creation of the decision index skewed the index. The plausible reason might be that women with children in the households are likely to score higher than those without a child on the index. The household decision-making index was created using multiple correspondence analysis. The following paragraph discusses multiple correspondence analysis (MCA).

2.3.2 Household decision-making index using Multiple Correspondence Analysis

There are many dimensional reduction techniques; these include principal component analysis (PCA), correspondence analysis (CA), multiple correspondence analysis (MCA), and joint correspondence analysis (JCA), among others. The choice of an appropriate technique depends on the variables' nature, whether continuous or categorical. While PCA is a data restructuring approach for continuous variables (StataCorp, 2007; Greenacre, 2010), and MCA is a multivariate approach for multiple categorical variables (Booyesen et al., 2008; Traissac & Martin-Prevel, 2012). To reduce the dimension of multiple questions for household decision-making, the study

employs multiple correspondence analysis (MCA). Existing studies have created an index of assets. For example, Booysen et al. (2008) used multiple correspondences in the study of assessing trends in poverty for selected Sub-Saharan African Countries.

Figure 2.1 presents the histogram of the household's decision-making index by gender. The index constructed by MCA places the range of values between -1.7 and 0.75; the cumulative distribution of the household's decision index is between -2 and 1. The standard deviation is one (1), and the mean is zero (0). The household decision-making index explains the difference or distribution between the lower and upper levels of primary decision-making. When the decision-making is negative, there is less decision-making power and a lower distribution of decision-making. Conversely, those individuals are at the upper quantile of the decision-making distribution when it is positive.

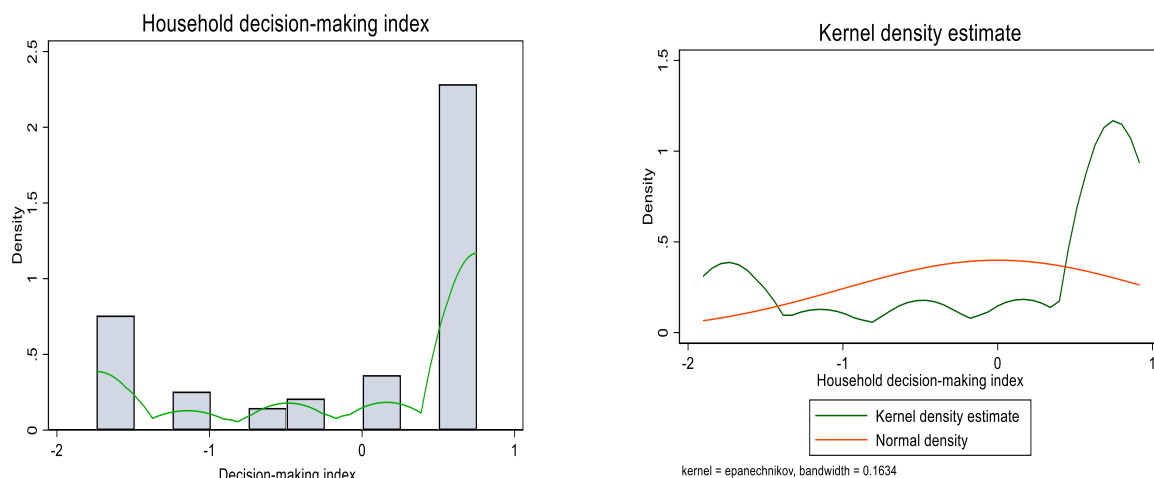


Figure 2.1 Histogram and the kernel density estimate of household's decision-making index computed by the Author

2.3.4 Econometric Strategy

Thistlethwaite and Campbell (1960) postulate the regression discontinuity (RD) design. The study uses a natural experiment to evaluate the effect of OAP on household decision-making using the RD design. The study followed the path of RDD (i.e. sharp), which assumes that assigned to treated and untreated at the cutoff point, the treatment effect relies on a cutoff and continuity in the variables (Calonico et al., 2014). The RD design uses three main components: running variable (age), cutoff point (age of eligibility to be a beneficiary), and treatment.

The RD design describes the average effect of the independent variable on the dependent variable at the threshold. If another household characteristic determines the selection criteria for treated and untreated, the use of RD design would be unacceptable. In comparing the average outcome for those in the treatment, there is a sharp jump at the cutoff point, which shows the treatment effect for those eligible and not eligible for the OAP transfer. The study uses the analysis of alternative covariates and density of the forcing variable or manipulation test to examine the validity of the RD design. One of the reasons for the study to use the RD design is that it is suitable for a cross-sectional dataset. It is imperative to note that investigating the causal effect in observational studies like this may be challenging for several reasons (McLanahan et al., 2013; Cattaneo et al., 2015). These reasons include that a control group is likely to have an economic advantage over the treatment group. The covariates are not likely to balance (or the distributions are different) for treatment and control groups. The point that age of eligibility (60 years and above) is conditional for receiving OAP could mean that the effect may not be uniform for the individual. Also, there is a tendency for a recipient of OAP to receive other social grants, such as a child support grant as a caregiver. In that sense, their income may increase and improve their ability to make personal decisions.

Furthermore, the study investigates how the effects of OAP vary across the distribution of household decision-making using a quantile treatment effect (QTE) by Frandsen et al. (2012). This approach is a procedure for non-parametric estimation of the effect of an endogenous treatment (OAP transfer) on the distribution of the outcome variable, that is, household decision-making (when the outcome is continuously measured)⁸. Also, the study used an unconditional quantile regression model that is based on the concepts of influence function and recentered influence (RIF) (Firpo et al., 2009) when the covariates change. It is essential to note that an unconditional quantile treatment effect (UQTE) does not change when the covariates change. Notwithstanding, the study presents conditional and unconditional quantile treatment effects results. The following paragraph discusses summary statistics of the sample used.

⁸ Interested readers refer to Frandsen et al. (2012) for details on the model.

2.3.5 Summary Statistics

As mentioned earlier, the study uses the dataset from NIDS 2017 (i.e. Wave 5). Whereas, the related study by Ambler (2016) used a dataset from NIDS 2008 (i.e. Wave 1). Some variables are categorical or dummy, such as treatment, OAP recipients, level of education, employment status, health status, life satisfaction, religious affiliation, child support grant, dwelling, relationship with the beneficiaries (head, partner and others), and decision-making variables are dummy before the creation of decision-making index. Other variables such as age, household size, and the logarithm of household income are continuously measured.

Table 2.1 Descriptive Statistics for key variables

Variable	Obs	Mean	Std.Dev.	Min	Max
Decision on daily household expenditures	5072	0.678	0.467	0	1
Decision on large unusual purchases	5072	0.696	0.46	0	1
Decision on where household should live	5072	0.711	0.453	0	1
Who is allowed to live in a household	5072	0.704	0.457	0	1
Household decision-making index	5072	0	1	-1.74	.753
Treatment (Old Age Pension recipient)	5072	0.474	0.499	0	1
Age	5072	60.711	8.044	50	80
Gender (Female =1, male =0)	5072	0.658	0.474	0	1
Household size	5072	4.924	3.168	1	30
Education attainment					
No schooling	5072	0.224	0.417	0	1
Primary	5072	0.267	0.442	0	1
Primary but below matric	5072	0.350	0.477	0	1
Matric	5072	0.050	0.218	0	1
Post matric	5072	0.082	0.274	0	1
University	5072	0.024	0.152	0	1
Vocational certificate	5072	0.001	0.031	0	1
Others diploma	5072	0.003	0.052	0	1
Log of Household monthly income	5072	8.696	0.916	4.605	13.173
Employment status (1 is yes, otherwise 0)	5072	0.316	0.465	0	1
Life satisfaction	5072	0.482	0.5	0	1
Health status	5072	0.734	0.442	0	1
African	5072	0.764	0.425	0	1
Coloured	5072	0.147	0.355	0	1
Indian	5072	0.024	0.154	0	1
White	5072	0.064	0.246	0	1
Dwelling	5072	0.823	0.382	0	1
Child Support Grant	5072	0.187	0.39	0	1
Religion					

No religion	5072	0.071	0.258	0	1
Christianity	5072	0.813	0.390	0	1
Jewish	5072	0.004	0.059	0	1
Muslim	5072	0.006	0.078	0	1
Hindu	5072	0.011	0.106	0	1
Africa traditional	5072	0.089	0.285	0	1
Other religion	5072	0.005	0.073	0	1
Head of the household	5072	0.684	0.465	0	1
Partner	5072	0.203	0.402	0	1
grandparent	5072	0.045	0.207	0	1
Other relatives	5072	0.052	0.221	0	1

Table 2.1 presents a summary statistics of a sample consisting of about 5072 observations. About 65.8% are females, and 34.2% are males. The summary statistics, about 47.4% are recipients of OAP in the sample. This implies that the relative average of the observations is the untreated group for each gender in the sample. The sample shows that the household decision-making percentage includes 67.8% of day-to-day purchases, 69.6% of the larger unusual purchases, 71.1% of where the household lives, and 70.4% of who can live in the household. Approximately 76.4% of the African racial population group are present in the sample, followed by Coloured, 14.7%, Indian with 2.4% and White with 6.4%. Although black or African groups were previously marginalized before the OAP scheme was designed to reduce income inequality, they remain the largest population group (Soudien, 2004; Hendriks & Erasmus, 2005) in South Africa. The sample observations in this current study are more or higher than that of the Ambler (2016) study.

Furthermore, the sample shows the percentage of the level of educational attainment. While 26.7% had primary, 35% attained primary school, but below matric, 5% had matric, 8.2% got post-matric, 2.4% had a university degree, the vocational certificate had 0.1%, and 0.3% had other diplomas. Only males have a vocational certificate in the study sample. A plausible reason might be the age cohort (elderly) that is the focus of the study. Approximately 22.4% do not have any form of schooling. Education level is likely to influence an individual's ability (or instinct) to make personal decisions without the influence of a partner.

In addition, about 18.7% of the sample receive the child support grant (CSG). Hence, CSG is not likely to influence the outcome. Given the South African labour market, approximately 31.6%

participate in the labour market in the sample. More so, about 82.3% are living in a structured dwelling place. The household members' relationships with the resident head were assembled into four groups. The proportion of relations consists of heads 68.4%, partners 20.3%, grandparents 4.5%, and other relations 5.2%.

2.4 Results and Interpretations

2.4.1 Regression Discontinuity Design

The important question that empirical evidence answer here is: does OAP transfer improve household decision-making, especially for women? The first estimation is on the causal effect of OAP transfer on household decision-making using a sharp regression discontinuity (RD) design graphical analysis (see Figure 2.2). Figure 2.2 below shows a discontinuity at the cutoff point of age 60. The untreated group is under 60, and the treated group are those aged 60 and above. The treated group are recipients of OAP transfer, and their decision-making improved. By looking at the graph, there is a jump up at the cutoff point, and the effect of the OAP transfer influences the women's decision-making (wide gap at the cutoff) more than that of men (small gap at the cutoff) in the household. The finding is compatible with Ambler's (2016) study, where she revealed that an exogenous income improves household decision-making and, for men, less than that of women.

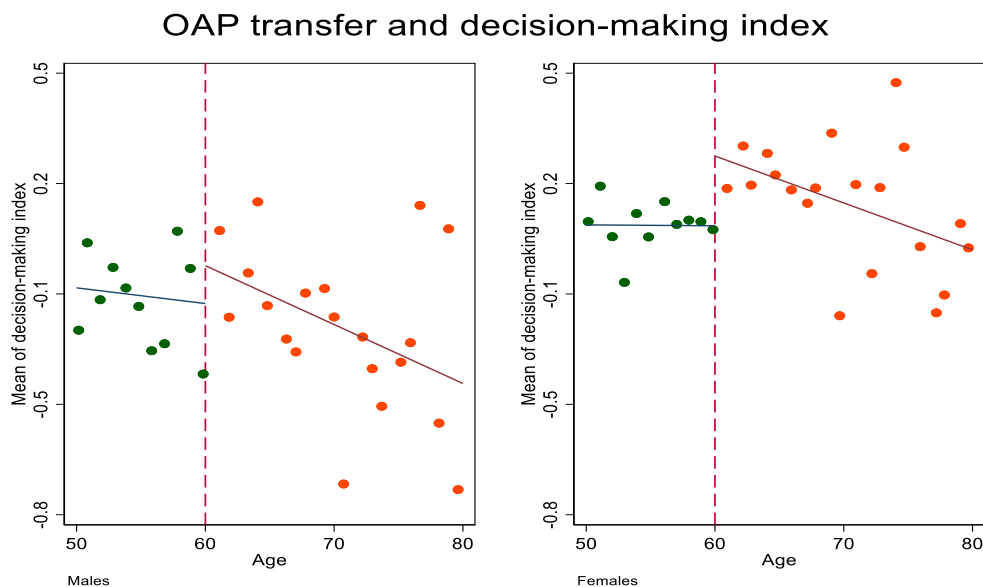


Figure 2.2 RD Plot: The Effect of OAP transfer on Household's Primary Decision-making

The study computes an RD point estimator by selecting an ad hoc bandwidth (h) =20 following Cattaneo et al. (2018). With this choice of bandwidth (h), the study constructed the local linear RD point estimate with a triangular kernel using nearest-neighbour (NN). The study set the order of polynomials at default in the analysis. The valid inference may have to rely on the specification of all options the yield conventional, bias-corrected and robust point estimator. There is the possibility of a tradeoff between the bandwidth and misspecification bias to the threshold (Cattaneo et al., 2018). Hence, a conventional inference may be a naïve approach because the estimation uses parametric within the neighbourhood close to the threshold and overlooks the bandwidth misspecification error. The robust inference is more valid because it corrected MSE-optimal bandwidth bias, and the shorter average length of the confidence interval is constructed. This current study uses a robust estimate in the interpretation of the result.

The study investigates the consistency of the RD design plot. Table 2.2 confirms the previous result in Figure 2.2. In addition, the results show that the OAP transfer has a significant positive effect on women's decision-making (Table 2.2 column 1). The robust result implies that a change of 0.12 standard deviation in women's decision-making is likely attributed to OAP transfer. In other words, women who are OAP beneficiaries are likely to decide by 12 percentage points more than non-beneficiaries. Whereas the OAP positively influences men's decision-making, it is statistically insignificant.

Table 2.2 Sharp RD Estimate using local polynomial regression

running variable: age	(1)		(2)		
	RD robust	95% Conf. Interv.	RD robust	95% Conf. Interv.	
Outcome variable	Women's decision-making		Men's decision-making		
Conventional	0.104*** (0.0353)	0.035 - 0.174	-0.0453 (0.0518)	-0.147	0.056
Bias-corrected	0.120*** (0.0353)	0.051 - 0.189	0.0212 (0.0518)	-0.080	- 0.123
Robust	0.120* (0.0688)	-0.015 - 0.254	0.0212 (0.0996)	-0.174	- 0.216

Observations	3,338	1,734
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Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

The current study's evidence confirms that unearned income is likely to influence women's primary decision-making in the household (Anderson & Eswaran, 2009).

As previously mentioned, the concern is that when using RD design in a study like this, it is important to investigate whether the eligibility for the OAP transfer is not manipulated. However, a previous study by Ambler (2016) has pointed to the fact that there was no evidence of widespread misrepresentation of eligible and 'no misreport of age on the NIDS survey. For curiosity, the following paragraph presents the required validity and falsification tests.

2.4.1.1 Validation of the RD Design

There is a plausible empirical investigation of the falsehood and validity of the use of the RD design, including the test for alternative covariates and the density of the running variable (manipulation test), as suggested by Cattaneo et al. (2017).

2.4.1.2 RD analysis for alternative covariates

Table 2.3 RD Analysis for Alternative Outcome (Placebo Outcomes)

Panel A Women: Variables	RD robust	P-value	Robust Inference conf. Int.		Eff. Number observations
Life Satisfaction	-0.016	0.659	[-0.086	0.054]	1611
Religion	-0.031	0.771	[-0.195	0.133]	1611
Female householdhead	-0.041	0.440	[-0.146	0.063]	1611
Dwelling	-0.028	0.488	[-0.106	0.051]	1611
Employment status	-0.288	0.000	[-0.388	-0.187]	1611
Panel B Men:					
Life Satisfaction	-0.089	0.074	[-0.187	0.009]	757
Religion	0.177	0.233	[-0.114	0.469]	757
Male household-head	-0.071	0.314	[-0.209	0.067]	757
Dwelling	-0.008	0.899	[-0.128	0.113]	757
Employment status	-0.204	0.005	[-0.348	-0.060]	152

Computed and compiled by the Author

Table 2.3 Panel A presents the local polynomial estimation of the effect of eligibility on the alternative covariates or placebo outcomes for women in the household. The findings show that robust estimators are small, close to zero or negative, and the p-values are insignificant. For instance, treatment (the OAP transfer) is not determined by the dwelling, life satisfaction, head of the household, and religion. The results imply that there is no empirical evidence that treatment has a significant positive effect on the placebo covariates because the beneficiary must have been dwelling in a place before reaching the age of eligibility. However, the running variable (age) significantly negatively affects employment status (that is, labour force participation). Studies have suggested that age influences labour participation (Zhang et al., 2009; Black et al., 2016). Women's labour participation rate may be affected by age or other exogenous variables like children's presence (Euwals et al., 2011) in the household. However, it may be expected that labour participation would decline as the age increases beyond the active working age (Black et al., 2016) and ageing.

Table 2.3 Panel B estimates the effect of eligibility (using running age as a running variable) on the alternative covariates or placebo outcomes for men in the household. The RD estimator reveals that the effect of the running variable on the covariates is negative and/or insignificant. For example, treatment (the OAP transfer) might not improve the dwelling of men because the beneficiary must have been dwelling in a place before reaching the age of eligibility. Also, if a man is not employed, the recipient of the OAP transfer is likely not to be employed. The following paragraph presents the estimation of a manipulation test.

2.4.1.3 RD Manipulation Test (Density of the running variable)

The manipulation test is one of the important tests to investigate falsehood in applying the RD design (Cattaneo et al., 2018). The individuals are assumed to be randomly assigned to treated and untreated groups. Intuitively, the density of the running variable should be continuous, so there is no systematic falsification (McCrary, 2008; Cattaneo et al., 2018). Here, the focus is on the running variable to estimate the RD effect of the OAP transfer on household decision-making. Table 2.4 presents the RD manipulation test using local polynomial density estimation. The most important part of the result is the robust manipulation test, which is -0.29 with a p-value of 0.77 and -1.55 with a p-value of 0.12 for women and men in the households, respectively. Therefore, since the

density of the running variable is not statistically significant at a conventional level, there is no manipulation, meaning there is no systematic manipulation of the running variable.

Table 2.4 RD Manipulation Test using local polynomial density estimation by gender

Running variable: age.				
Women			Men	
Method	T	P> T	T	P> T
Robust	-0.286	0.775	-1.546	0.122

Computed by the Author

Also, Figure 2.3 shows a manipulation test RD plot where the line and curve approach each other but never touch (that is, asymptotic bias) and use the mean square error (MSE) option. Therefore, an improvement in household decision-making is limited to the causal effect of OAP transfer. Therefore, the study empirically established that no one receives the OAP transfer without reaching the age of eligibility, and there is no individual misrepresentation of age or administrative mistake. Given the above, there is no systematic manipulation of the running variable. Hence, the RD design is robust and satisfies a validity test.

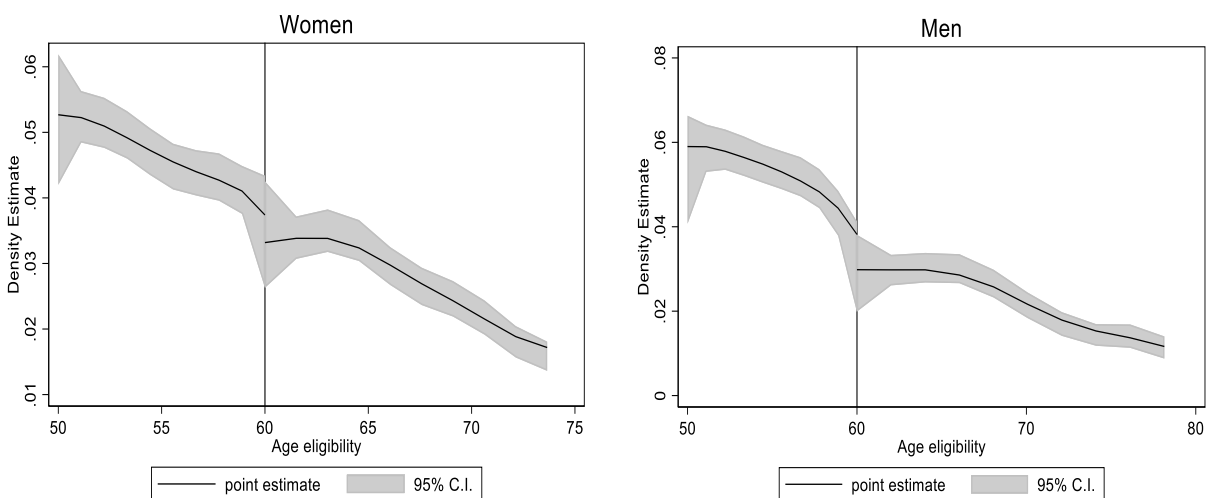


Figure 2.3 Manipulation test Plot Graph for both women and men

Plausible reasons for no manipulation could be because the administration of OAP transfer required verification of the birth certificate of eligible beneficiaries, and misreported age is not likely to be included in the dataset.

2.4.1.4 Robustness check of RDD

For robustness check of the RD design, the study concludes causal inference of OAP transfer on the household decision-making by using linear, quadratic and cubic regression of the assignment variable (Cunningham, 2021). In addition, the model includes weight (post-stratified weight) and robust cluster identification.

Table 2.5 Effect of OAP transfer on women's decision-making using Linear, Quadratic and Cubic regression

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)
Deciosion-making	Linear plus control	Linear without control	Quadratic plus control	Quadratic without control	Cubic plus control	Cubic without control
Treatment	0.185*** (0.0607)	0.185*** (0.0606)	0.136** (0.0689)	0.135** (0.0688)	0.0964 (0.0769)	0.0937 (0.0767)
Age (Linear)	-0.00732* (0.00381)	-0.00765** (0.00380)	0.0517 (0.0393)	0.0514 (0.0393)	-0.443 (0.449)	-0.472 (0.449)
Age (Quadratic)			-0.000447 (0.000297)	-0.000447 (0.000297)	0.00751 (0.00720)	0.00796 (0.00720)
Age (Cubic)					-4.20e-05 (3.80e-05)	-4.44e-05 (3.80e-05)
Health status	0.0358 (0.0381)		0.0344 (0.0382)		0.0336 (0.0382)	
Dwelling	-0.0690 (0.0440)		-0.0698 (0.0440)		-0.0683 (0.0440)	
Weight	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.463** (0.217)	0.453** (0.209)	-1.416 (1.263)	-1.431 (1.263)	8.712 (9.223)	9.278 (9.222)
Observations	3,338	3,338	3,338	3,338	3,338	3,338
R-squared	0.004	0.003	0.005	0.004	0.005	0.004

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table 2.5 presents the effect of OAP transfer on women's decision-making using linear, quadratic and Cubic running variables. First, there is no difference in the estimated result of the effect of

treatment (OAP eligibility) on the women's decision-making with covariates (health status and dwelling) and without covariates for linear and quadratic regression. The estimate shows that the OAP contribution is likely to increase women's decision-making for linear and quadratic. This result is robust compared to the RD design's robust estimate of 12%. However, estimation of OAP on women's decision-making using Cubic of the running variable reduces the results and makes it not statistically significant. This implies that as the age increase (becoming more ageing), the effect of OAP transfer reduces and becomes insignificant to improving women's decision-making. It is noted in the literature that age has a negative relationship with decision-making for the elderly (Ambler, 2016) for women (see Figure A1 in Appendix 1 for graphical presentation)⁹.

Table 2.6 Effect of OAP transfer on men's decision-making

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)
Decision-making	Linear plus control	Linear without control	Quadratic plus control	Quadratic without control	Cubic plus control	Cubic without control
Treatment	0.0521 (0.0921)	0.0609 (0.0920)	0.0244 (0.1000)	0.0313 (0.0997)	0.0943 (0.117)	0.102 (0.117)
Age (Linear)	-0.00663 (0.00597)	-0.00787 (0.00595)	0.0338 (0.0577)	0.0353 (0.0577)	0.830 (0.724)	0.844 (0.725)
Age (Quadratic)			-0.000310 (0.000441)	-0.000331 (0.000441)	-0.0132 (0.0117)	-0.0134 (0.0117)
Age (Cubic)					6.81e-05 (6.17e-05)	6.92e-05 (6.17e-05)
Health status	0.110* (0.0590)		0.110* (0.0590)		0.110* (0.0589)	
Dwelling	-0.105* (0.0638)		-0.105 (0.0639)		-0.104 (0.0638)	
Weight	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.105 (0.344)	0.173 (0.328)	-1.174 (1.851)	-1.192 (1.845)	-17.40 (14.84)	-17.67 (14.85)
Observations	1,734	1,734	1,734	1,734	1,734	1,734
R-squared	0.020	0.017	0.020	0.017	0.021	0.018

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

⁹ For women, the study plots a two-way line graph of the predicted outcome variable and the running variable.

Table 2.6 presents the effect of OAP transfer on decision-making for men using linear, quadratic and cubic running variables (columns 1 to 6). The result reveals that OAP positively affects men's decision-making, but it is not statistically significant. The estimated results (2.4% to 10.2%) are robust compared to that RD robust estimate (2.1%) in all the analyses for with and without covariates. Similar to the women's results, there is no difference in the estimated effect of treatment (OAP eligibility) on men's decision-making when the covariates (health status and dwelling) were included and not included. However, there is a small variation in the results of the OAP on the men's decision-making (see the columns in Table 2.6). Using cubic of the running variable increase, the degree of the estimation increase, but it is not statistically significant. It implies that as the age increases (becoming more ageing), the effect of OAP transfer is likely to increase men's decision-making. Furthermore, that age positively correlates with older men's decision-making (see Figure A2 in Appendix 1 for graphical presentation)¹⁰. The empirical result supports the evidence in the literature concerning the African cultural belief that patriarchs (older men in the household) are decision makers.

2.4.2 Quantile Regression

In this section, the study explores the heterogeneous effect of OAP transfer across the distribution of household decision-making using quantile regression (Angrist and Pischke 2009) and quantile¹¹ treatment effect. The current study use quantile regression (Angrist and Pischke 2009) in an attempt to answer the question of where the effect of OAP transfer lies on the distribution of decision-making and included covariates such as household size, education, religion and dwelling in the analysis. The study presents tabulate quantile regression (bootstrapped) results for women's decision-making empowerment (Table 2.7, columns 1 to 5).

¹⁰ For men, the study plots a two-way scatter graph of the predicted outcome variable and the running variable

¹¹ Quantile treatment effect (QTE) is a unique tool to estimate the dependent variable with connecting nature where the independent variable includes treatment and control (Angrist and Pischke 2009).

Table 2.7 Quantile Regression for women's decision-making empowerment

Variables	(1) 0.10 Quantile Women decision- making	(2) 0.25 Quantile Women decision- making	(3) 0.50 Quantile Women decision- making	(4) 0.75 Quantile Women decision- making	(5) 0.90 Quantile Women decision- making	(6) OLS robust SE Women decision- making
Treatment	0.000 (0.040)	0.546*** (0.090)	-0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	0.232*** (0.038)
Household size	-0.000 (0.011)	-0.082*** (0.014)	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	-0.027*** (0.006)
Health status	0.000 (0.037)	0.191* (0.105)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	0.052 (0.037)
Primary	0.000 (0.043)	0.030 (0.131)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.059 (0.045)
Primary b4 matric	-0.000 (0.042)	0.046 (0.108)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	0.080* (0.046)
Matric	0.000 (0.150)	0.366*** (0.137)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	0.214** (0.089)
Post-matric	0.000 (0.207)	0.503*** (0.154)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	0.318*** (0.078)
University	0.556** (0.280)	1.169*** (0.144)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	0.671*** (0.118)
Other diplomas	1.196** (0.481)	0.961*** (0.309)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	0.629*** (0.150)
African	0.000 (0.151)	0.743*** (0.182)	0.643 (0.403)	0.000 (0.000)	-0.000 (0.000)	0.364*** (0.092)
Coloured	0.000 (0.135)	0.329** (0.155)	0.643 (0.403)	0.000 (0.000)	0.000 (0.000)	0.213** (0.099)
Indian	0.000 (0.601)	0.219 (0.404)	0.643 (0.448)	0.000 (0.000)	0.000 (0.000)	0.240 (0.189)
Christianity	-0.000 (0.067)	0.063 (0.145)	0.000 (0.124)	-0.000 (0.000)	-0.000 (0.000)	0.048 (0.076)
Jewish	0.640 (0.429)	0.039 (0.557)	0.000 (0.434)	-0.000 (0.000)	-0.000 (0.000)	0.111 (0.205)
Muslim	0.000 (0.678)	0.773 (0.614)	0.000 (0.395)	-0.000 (0.000)	-0.000 (0.000)	0.159 (0.231)
Hindu	0.000 (0.602)	0.065 (0.563)	-1.297*** (0.462)	-0.000 (0.267)	-0.000 (0.000)	-0.285 (0.246)
Africa tradition	-0.000 (0.053)	-0.061 (0.212)	0.000 (0.124)	0.000 (0.000)	-0.000 (0.000)	-0.034 (0.096)
Other religion	1.196*** (0.339)	0.052 (0.284)	0.000 (0.362)	0.000 (0.000)	-0.000 (0.000)	0.183 (0.178)
Household income	-0.000	-0.517***	0.000	-0.000	-0.000	-0.269***

	(0.082)	(0.041)	(0.000)	(0.000)	(0.000)	(0.024)
Employment status	0.000	0.543***	-0.000	-0.000	-0.000	0.320***
	(0.203)	(0.070)	(0.000)	(0.000)	(0.000)	(0.041)
Dwelling	0.000	0.043	0.000	0.000	0.000	0.030
	(0.038)	(0.128)	(0.000)	(0.000)	(0.000)	(0.043)
Constant	-1.740***	3.052***	0.110	0.753***	0.753***	1.845***
	(0.661)	(0.424)	(0.411)	(0.000)	(0.000)	(0.238)
Observations	3,338	3,338	3,338	3,338	3,338	3,338
R-squared						0.106

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1; The estimate excludes weight because the inclusion of weight (post stratified weight) does not change the results or make the results to be more robust.

Table 2.7 analyses the effect of OAP transfer across the distribution of women's decision-making. In column (1), the 0.10 quartile shows that OAP does not affect women's decision-making. Column (2) shows that the OAP transfer has a significant positive effect on the women's decision-making at 0.25 quartile. It implies that the OAP transfer improves women's decision-making at 0.25 quartile. Column (3) to (5) presents the analysis of the impact of OAP transfer on women's decision-making distribution at 0.50 to 0.90 quantiles. The OAP does not affect the women's decision-making distributions of 0.50 to 0.90 quantiles. Column (6) shows that OAP transfer has a significant positive association with the women's decision-making using OLS with robust standard error.

Table 2.8 Quantile Regression for men's decision-making empowerment

Variables	(1) 0.10 Quantile men decision- making	(2) 0.25 Quantile men decision- making	(3) 0.50 Quantile men decision- making	(4) 0.75 Quantile men decision- making	(5) 0.90 Quantile men decision- making	(6) OLS robust SE men decision- making
Treatment	0.000 (0.000)	0.345*** (0.073)	0.095 (0.074)	-0.000 (0.000)	-0.000 (0.000)	0.162*** (0.058)
Household size	0.000 (0.000)	-0.101*** (0.019)	-0.104*** (0.014)	-0.000 (0.000)	-0.000 (0.000)	-0.060*** (0.009)
Health status	0.000 (0.000)	-0.009 (0.123)	0.053 (0.098)	0.000 (0.000)	-0.000 (0.000)	0.075 (0.058)

Primary	0.000 (0.000)	0.097 (0.180)	0.135* (0.080)	-0.000 (0.000)	0.000 (0.000)	0.070 (0.074)
Primary before matric	0.000 (0.000)	0.109 (0.156)	0.159* (0.086)	-0.000 (0.000)	0.000 (0.000)	0.104 (0.071)
Matric	0.000 (0.144)	0.497* (0.261)	0.272* (0.152)	-0.000 (0.000)	0.000 (0.000)	0.330*** (0.120)
Post-matric	0.000 (0.000)	0.342 (0.288)	0.254** (0.129)	-0.000 (0.000)	0.000 (0.000)	0.215** (0.103)
University	0.000 (0.277)	0.839** (0.381)	0.302* (0.167)	-0.000 (0.000)	0.000 (0.000)	0.336** (0.167)
Vocational certificate	1.283** (0.569)	1.163** (0.464)	0.368 (0.285)	-0.000 (0.000)	0.000 (0.270)	0.794*** (0.297)
Other diplomas	0.643 (0.687)	0.881 (0.665)	0.397 (0.535)	-0.000 (0.531)	0.000 (0.000)	0.535 (0.353)
African	0.000 (0.000)	-0.121 (0.283)	-0.110 (0.098)	-0.000 (0.000)	0.000 (0.000)	-0.068 (0.099)
Coloured	0.000 (0.000)	-0.538* (0.300)	-0.344** (0.173)	-0.000 (0.000)	0.000 (0.000)	-0.277** (0.110)
Indian	-0.000 (0.000)	-1.223*** (0.358)	-1.203 (0.884)	-0.000 (0.462)	-0.000 (0.000)	-0.675** (0.273)
Christianity	0.000 (0.000)	0.238 (0.178)	0.087 (0.074)	0.000 (0.000)	0.000 (0.000)	0.086 (0.076)
Jewish	0.000 (0.316)	-0.079 (0.568)	-0.663 (0.555)	0.000 (0.661)	0.000 (0.171)	-0.182 (0.359)
Muslim	0.000 (0.000)	0.314 (0.264)	-0.192 (0.736)	-1.196* (0.693)	0.000 (0.402)	-0.142 (0.322)
Hindu	0.000 (0.144)	1.275** (0.560)	0.590 (0.917)	0.000 (0.528)	0.000 (0.000)	0.486 (0.327)
Africa tradition	0.000 (0.000)	0.302 (0.284)	0.087 (0.097)	0.000 (0.000)	0.000 (0.000)	0.096 (0.100)
Other religion	-0.000 (0.436)	0.712 (0.497)	-0.246 (0.494)	-0.556 (0.373)	0.000 (0.228)	0.019 (0.240)
Household income	-0.000 (0.000)	-0.238*** (0.079)	-0.101* (0.058)	-0.000 (0.000)	-0.000 (0.000)	-0.121*** (0.035)
Employment status	0.000 (0.000)	0.671*** (0.120)	0.208*** (0.077)	-0.000 (0.000)	0.000 (0.000)	0.297*** (0.060)
Dwelling	0.000 (0.000)	-0.240 (0.221)	-0.050 (0.056)	0.000 (0.000)	-0.000 (0.000)	-0.080 (0.066)
Constant	-1.740*** (0.000)	1.234* (0.708)	1.332*** (0.421)	0.753*** (0.000)	0.753*** (0.000)	0.904*** (0.312)
Observations	1,734	1,734	1,734	1,734	1,734	1,734
R-squared						0.090

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1; The table report estimate excludes weight in the cross-sectional analysis because the inclusion of weight (post stratified weight) does not change the results or make the results to be more robust.

Table 2.8 presents the analysis of the effect of OAP transfer on the distribution of men's decision-making using quantile regression in columns (1) to (5). The results show that OAP has a significant positive men's decision-making at 0.25 quantile, insignificant at 0.10, 0.50, 0.75 and 0.90. In column (6), there is a significant positive association between OAP transfer and men's decision-making using OLS.

2.4.3 Quantile Treatment Effect

The study uses a quantile¹² treatment effect (QTE) to affirm the results of the tabulated quantile regression. Powell (2020) noted in the literature that the QTE describes the effect of policy on the distribution of outcome variables. Therefore, the quantile treatment effect is more suitable when the study investigates the effect of treatment (policy) on the outcome.

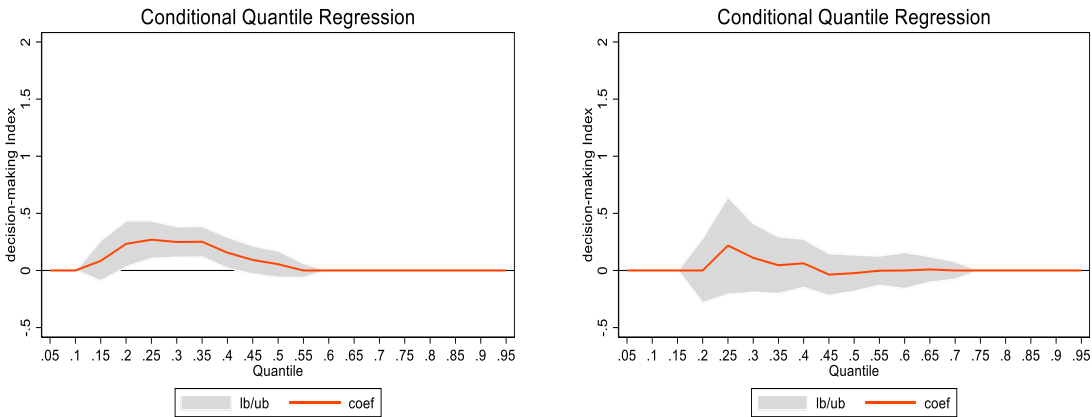


Figure 2.4 Conditional Quantile Regression for women (left) and men (right)

Figure 2.4 indicates that OAP transfer does not affect those at the lower tail of decision-making and those along the upper quantiles for women and men using a conditional quantile treatment effect. While the OAP affects women's decision-making for those between 0.20 and 0.40 quantiles. Logically, those in the upper quantile may be in the labour market and have extra

¹² Quantile treatment effect (QTE) is a unique tool to estimate the dependent variable with connecting nature, where the independent variable includes treatment and control (Angrist & Pischke, 2009).

income; hence, the OAP transfer may not influence their decision-making empowerment. The effect of OAP transfer on men's decision-making lies between 0.20 and 0.45 quantiles. The OAP transfer does not affect those at the lower and upper quantiles of the decision-making distribution. The result is similar to that of women, but the effect was lesser compared to women. The finding in the current study is unique because there is a paucity of studies investigating exogenous income in the distribution of decision-making in South Africa.

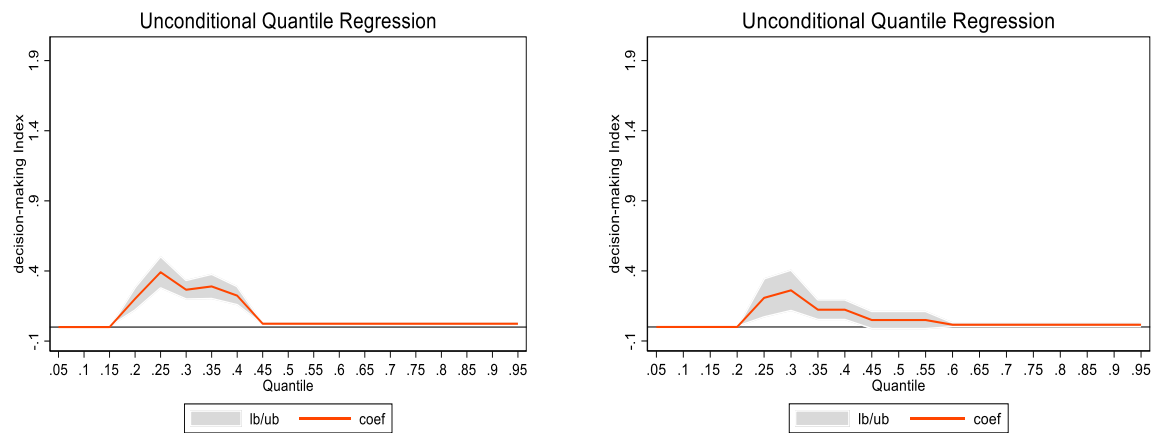


Figure 2.5 Unconditional Quantile Regression for women (left) and men (right)

Figure 2.5 presents an unconditional QTE result for women's decision-making. Again, the result is different from the conditional quantile effect, yet there is no noticeable effect on the decision-making distributions' lower tail and upper part. The effect of the OAP transfer on women's decision-making increases between 0.15 and 0.45 quantiles using the unconditional quantile treatment effect. This explains the significant positive effect the OAP transfer has on the decision-making of women in the first quartile. The OAP income has no effect on women's decision-making less than 0.15 quantile and those above the spectrum of 0.45 quantile. This current finding is likely to interest the policymaker, especially those at the lower tail of the decision-making distribution. The impact of OAP on decision-making for men using the unconditional quantile effect shows that there was a notable improvement in men's decision-making between 0.20 and 0.45 quantiles.

Though the effect of OAP income does not have the same magnitude in men as in women, the distance was much on the distribution of men's decision-making.

2.5 Discussion

The study uses a regression discontinuity (RD) design and a quantile treatment effect. First, the findings show that OAP transfer contributes to the improvement of household dynamics using an RD design. This result is compatible with Ambler's (2016) study, which indicates that an increase in bargaining power through OAP transfer is likely to increase the chance of women making personal decisions better than men do. Plausible reasons for this result may be the absence of men in some households. Unobserved characteristics of women may have suggested improvement in women's decision-making compared to men from the effect of OAP transfer.

Second, using RD design requires validity tests, which show no systematic manipulation in the administration of OAP transfer. This confirms Ambler's (2016) observation that recipients did not manipulate their age to benefit from the OAP. In other words, the manipulation test satisfied the condition of no misrepresentation among OAP recipients. Third, the alternative method presents a robust result to the RD design estimate in the effect of eligibility for OAP transfer on household decision-making (Table 2.5 and 2.6). In addition, the study finds that as women become more aged, the effect of OAP transfer reduces their decision-making. OAP income tends to increase men's decision-making capability as they age.

The use of standard quantile regression in the study of the treatment variable (OAP transfer) effect on household dynamics indicated a significant positive effect in the first quartile. While using a quantile treatment effect presents a clearer effect of income shocks on household decision-making. The study found that OAP transfer has a heterogeneous effect on the distribution of household decision-making with more focus on women's decision-making through quantile treatment effects (QTE). After a robustness check, the quantile treatment effects with the instrumental variable (QTE-IV) technique provide additional clear insight into the heterogeneous effect of OAP on household dynamics.

The study anticipated that OAP income would have a more significant effect on household decision-making at the lower quantiles than at the upper quantiles since individuals at the high quantiles already have high levels of decision-making. However, it is essential to note that the effect of OAP transfer is not uniform across household dynamics. The study shows that OAP transfer does not influence household decision-making in the lower and upper parts of the distribution. The improvement in household decision-making at the middle quantiles may be influenced by unobserved individual-specific characteristics such as ability and unaccounted income. A plausible reason for the improvement in household decision-making at the middle quantile might be that they participated in the labour market and earned income even if it was low.

Existing studies have pointed to the fact that other household members might influence decision-making in the household (Ketani & Tanga, 2019), especially since the presence of sons may influence women's decision-making (Melesse, 2021). The study anticipates that household composition and extended family lifestyle in South Africa also contribute to household dynamics. The suggestion is likely true for the African extended family living system, and the South African grandmothers who are OAP beneficiaries mostly live with their grandchildren (Duflo, 2003) and family relations. Standish-White and Finn's (2015) study suggests that a pension may have a more positive effect on co-residents welfare (such as grandchildren). South African society enjoys an extended family structure similar to that found in traditional African culture. It is commonly found that grandparents accommodate their grandchildren and other relations (employed and unemployed). Thoughtfully, a change in the household size may change the impact of OAP on household dynamics. When the household size is large, the OAP income may not significantly improve household decision-making. However, the current study suggests that women may use it as a channel for the distribution of social grants.

2.5 Conclusion

The study investigated the heterogeneous effect of OAP transfer on household decision-making. The findings from this study reflect a true picture and concern about South African households with high inequality within and among the household. This finding supports the study of Grogan and Summerfield (2019), which suggests that government subsidies might not improve the total

individual household income. The implication is that income inequality might have affected the household decision-making of those in the distribution's lower part (de Lettenhove, 2012).

A fundamental interest to the policymaker is how inequality can be handled. Policymakers are likely to pay attention to such varying effects of OAP transfer on household dynamics, especially for those at the lower part of which it was expected to have a significant effect. Nevertheless, the truth remains that OAP transfer has a heterogeneous effect on household dynamics. One of the policy implications is that OAP transfer is a good source of income for older men and women, influencing their decision-making. The study suggests that when it comes to social grants, using women as a channel may impact household welfare more than men. Consequently, the involvement of all stakeholders in achieving gender equity is likely to be a complementary effort to actualize this goal.

There are limitations in the study of the effect of OAP transfer on household decision-making in South Africa. First, out of over 30000 observations in the NIDS 2017 data, the data management and identification restriction reduced the data to about 5072 observations. Second, the study cannot track trend analysis of OAP transfer in the household dynamics. It would have been more interesting if the study could use a panel dataset, but cross-sectional data is more suitable for this type of study. Third, it was noticed that the absence of males in some households is likely to give a female chance to decide in those households. Also, the study cannot draw inferences on some potential unobservables because they are not available in the data used, such as gender-based violence and gender norm. In conclusion, further research should target the elderly in another sample and investigate whether government intervention contributes to their emotional well-being by using various indicators. Using other samples could replicate the study by Ambler (2016) and improve on it.

CHAPTER THREE

The Effect of Women's Decision-making on Child Nutritional Outcomes in South Africa

3.1 Introduction

Child malnutrition can be referred to as the effect of not being fed a balanced diet during early childhood, which could result in adverse health outcomes (Smith & Haddad, 2000; Ge & Chang, 2001). Approximately half of the world's children are at risk of malnutrition, and scholars have revealed that child malnutrition remains a challenge in Sub-Saharan African countries (Lartey, 2008; Fanzo, 2012; Adedokun & Yaya, 2021). The existing literature suggests that many African countries are experiencing an increase in the prevalence of childhood stunting and wasting (Adedokun & Yaya, 2021), even though they are still contending with the persistence of child malnutrition. In other words, many children under the age of 5 are susceptible to numerous risks, including malnutrition, poor health, and unhealthy environments that are detrimental to their intellectual, physical, and expressive growth in developing countries (Grantham-McGregor et al., 2007). The existing literature on children's health issues has reported that South Africa is one of the nations affected by the high burden of child malnutrition (Doherty et al., 2006; Madiba et al., 2019). Madiba et al. (2019) study revealed that child birthweight, age, gender and preschool attendance might contribute to undernutrition such as stunting and underweight. In addition, the study suggested that a mother's education may reduce the child's underweight, in the case of the Tshwane district in South Africa.

Existing studies have revealed that the prevalence of children's undernutrition was 29.1% for stunting, 13.7% for underweight and 6.3% for wasting in low and middle-income countries (Ssentongo et al., 2021; Amadu et al., 2021). According to the 2016 South Africa Demographic Health Survey (SADHS), 6% of children under five years were underweight, 13% were overweight, and 27% were stunted (Sandersa et al., 2019; Sartorius et al., 2020). Hence, the current study focuses on the three anthropometric measurements: weight-for-height, weight-for-age and height-for-age. While certain initiatives such as the Roadmap for Nutrition, Scaling Up Nutrition, Early Childhood Development Policy and the 2030 National Development Programme (NDP) have focused on reducing child malnutrition in South Africa (National Development Commission [NPC] 2013). However, the children's malnutrition yet remains a challenge. This may be due to

societal challenges with which the parents are faced, such as unemployment, poor health, a lack of income, and a lack of education (De Onis et al., 1993; Black et al., 2003; Gordon et al., 2003), and reflecting on gender a lack of women's decision-making. Existing studies have revealed that some South Africans live in poverty (Francis & Webster, 2019), inequality, and unemployment (Van der Berg, 2014). Thoughtfully, the living conditions of the mother or caregiver, whether poor or rich, may affect the nutritional outcome of the child under her care. Existing studies have suggested that child nutrition may be influenced by poverty and inequality (Sahn & Younger, 2005; Taghizade Moghaddam et al., 2015). Despite the importance of child nutrition in health policymaking (Zere & McIntyre, 2003), there has been a scarcity of empirical evidence on the effect of women's decision-making on child nutritional outcomes in South Africa.

Women's decision-making refers to the ability of women to make decisions relative to their partner in the household (Anderson & Eswaran, 2009). Evidence in the literature shows that women's decision-making can be identified using different variables as proxies. Some studies have identified women's decision-making with empowerment.¹³ Other scholars have argued that women's property rights (Allendorf, 2007), access to credit (Kabeer, 2005; Pahl, 2008), status (Smith et al., 2003; Urke et al., 2011), and decision-making ability (Chakraborty & De, 2011; Lépine, and Strobl 2013) are forms of empowerment. This current study used various decision-making variables such as day-to-day household expenditure, the decision on large-unusual purchases, where the child goes to school, who is allowed to live, and where the household should live. These variables are available in the NIDS dataset. In the current study, the mechanism through which women's decision-making influence child nutritional outcomes is the decision about mealtime (Pesch et al., 2016) and food consumption (balanced diet) choices. It is noteworthy that an increase in time and income is likely to improve women's decision-making in the household (Swain & Wallentin, 2008). The study hypothesized that the ability to decide on daily food consumption and provide it might influence the child's nutrition.

Further, it is commonly found that women are given few decision-making opportunities in the household because of the African cultural beliefs regarding patriarchy. The consequences of patriarchy may result in an asymmetric power relationship between adult males and females in

¹³ For a further discussion on women's empowerment and the prevalence of stunted and underweight children in the case of rural India, Imai et al. (2014).

South Africa. The asymmetric power relationship could also be due to unequal earnings between men and women (Casale, 2004; Posel & Rogan, 2009). For example, because women earn less than men, they are likely to have less decision-making power, giving men room to dominate the household decision-making. Studies have shown that income is a critical factor in women's empowerment (Batoool & Batoool, 2018; Barnett et al., 2021). Aside from labour income and non-labour income, cash-transfer programmes (such as child support grants) could influence children's nutrition (de Groot et al., 2017) and human capital investment (Duflo, 2003; Agüero et al., 2006). Noted in a strand of the literature that the income transfer (old-age pension) received by a grandmother has a positive influence on the children's nutrition (wasting and stunting), especially on the granddaughters but with little effect on the grandsons (Duflo, 2003).

Existing studies have revealed that women's decision-making is important for child nutrition (Brunson et al., 2009; Dancer and Rammohan, 2009; Chakraborty & De, 2011; Lépine & Strobl, 2013; Arulampalam et al., 2016). Studies have found a positive association between women's empowerment and child nutritional outcomes (Chisadza et al., 2020; Yaya et al., 2020). Rahman et al. (2015) noted in the literature that women's decision-making tends to reduce childhood stunting in the case of Bangladesh. Along the same progression in a recent study, a mother's ability to make her own decision or be in control of income is likely to reduce children's malnutrition (Kamiya et al., 2018). Unfortunately, there is a paucity of studies on a related topic in the South African context.

This study contributes to the existing literature in some ways. At the same time, previous studies have used various economic-related measurements of women empowerment. This current study created an index of women's decision-making using a restructuring tool, multiple correspondence analysis (MCA). More so, the study answers the question of the causal effect of women's decision-making on child nutritional outcomes. A causal effect of unobserved characteristics using a fixed effect panel regression (Brüderl & Ludwig, 2015) and uses the control function approach (CFA) to control for endogeneity. This study contributes to the existing literature by adopting a fixed-effect regression to eliminate time-invariance components to account for unobserved characteristics and clustering issues using standard cluster-robust error. The study controlled for differences across the waves, provinces, and inflation in household income. The study findings that women's decision-making has an unobserved and heterogeneous effect on child nutritional

outcomes. The remainder of this chapter is structured as follows: Section 3.2 is the literature review; Section 3.3 comprises the methodology, which also includes motivation for the outcome variable and restructuring of the vital explanation; Section 3.4 describes the data source and summary; Section 3.5 presents the empirical results, and Section 3.6 presents a discussion of the results and ; Finally, Section 3.7 concludes the study.

3.2 Literature review

It is essential to note that one can explain the empirical literature on women's decision-making from an intra-household decision-making context within the bargaining model (Becker, 1964). The study concisely reviews relevant empirical studies to present the importance of women's decision-making in improving children's nutritional outcomes (Lepine & Strobl, 2013; Carlson et al., 2015). The current study is more empirical than theoretical. Therefore, empirical studies on the effect of women's decision-making on child nutrition are reviewed.

An existing study has employed logistic regression in examining the association between maternal autonomy and child stunting (Shroff et al., 2009). The study suggested that maternal autonomy to visit the market anytime she wants and have chances to interact and exchange information with other people. Invariably, she is likely to have access to information that could benefit the child's wellbeing. When women's autonomy to visit the marketplace is reduced, the opportunity to interact with others aside from immediate family members is denied, and this may reduce access to vital information that could enhance children's development. Also, a study in India attempted to answer whether women's decision-making promoted better child nutrition (Arulampalam et al., 2016). The authors adopted a logit model and found that women with greater autonomy could contribute to the child's height-for-age within the first two years. Family characteristics are an essential determinant of maternal autonomy. The study found that women with greater autonomy experienced delayed marriages and pregnancies and had fewer children, with the children's birth well spaced. These contribute to better child nutritional outcomes.

In addition, Dancer and Rammohan (2009) argued that maternal autonomy is inadequate for improving child nutrition. Instead, they found that household wealth positively influenced child nutrition in rural Nepal. Furthermore, maternal autonomy produced a different result based on a child's gender. Using the ordinary least squares (OLS) method, women's autonomy in their daily

household purchases improved the child weight-for-age for boys but showed no effect on the girls. Another study examined the impact of women's autonomy on child nutrition (Brunson et al., 2009). The study revealed that women's autonomy did not affect child nutrition for children below three years old. The reason was that most children under three years of age would receive breast milk directly from their mothers. This implies that if a child lives on breast milk alone, he/she is likely to benefit less from the mother's ability to provide additional food and any family economic changes. Hence, there is no general acceptance concerning the influence of women's decision-making on child nutrition. Existing studies on this topic have primarily used cross-sectional data, but there is a scarcity of studies related to South Africa. At the same time, some studies found mixed and inconclusive results about women's empowerment and child nutrition (Cunningham et al., 2015; Santoso et al., 2019). Kamiya et al. (2018) found in a cross-sectional study that there is a significant reduction in child malnutrition when the mother could decide on health or control of economic resources in the case of semi-urban communities in Lao PDR located in northeast-central mainland Southeast Asia. The study employs a logistics regression. The study suggests that the children are likely not to experience stunting when a mother can make a personal decision on their income.

Similarly, Saaka (2020) investigate the relationship between women's decision-making and child nutrition in the Bawku West District of Ghana. The child's age ranges from 6 to 24 months, creating an index of women's decision-making, and employing a cross-sectional dataset and multivariate regression model. The study argued that women with higher decision-making tend to improve their child's nutritional outcomes better than those with lower decision-making. Essilfie et al. (2020) studied the effect of women empowerment on child nutrition using the Ghana Demographic Health Survey (DHS) 2014 and OLS and quantile regression. The study remark that the mother's educational level may improve the child's nutritional status. Also, household assets (e.g. health insurance and radio) may likely improve the child's nutritional outcome. However, most of the studies have used a cross-sectional dataset (Essilfie et al. (2020; Saaka, 2020), and studies are typically unable to draw a causal inference using a cross-sectional dataset. At the same time, fewer study has used longitudinal monthly dataset (Shoff et al., 2011). A strand of the recent literature has suggested longitudinal or panel studies (Santoso et al., 2019). The current study employs a panel dataset, as earlier mentioned.

Lepine and Strobl (2013) investigated the impact of bargaining power on child nutrition in rural Senegal. The study account for the endogeneity issue. After using relative ethnicity as an instrumental variable to control for endogeneity, the study found that bargaining power significantly positively affected child nutrition. Their study improves one's understanding of possible econometric problems that similar studies may face. One of the challenges that this study addressed was the issue of endogeneity. The thinking behind the endogeneity issue is that women's decision-making correlates with idiosyncratic errors. Another challenge is that women's decision-making may influence that child's nutritional outcomes in the preceding period. Therefore, there is a need to find an exogenous variable that controls for potential unobserved characteristics in women's decision-making empowerment (Imai et al., 2014). The study employs fixed-effects and a control function approach to investigate the causal effect of women's decision-making empowerment on a child's nutritional outcomes. The study addresses potential econometric problems such as clustering and endogeneity issues. The econometric problems were addressed using a cluster-robust covariance matrix estimator and the two-stage least squares method.

3.3 Methodology

3.3.1 Data

This study employed a nationally representative dataset from the National Income Dynamic Survey (NIDS) Wave 4 (2014/15) (Dataset retrieved from <https://www.datafirst.uct.ac.za/dataportal/index.php/catalog/570/get-microdata>) and Wave 5 (2017) (Dataset downloadable from <https://www.datafirst.uct.ac.za/dataportal/index.php/catalog/712/download/9901>). The nutritional outcomes focus on children aged zero to five years. The study uses two waves (4 and 5) to have repeated respondents (children), otherwise, the children's age are likely to be more than five years if we consider more waves. Hence, using panel data for the analysis was motivated by the need to explore the causal effect of women's decision-making on child nutritional outcomes.

3.3.2 Identification strategy

The research question in the study is "what is the causal effect of women's decision-making on child nutritional outcomes?" The study includes the outcome variable child nutritional outcomes

and women's decision-making as the primary independent variable to answer the research of interest. At the same time, nutritional outcomes focus on children aged 0 - 5 years (or ages below six years) (WHO, 2006; Onis et al., 2007). The study selected females between 15 and 44 years in the sample for the analysis. The selection for the minimum age is motivated by the least age in the adult dataset and the active labour age. The maximum age of the mother is 44 years. The literature informed the choice of 44 years because the fertility risk increases as the women's age increases (Cavazos-Rehg et al., 2015; Glick et al., 2021) and the baseline age for maternal fertility (Kovac et al., 2013). Only the women have a birth history; therefore, males are not included in the estimation. Motivation for the child's nutritional outcomes is discussed in the next paragraph.

3.3.2.1 Motivation for the Child Nutritional Outcomes

The child's nutritional outcomes are anthropometrical measurements such as height-for-age z score (stunting), weight-for-age z-score (underweight), and weight-for-height z-score (wasting) using the World Health Organization (WHO) international growth standard (WHO, 2006; Onis et al., 2007; Ardington & Gasealahwe, 2012; Casale, 2016). Weight-for-height measures weight (or body mass) associated with height and indicates acute child malnutrition in the short term. The weight-for-age measures weight (or body mass) to age, reflecting deprivation in a child's nutritional status in the short term (Ardington & Gasealahwe, 2012; Khan et al., 2019). Another child nutrition indicator, height-for-age, is a long-run growth measurement (Casale, 2016). The height-for-age measures height to age, reflecting severe child malnutrition and significant lifelong health consequences. One of the significant effects is that it may affect cognitive development, especially in early childhood development. The height-for-age effects are mostly associated with poor socioeconomic conditions in society (Skoufias, 1998; Zere & McIntyre, 2003). Also, many factors could lead to children being underweight (or low weight for age). These include the children's weight at birth, the parent's education, the mother's health and vulnerability when giving birth (Rayhan & Khan, 2006), and parental income (Ardington & Gasealahwe, 2012), among other factors.

The child nutrition measurement is in alignment with the world health organization (WHO) child early development stage chart. Following Khatab (2010), the study measure child nutritional outcomes indicated by z scores as:

$$C_i = \frac{AI - MAI}{\sigma} \quad (3.1)$$

Where C_i is the individual anthropometric indicator such as height at a certain age, σ is the standard deviation of the reference population, and MAI is the median of a reference population. Each indicator measures different aspects of the child's nutrition status. The higher values of a z-score indicate better child nutritional outcomes. For example, the child's height-for-age z-score is less than -2 standard deviation (SD) as stunting. Likewise, child weight for age z-score and weight-for-height z-score is less than -2 SD as the underweight and wasting, respectively (Ardington, and Case 2009; Frison et al., 2016). As earlier mentioned, the study presents a summary of anthropometric (z-score) measures of children's nutritional outcomes using global measurement (WHO, 2006).

Table 3.1 summarises the number of children allotted in each anthropometric measure (z-score) of child nutritional outcomes by waves in the sample. The observations in Wave 4 are less than that of Wave 5. The weight-for-age has 1737 and 1839 observations, weight-for-height consists of 1578 and 1644 observations, and height-for-age comprises 1707 and 1792 observations in Waves 4 and 5, respectively. While approximately 6.3% are underweight (weight-for-age), 3.3% are wasted (weight-for-height) and 22% are stunted (height-for-age) on the overall sample. The percentage of children who are not malnourished (above -2 SD) is relatively higher. The sample shows an increase in the number of those who are not malnourished from one wave to another, evident in Wave 4 and 5. A plausible reason for increased nutritional outcomes could be the effect of a policy or caregiver's unobserved characteristics.

Table 3.1 Details of children nutritional outcomes by Waves

Weight-for-age - underweight (z-score)	Wave 4	Wave 5	Total	Percentage
Less than -2 (0)	100 (5.8%)	126 (6.9%)	226	6.3
Greater than -2 (1)	1637 (94.2%)	1713 (93.1%)	3350	93.7
Total	1737	1839	3576	
Weight-for-height – wasting (z-score)				
Less than -2 (0)	51 (3.2%)	55 (3.3%)	106	3.3

Greater than -2 (1)	1527 (96.8%)	1589 (96.7%)	3116	96.7
Total	1578	1644	3222	
Height-for-age – Stunting (z-score)				
Less than -2 (0)	407 (23.8%)	358 (20%)	765	21.9
Greater than -2 (1)	1300 (76.2%)	1434 (80%)	2734	78.1
Total	1707	1792	3499	

Compiled by the Author

Table 3.2 presents the child's nutritional outcomes by age. Reduction in malnourished children was highlighted in the sample, but child weight-for-age is yet a problem. Mkhize and Sibanda (2020) have noted in a recent study that there is persistent child malnutrition in South Africa. It was documented that South Africa has triple burden malnutrition that includes under-nutrition, over-nutrition and micronutrient deprivations. The children in the age cohort of 0 -11 months are less likely to experience malnutrition. The plausible reason maybe that the mothers can decide on the child's mealtime and food choice because the children are likely to be receiving breast within that period.

Table 3.2 Details of child nutritional outcomes by age

Child age (Years)	0	1	2	3	4	5	Total
Weight-for-age - underweight (z-score)							
Less than -2 (0)	3	31	37	42	59	54	226
Greater than -2 (1)	57	493	592	758	737	713	3350
Total	60	524	629	800	796	767	3576
Weight-for-height - wasting (z-score)							
Less than -2 (0)	9	32	18	17	20	10	106
Greater than -2 (1)	45	459	586	765	763	498	3116
Total	54	491	604	782	783	508	3222
Height-for-age – Stunting (z-score)							

Less than -2 (0)	7	118	197	193	156	94	765
Greater than -2 (1)	50	373	413	591	637	670	2734
Total	57	491	610	784	793	764	3499

Data source: NIDS Wave 4 & 5. Note: Age 0 – 5 years which could mean 0 years may indicate (1-11 months), 1 year may indicate (12-23 months), 2 years may indicate (24-35months), 3 years may indicate (36-47 months), 4 years may indicate (48-59months) and 5 years may indicate (60-71 months).

The current study focused on short and long terms consequences of child nutritional deprivation. The kernel density of the outcome variables is presented below.

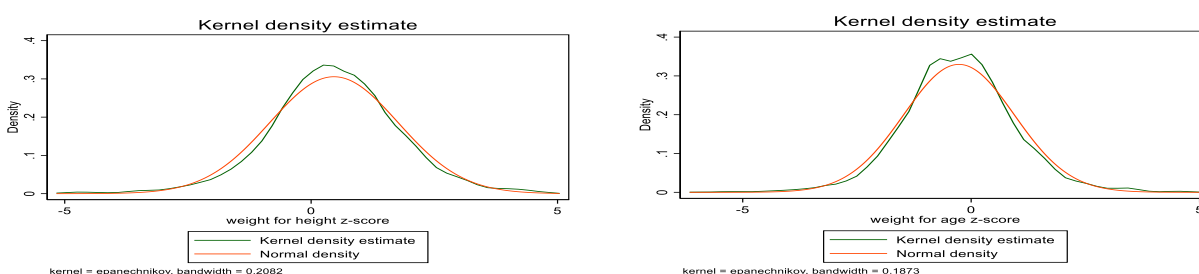


Figure 3.1 Kernel density of weight-for-height and weight-for-age computed by the Author

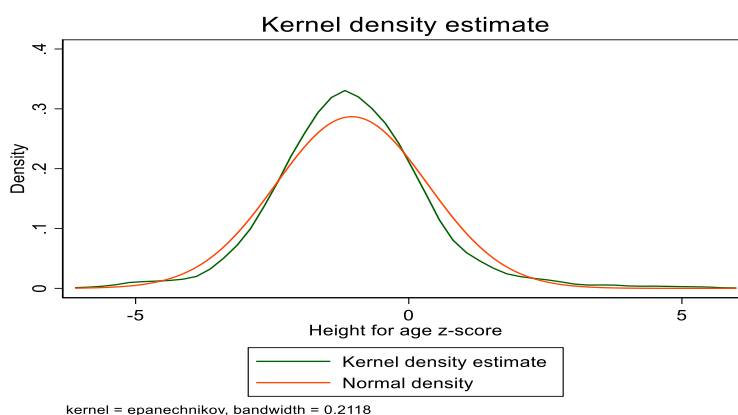


Figure 3.2 Kernel density of height-for-age computed by the Author

Figure 3.1 and 3.2 presents the kernel density estimate of the children's nutritional outcomes. The outcome variables are normally distributed in the dataset. The outcome variables ranges from -5 to 5 for weight-for-height, -6 to 6 for height-for-age and -6 to 5 for weight-for-age.

3.3.2.2 Measure of women's decision-making index: Multiple Correspondence Analysis

In this study, an index of the women's decision-making variable was created from five decision-making variables: who decides on the day-to-day expenditure, who decides on large unusual purchases, who decides on where children go to school, which members are allowed to live in the household, and who decides on where the family should live. The study was concerned with all the decision-making variables, irrespective of whether they were income-related¹⁴. It is important to note that the responses to various questions regarding decisions were "yes" or "no" to identify the person who was the main or single decision-maker. The study uses decision-making variables as one (1) for a single decision and zero (0) otherwise. This is appropriate when using multiple correspondence analysis (MCA) (Fotuhi et al., 2019). "When the records are 0 or 1, MCA is accomplished by expending standard correspondence analysis on the indicator matrix (Fotuhi et al., 2019). The study constructed a decision-making index by employing multiple correspondence analysis (MCA) following Booysen et al. (2008) and Fotuhi et al. (2019) studies. The index interpretation involves a positive value representing primary decision-making and a negative signifying otherwise.

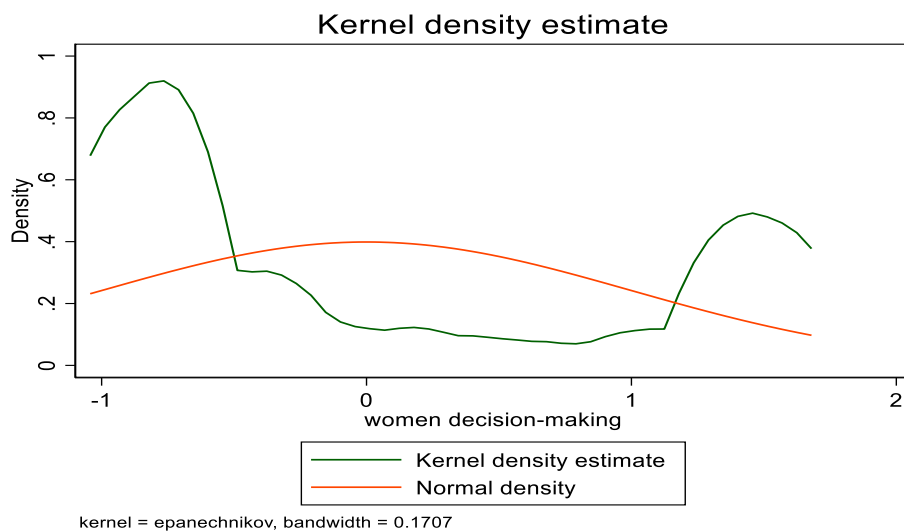


Figure 3.3 Kernel density estimate of women's decision-making

¹⁴ Schultz's (1984) study noted that non-economic or economic decision-making could affect child nutrition.

Figure 3.3 presents the kernel density of the decision-making index. The index was constructed by using MCA, as earlier mentioned. The value ranges between -0.89 and 1.48. The women's decision-making index explains the difference between the lower (negative) and upper (positive) levels of decision-making. This implies that those in the lower part of the distribution of decision-making are likely to lack decision-making, and the upper distribution is likely to have decision-making.

3.3.3 How to resolve attrition and clustering issues

The study is concerned with attrition bias and a clustering problem. Attrition means failure to include some respondents present in the initial wave in the subsequent waves (Durrant & Goldstein, 2010). For instance, the NIDS data were collected over many Waves. Wave 1 was conducted in 2008, and some may drop out entirely in subsequent waves. The dropping may affect the dataset's quality and pose severe consequences for the reliability of the estimation. Interestingly, NIDS does not provide a balanced panel (Branson & Wittenberg, 2019). The NIDS complex survey design provides weight to the account for attrition bias¹⁵.

This study is based on this important assumption, and one of the concerns is whether a woman-specific ability to take care of the child or household welfare is associated with her decision-making in the model. One of the challenges is that there may be a natural correlation within the household (cluster). Child nutrition may be correlated with household characteristics. Hence, children clustered within the same household may suffer similar shocks; they are likely to have similar household characteristics, suggesting that error terms may correlate within each cluster. The study uses a fixed-effects estimator and robust (or cluster) standard errors to control for clustering errors (Wooldridge, 2010). The study finally set the data into an unbalanced panel using child identification as the dataset's lowest granularity. In the next paragraph, the study presents the econometric strategy.

¹⁵ For a depth of understanding of how to handle attrition bias (see Branson and Wittenberg (2019) for more detail)

3.3.4 Econometric strategy

The study used a fixed-effects model to control for the caregiver's time-invariant characteristics. Variable such as gender does not vary over time. The fixed-effects model provides a framework to control for all time-invariant variables in the model, as given by Equation 1:

$$C_{it} = \beta_1 A_{it} + \beta_2 X_{it} + \alpha_i + u_{it}; \quad i = 1, 2, \dots, N; t=1, \dots, T. \quad (3.2)$$

Where, C_{it} is the child nutrition indicator; A_{it} represents the women's decision-making index; X_{it} comprises the vector of household characteristics, such as child gender, child age, household size, religion, and dwelling among others; β_1 , is a vector of women's decision-making; β_2 is a vector of covariates; and ε_{it} is the error term. Also, $u_{it} \sim IID(0, \sigma_u^2)$ and $\alpha_i + u_{it}$ capture the unobserved individual fixed effect and the idiosyncratic error term that is specific to each individual (Rüttenauer and Ludwig 2019). The child nutritional outcomes models are as follows;

$$C_{it}^u = \beta_1 A_{it} + \beta_2 X_{it} + \varepsilon_{it} \quad (3.3)$$

$$C_{it}^w = \beta_1 A_{it} + \beta_2 X_{it} + \varepsilon_{it} \quad (3.4)$$

$$C_{it}^h = \beta_1 A_{it} + \beta_2 X_{it} + \varepsilon_{it} \quad (3.5)$$

Where C_{it}^u measures weight-for-age, C_{it}^w measures the weight-for-height, and C_{it}^h measures the height-for-age of the child i .

Endogeneity may occur when there is a correlation between the women's decision-making and the error term. Let us assume that a variable that is not measured, like a woman-specific ability to take

care of the child or household welfare, is in the error term. A woman-specific ability to take care of the child or household welfare may be correlated with the child's nutritional outcome and women's decision-making. When unobserved specific characteristics influence child nutritional outcomes and women's decision-making, the estimation is likely biased. Hence, the study accounted for the endogeneity that occurs in the effect of women's decision-making on child nutritional outcomes by using a Control Function Approach (CFA) following Wooldridge's (2015) and Lin and Wooldridge's (2019). Notably, the CFA required the endogenous explanatory variable to be continuous (Wooldridge, 2015), so the decision-making variable is continuous. The CFA is relevant in the panel analysis and an alternative to the two-stage least squares (2SLS) techniques. Intuitively, the control function has two steps similar to the 2SLS techniques, and an instrumental variable (IV) is required. The validity of IV relies on some assumptions, such as relevance and exclusion restriction conditions. The IV is correlated with the regressor (or endogenous variable) but uncorrelated with the error term. Also, the IV is correlated with the dependent variable through the relationship with the endogenous regressor. This study followed the literature to identify a potential instrument. Melesse (2021) study suggested assets brought into marriage and asset ownership as an IV for women's empowerment. The study uses total female assets comprising real estate, business, vehicle, financial and superannuation assets from the individual folder available in the NIDS dataset.

Further, the endogenous explanatory variable is regressed on the IV and exogenous variables in the first stage. The 2SLS approach holds under the assumption of relevance and exclusion restriction. In the reduced form of the equation or first stage, the covariates in the model get regressed on endogenous variables, as:

$$A_{it} = \alpha_i + \beta_2 X_{it} + \gamma_i Z_{it} + \varepsilon_{it} \quad (3.6)$$

where Z_{it} denotes the IV (female total assets); and γ_i is a parameter of the IV. The endogenous variable is regressed on the instrument and explanatory variables. The CFA involves controlling for the predicted residual (v_{it}) in the second stage.

The last estimation includes the predicted residual as:

$$C_{it} = \alpha_i + \beta_1 A_{it} + \beta_2 X_{it} + \beta_3 v_{it} + \varepsilon_{it} \quad (3.7)$$

In the estimation, the study implement equations (3.6) and (3.7) for all the child's nutritional outcomes.

3.4 Summary Statistics

Table 3.1 presents the sample statistics from NIDS, a nationally representative survey. In this descriptive statistics, there were several binary variables. These included child gender, the caregiver's gender, racial group, health status, educational level, life satisfaction, and dwellings, among others. At the same time, the continuous variables include child nutritional outcome variables, the decision-making index, mother's age, child age, household size, household income and poverty. Poverty may be referred to as per-capita household expenditure, which is assumed to be the make-up of a better estimation of consistent household income than the recorded income (Schotte et al., 2018). The study divided the household income by the household size to computer household per capita income. Then, generate poor and non-poor by using the upper-bound poverty line set at R963 per person per month. If the household per capita income is less than R963, the household is poor and more than R963 is non-poor.

In Table 3.3, the sample consists of different observations of child nutritional outcomes. For weight-for-age has 3576, weight-for-height consists of 3222, and height-for-age comprises 3499, as earlier mentioned. Approximately 48.6% of children were males, and 51.4% were females. The employment status shows that approximately 32.6% had participated in the form of labour, and the remainder had not participated in any form of labour activities. Since labour market participation is lower among females (Casale & Posel, 2002; Casale, 2004), one may expect low income and bargaining power among females. Low labour participation is likely to hurt the children's nutritional outcomes if it is not for maternity or medical leave.

Table 3.3 Description statistics

Variables	Obs	Mean	Std.Dev.	Min	Max
Outcome variables					
Height-for-age (stunting)	3499	-1.043	1.391	-5.898	5.785
Weight-for-age (underweight)	3576	-0.266	1.21	-5.975	4.849
Weight-for-height (wasting)	3222	0.463	1.305	-4.959	4.835

Endogenous regressor

Women's decision-making index	4077	0	1	-.872	1.509
Decision on daily household expenditures	4077	0.434	0.496	0	1
Decision on large, unusual purchases	4077	0.344	0.475	0	1
Decision on who lives in a household	4077	0.313	0.464	0	1
Decision on where household should live	4077	0.319	0.466	0	1
Decision on where the child goes to school	4077	0.458	0.498	0	1
Female Total Assets (Log) (IV)	3861	9.161	1.65	0	16.213

Other covariates

Mother's Age (in years)	4077	28.961	6.581	15	44
Child Sex (Male = 1, otherwise = 0)	4077	0.486	0.5	0	1
Child Age	4077	2.887	1.548	0	5
Household size	4077	6.767	3.465	2	31
Child Support Grant	4062	0.762	0.426	0	1
Household income Deflated (Log)	4077	8.469	0.86	5.278	11.8
Life satisfaction	4062	0.559	0.497	0	1
Health status	4077	0.95	0.219	0	1
Labour market status	4062	0.326	0.469	0	1
Poverty status (poor = 1, non-poor = 0)	4077	0.591	0.492	0	1
Dwelling	4076	0.746	0.435	0	1

Education attainment

No education	4077	0.010	0.101	0	1
Education primary level	4077	0.054	0.226	0	1
Education below matric level	4077	0.535	0.499	0	1
Education matric level	4077	0.208	0.406	0	1
Education post-matric	4077	0.173	0.378	0	1
Education university level	4077	0.018	0.132	0	1
Education other levels	4077	0.002	0.049	0	1

Race

African	4077	0.858	0.349	0	1
Indian	4077	0.008	0.091	0	1
White	4077	0.005	0.072	0	1
Coloured	4077	0.129	0.335	0	1

Relationship with the caregivers

Parent	4077	0.934	0.249	0	1
Grandparent	4077	0.027	0.161	0	1
Uncle Aunt	4077	0.026	0.161	0	1
Other relatives	4077	0.001	0.027	0	1

Marital status

Married	4077	0.214	0.41	0	1
Cohabiting	4077	0.113	0.316	0	1
Widow	4077	0.017	0.128	0	1
Divorce	4077	0.01	0.101	0	1
Single	4077	0.646	0.478	0	1

Religion

No religion	4062	0.052	0.222	0	1
Christianity	4062	0.852	0.354	0	1
Jewish	4062	0.002	0.050	0	1
Muslim	4062	0.005	0.072	0	1
Hindu	4062	0.005	0.072	0	1
Africa	4062	0.077	0.267	0	1
Others	4062	0.006	0.077	0	1

Provinces

Western Cape	4077	0.09	0.286	0	1
Eastern Cape	4077	0.106	0.308	0	1
Northern Cape	4077	0.075	0.264	0	1
Free State	4077	0.058	0.233	0	1
KwaZulu-Natal	4077	0.307	0.461	0	1
North West	4077	0.069	0.253	0	1
Gauteng	4077	0.113	0.317	0	1
Mpumalanga	4077	0.078	0.269	0	1
Limpopo	4077	0.104	0.305	0	1

Further, the levels of their educational attainment varied in the sample. Starting with the lowest percentage, those who had other levels were 0.2%, and no form of education was 1%. Those with university-level had 1.8%, primary-school-level education had 5.4%, post-matric had 17.3%, and approximately 20.8% had obtained a matric certificate. About 53.5% had education below the matric level. Most of the individuals in this sample had a below matric level of education and above. Therefore, the majority are likely to have access to information that could enhance child nutritional outcomes. Approximately 74.5% lived in a well-built flat or townhouse; living in a sturdy building with a pleasant environment may likely improve the child's nutritional outcomes. Africans (Blacks) constituted approximately 85.8% of the sample, while other racial groups made up 14.2% of the data. However, the focus of the study is not on comparing the child's nutritional outcome by racial groups.

In addition, the relationships between the caregivers and the children were grouped into four categories: parent (father or mother), grandparent (grandparent and great-grandparent), uncle and aunt, and others. The 'others' category consisted of sons or daughters, foster children, stepparents,

adoptive parents, foster parents, brothers or sisters, grandchildren, fathers - or mothers-in-law, brothers- or sisters-in-law, nephews or nieces, cousins, and other family and non-family members. In the sample, 93.4% were direct parents, likely mothers or caregivers, who may influence a child's nutritional outcome positively.

3.5 Empirical Results

This section presents the results of the multivariate analysis and discusses substantive points emerging from these results. The results are presented in sequential order for each anthropometric measure; weight-for-height, weight-for-age and height-for-age.

3.5.1 Fixed effects

This study examines the effect of women's decision-making on child nutritional outcomes in South Africa. Table 3.4, column (1) presents the naïve regression of the effect of women's decision-making on child nutrition using pooled ordinary least squares (POLS). The results showed that women's decision-making positively correlates with child weight-for-age (underweight) but is insignificant. The result implies that the women's decision-making may not improve the child's weight for age. Some existing empirical findings show similar results (Mckenna et al., 2019) in the case of the Democratic Republic of the Congo. The empirical findings reveal that child age, gender, and household significantly negatively affect child weight-for-age. At the same time, the findings show that mothers working in electricity, gas and water supply, mining and quarrying, have a significant positive association with the child's weight for age at the minimum of a 0.05 level. In these occupations, women are likely to earn better from the labour income, which may influence the child's weight for age.

The study anticipates that OLS regression is likely to yield a biased estimate (Brüderl & Ludwig, 2015), and use the fixed effect (FE) estimator to answer the question of the causal effects of women's decision-making on the children's nutritional outcomes. It is essential to note that women's primary decision-making may not be static but dynamic. Thoughtful decision-making may change depending on individual resources and ability, among other factors. However, an existing study has pointed out in the literature that mother decision-making is difficult to shift in the short run due to patriarchal cultural beliefs (Arulampalam et al., 2020).

Column (2) shows that women's decision-making has an insignificant positive effect on child weight-for-age using fixed effects. While child support grants, being a widow, working in a community social and personal service, being a Hindu worshipper, household size, and child age significantly negatively affect the child's weight-for-age (WFA). At the same time, the findings show that a mother's educational attainment (post-matric) significantly positively influences the child's weight for age at a minimum of a 0.1 level of confidence. Also, the results show that mother labour participation is likely to improve child weight for age (Nankinga et al., 2019).

Table 3.4 weight-for-age and women's decision-making

	(1) Pooled OLS	(2) Fixed Effects
Variables	weight-for-age	weight-for-age
Women's decision-making	0.0246 (0.0241)	0.0251 (0.0435)
Female age	-0.00774* (0.00430)	-0.0761 (0.0797)
Child gender	-0.104** (0.0425)	-0.192 (0.408)
Child age	-0.129*** (0.0150)	-0.218** (0.0967)
Reference educational attainment: No schooling		
Primary level	-0.319 (0.244)	-0.311 (0.325)
Below matric level	-0.135 (0.228)	0.460 (0.281)
Matric level	0.0480 (0.232)	0.281 (0.257)
Post-matric	0.119 (0.232)	0.317* (0.167)
University level	-0.0802 (0.272)	0.612 (0.939)
Other levels of education	-0.244 (0.383)	
Household size	-0.0182** (0.00806)	-0.0379** (0.0183)
Deflated Household Income	0.0747* (0.0432)	0.115 (0.0797)
Life satisfaction	0.0625	-0.00272

	(0.0408)	(0.0673)
Health status	0.0475	-0.257
	(0.0887)	(0.177)
Employment status	0.124***	0.0882
	(0.0476)	(0.104)
Reference Religion: No religion		
Christianity	-0.0204	0.293*
	(0.0838)	(0.154)
Jewish	0.398	-0.133
	(0.316)	(0.203)
Muslim	0.0703	-1.316**
	(0.411)	(0.570)
Hindu	-0.341	0.496
	(0.312)	(0.364)
Africa traditional	-0.0972	0.176
	(0.107)	(0.178)
Other religion	-0.289	0.223
	(0.267)	(0.364)
Dwelling	0.0721	-0.000549
	(0.0473)	(0.0873)
African	0.278***	0.492
	(0.0898)	(0.317)
Indian	-0.170	
	(0.267)	
White	0.299	
	(0.201)	
Parent	0.189	0.499
	(0.239)	(0.449)
Grandparent	0.237	0.00168
	(0.263)	(0.752)
Uncle and ant	0.169	1.343*
	(0.269)	(0.742)
Other relatives	-0.385	
	(0.644)	
Reference Job characteristics: Private households exterritorial org		
Agriculture hunting forestry & fishing	-0.0584	-0.408
	(0.136)	(0.361)
Mining and quarrying	0.473**	-0.360
	(0.213)	(0.266)
Manufacturing	0.0146	-0.225
	(0.135)	(0.220)
Electricity gas and water supply	0.869***	0.237
	(0.249)	(0.277)
Construction	-0.111	-0.222
	(0.358)	(0.197)
Wholesale and retail trade	0.141	-0.116

	(0.111)	(0.180)
Transport storage & comm.	0.271	-0.196
	(0.259)	(0.236)
Financial intermediation institution	0.0658	-0.518
	(0.159)	(0.394)
Community social & personal service	-0.00172	-0.377**
	(0.0977)	(0.167)
Reference Province: Western Cape		
Eastern Cape	0.125	-1.991
	(0.112)	(1.447)
Northern Cape	-0.449***	-0.234
	(0.117)	(0.275)
Free State	-0.237*	
	(0.124)	
KwaZulu-Natal	0.178*	-0.151
	(0.102)	(0.470)
North West	-0.441***	0.620
	(0.125)	(0.506)
Gauteng	-0.121	-0.405
	(0.111)	(0.454)
Mpumalanga	-0.0283	-0.846***
	(0.121)	(0.306)
Limpopo	-0.346***	
	(0.113)	
Reference Marital status: married		
Cohabiting	-0.206***	0.0301
	(0.0782)	(0.157)
Widow	-0.270*	-0.634**
	(0.160)	(0.300)
Divorce	0.0360	-0.217
	(0.202)	(0.227)
Single	-0.105*	-0.118
	(0.0578)	(0.140)
Poverty status	-0.0220	0.131
	(0.0636)	(0.126)
Child Support Grant	-0.0726	-0.164
	(0.0529)	(0.103)
Stratified weight	Yes	Yes
Wave 5 dummy	Yes	Yes
Constant	-0.351	1.004
	(0.537)	(2.614)
Observations	3,560	3,560
R-squared	0.102	0.183

Number of identification	2,958
sigma_u	1.497
sigma_e	0.739
rho	0.804

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1, FE omitted other levels of education, Free State and Limpopo provinces, Estimation are robust clustered with identification

Table 3.5 column (1) shows that women's decision-making has a significant positive relationship with child weight-for-height. This implies that a change of one standard deviation in the women's decision-making is likely to improve the child's weight-for-height by 6.6%. The result is expected because mothers are the primary caregiver (Shroff et al., 2009) and their ability to make a personal decision on child feeding time is likely to improve the child's weight for height and reduce wasting. Similarly, deflated household income and mother life satisfaction positively affect the child's weight-for-height. While the mother's age, child's age, and household size have a significant negative association with the child's weight for height. Women working in sectors such as agriculture are not like to have enough time to improve their child nutrition in the short run. An existing study has revealed that children whose parents are worked in agriculture are likely to experience the worst nutritional outcome (Adjaye-Gbewonyo et al., 2019). For mothers living in the Eastern cape and KwaZulu-Natal provinces, their children are likely to have an improvement in their weight-for-height as compared to those living in the Western cape. However, the pooled OLS results may be biased because they do not account for individual time-invariant components.

In column (2), the result shows that the mother's decision-making positively influences the child's weight-for-height (cWFH), but not statistically significant using a fixed effect estimator. However, household size has a significant negative effect on cWFH.

Table 3.5 weight-for-height and women's decision-making

	(1) Pooled OLS	(2) Fixed Effects
Variables	Weight-for-height	Weight-for-height
Women's decision-making	0.0657** (0.0273)	0.0248 (0.0675)
Female age	-0.0113**	-0.137

	(0.00486)	(0.105)
Child gender	0.0367	-0.735**
	(0.0472)	(0.353)
Child age	-0.103***	-0.0758
	(0.0186)	(0.124)
Reference educational attainment: No schooling		
Primary level	-0.214	-0.495
	(0.326)	(0.556)
Below matric level	-0.0899	-0.216
	(0.310)	(0.466)
Matric level	0.0599	-0.764
	(0.314)	(0.465)
Post-matric	0.0308	-0.315
	(0.315)	(0.300)
university level	-0.0832	-0.596
	(0.352)	(0.789)
Other levels of education	-0.329	
	(0.477)	
Household size	-0.0193**	-0.0542*
	(0.00901)	(0.0277)
Deflated Household Income	0.103**	0.0784
	(0.0472)	(0.124)
Life satisfaction	0.0948**	0.00948
	(0.0460)	(0.0969)
Health status	0.129	0.00704
	(0.114)	(0.266)
Employment status	0.105**	-0.0270
	(0.0517)	(0.134)
Reference for religion: No religion		
Christianity	0.167	0.532**
	(0.107)	(0.222)
Jewish	1.043***	-0.254
	(0.395)	(0.557)
Muslim	-0.193	-1.582***
	(0.322)	(0.220)
Hindu	-0.134	0.0377
	(0.355)	(0.627)
Africa traditional	0.136	0.545**
	(0.131)	(0.264)
Other religion	-0.0514	0.145
	(0.344)	(0.720)
Dwelling	-0.0485	0.00912
	(0.0535)	(0.157)
African	0.294***	0.660**
	(0.101)	(0.330)
Indian	-0.324	

	(0.291)	
White	-0.175	
	(0.291)	
Parent	0.0991	-0.563
	(0.287)	(1.135)
Grandparent	0.0437	-1.266
	(0.319)	(1.158)
Uncle and ant	0.141	0.417
	(0.316)	(1.430)
Other relatives	-0.614	
	(0.561)	
Reference Province: Western Cape		
Eastern Cape	0.376***	-0.555
	(0.125)	(0.757)
Northern Cape	-0.529***	3.731***
	(0.129)	(0.427)
Free State	-0.00131	
	(0.150)	
KwaZulu-Natal	0.347***	-0.897
	(0.121)	(0.696)
North West	-0.349**	0.613
	(0.149)	(0.688)
Gauteng	-0.128	-0.663
	(0.132)	(0.575)
Mpumalanga	0.0215	-1.145**
	(0.139)	(0.562)
Limpopo	-0.226*	
	(0.135)	
Reference Marital status: married		
Cohabiting	-0.113	0.179
	(0.0904)	(0.212)
Widow	-0.0630	0.0729
	(0.193)	(0.337)
Divorce	-0.125	-0.434
	(0.241)	(0.401)
Single	-0.0831	-0.0571
	(0.0657)	(0.209)
Poverty status	0.0899	0.0619
	(0.0736)	(0.193)
Child Support Grant	-0.0545	-0.312
	(0.0618)	(0.194)
Stratified weight	Yes	Yes
Wave 5 dummy	Yes	Yes
Constant	-0.195	4.862

	(0.630)	(3.714)
Observations	3,206	3,206
R-squared	0.095	0.152
Number of IDs		2,699
sigma_u		2.106
sigma_e		1.027
rho		0.808

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1, FE omitted other levels of education, Free State and Limpopo provinces, as well as Electricity gas and water supply, Estimates are robust clustered with identification

Table 3.6 column (1) presents that women's decision-making has an insignificant negative relationship with the child height-for-age using POLS. However, the dwelling has a significant positive relationship with the child's height for age (cHFA). This implies that a well-structured dwelling will likely improve child height-for-age (Pongou et al., 2006).

Column (2) shows that women's decision-making has an insignificant effect on cHFA. In addition, the findings show that a mother's educational attainment at the below matric level matric, matric and post-matric level has a significant positive effect on the cHFA. This implies that the caregiver's education will likely improve child nutrition (Frost et al., 2005; Alderman & Headey, 2017). In other words, educated caregivers are likely to make personal decisions on the choice of food and time of the meal, as well as health-related issues that may potentially influence child nutritional outcomes.

Table 3.6 Height-for-age and women's decision-making

	(1) Pooled OLS	(2) Fixed Effects
Variables	height-for-age	height-for-age
Women's decision-making	-0.0108 (0.0284)	0.0675 (0.0657)
Female age	-0.00297 (0.00485)	0.0422 (0.0995)
Child gender	-0.193*** (0.0492)	0.991 (1.004)
Child age	-0.0209 (0.0187)	-0.311** (0.144)

Reference educational attainment: No schooling

Primary level	-0.184 (0.246)	-0.0170 (0.563)
Below matric level	-0.125 (0.227)	0.650* (0.347)
Matric level	0.0396 (0.232)	0.885*** (0.331)
Post-matric	0.133 (0.232)	0.775*** (0.266)
university level	-0.0345 (0.293)	-0.627 (0.984)
Other levels of education	-0.0646 (0.363)	
Household size	-0.0232** (0.0102)	-0.0145 (0.0248)
Deflated Household Income	0.106** (0.0509)	0.125 (0.0980)
Life satisfaction	0.0776 (0.0473)	0.00669 (0.0983)
Health status	0.100 (0.102)	-0.223 (0.220)
Employment status	0.0394 (0.0551)	0.144 (0.122)

Reference for religion: No religion

Christianity	-0.191 (0.121)	-0.121 (0.187)
Jewish	-0.0434 (0.299)	-0.0688 (0.357)
Muslim	0.478 (0.354)	-0.264 (1.321)
Hindu	-0.202 (0.430)	1.068 (1.019)
Africa traditional	-0.332** (0.145)	-0.251 (0.220)
Other religion	-0.461 (0.303)	0.197 (0.500)
Dwelling	0.150*** (0.0560)	0.0717 (0.114)
African	0.0971 (0.104)	-0.116 (0.487)
Indian	-0.0857 (0.327)	
White	0.523* (0.268)	
Parent	0.0279 (0.292)	0.419 (0.973)

Grandparent	0.145 (0.319)	0.184 (1.192)
Uncle and ant	0.0279 (0.317)	0.547 (1.199)
Other relatives	-0.0879 (0.830)	
Reference Province: Western Cape		
Eastern Cape	-0.109 (0.137)	-3.473 (2.309)
Northern Cape	-0.0414 (0.131)	-5.185*** (0.492)
Free State	-0.235 (0.152)	
KwaZulu-Natal	0.00425 (0.126)	-0.387 (0.781)
North West	-0.167 (0.152)	0.379 (0.615)
Gauteng	0.0193 (0.133)	-0.119 (0.513)
Mpumalanga	0.0400 (0.139)	-0.828 (0.640)
Limpopo	-0.257* (0.138)	
Reference Marital status: married		
Cohabiting	-0.179* (0.0914)	-0.138 (0.200)
Widow	-0.398** (0.188)	-0.786 (0.648)
Divorce	0.157 (0.191)	-0.109 (0.390)
Single	-0.0849 (0.0676)	-0.186 (0.194)
Poverty status	0.00793 (0.0764)	0.160 (0.146)
Child Support Grant	-0.127* (0.0682)	-0.0230 (0.191)
Stratified weight	Yes	Yes
Wave 5 dummy	Yes	Yes
Constant	-1.460** (0.649)	-2.748 (3.163)
Observations	3,483	3,483
R-squared	0.045	0.093
Number of IDs		2,913

sigma_u	2.268
sigma_e	1.043
rho	0.825

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1, FE omitted other levels of education, Free State and Limpopo provinces, as well as Electricity gas and water supply; Estimates are robust clustered with identification

3.5.2 Robustness: Control Function Approach

The study ran pooled OLS regression to predict the residual and plug the residual into the estimation (Wooldridge, 2015; Lin & Wooldridge, 2019). The results of the robustness analysis are presented in Table 3.7, and column (1) presents the first stage results of the regression of female total individual asset (IV) on women's decision-making. The results show that IV has a significant positive relationship with women's decision-making at a 5% confidence level. The significance of the IV suggests that relevance assumptions are met, and the IV is a good instrument. The F statistics is 38, which is greater than the thumb rule of 10. The instrumental variable has an anticipated influence on the endogenous variable, showing that the instrument is not weak. This implies that women's asset is likely to influence their decision-making. Also, there is no correlation between the IV and unobserved individual ability that could improve child nutritional outcomes. Then, after the first-stage regression or reduced form, residual was predicted. It is noteworthy that the first stage of CFA does not require the option of robust clustered identification. The findings show that using a CFA result is robust to the fixed effects estimator.

The study is concerned that child nutrition might depend on the time effect and unobserved characteristics that could influence decision-making. Also, the caregiver's decision-making may be lower at one time (e.g. in wave 4) and high at another time (e.g. in wave 5) or vice versa over the two waves. Petersen (2009) noted in the literature that the clustered standard errors rightly account for the reliability of the panel data set and yield unbiased estimates.

Table 3.7 Causal Inference using Control Function Approach

Variables	(1) Reduced form Women decision- making	(2) CFA Weight-for- age	(3) CFA Weight- for-height	(4) CFA Height-for- age
Women's decision-making		0.647*** (0.181)	0.542*** (0.203)	0.696*** (0.211)
Female age	0.0497*** (0.00247)	-0.0417*** (0.0111)	-0.0361*** (0.0122)	-0.0426*** (0.0126)
Child gender	-0.0245 (0.0264)	-0.0907** (0.0435)	0.0399 (0.0482)	-0.168*** (0.0507)
Child age	0.00614 (0.00881)	-0.128*** (0.0155)	-0.0962*** (0.0191)	-0.0234 (0.0193)
Reference educational attainment: No schooling				
Primary level	0.195 (0.142)	-0.462* (0.259)	-0.339 (0.337)	-0.276 (0.256)
Below matric level	0.0662 (0.133)	-0.218 (0.244)	-0.149 (0.320)	-0.184 (0.235)
Matric level	-0.00145 (0.136)	0.00991 (0.248)	0.0397 (0.324)	0.0226 (0.239)
Post-matric	-0.0695 (0.137)	0.0998 (0.248)	0.00413 (0.326)	0.160 (0.239)
university level	-0.00690 (0.171)	-0.184 (0.287)	-0.171 (0.362)	-0.112 (0.303)
Other levels of education	-0.228 (0.303)	-0.0817 (0.408)	-0.215 (0.494)	0.168 (0.382)
Household size	-0.0729*** (0.00527)	0.0311* (0.0161)	0.0178 (0.0179)	0.0332* (0.0193)
Deflated Household Income	-0.246*** (0.0269)	0.204*** (0.0612)	0.205*** (0.0672)	0.257*** (0.0704)
Life satisfaction	0.00465 (0.0269)	0.0641 (0.0416)	0.0913* (0.0468)	0.0842* (0.0484)
Health status	-0.0451 (0.0624)	0.0722 (0.0921)	0.151 (0.118)	0.130 (0.106)
Employment status	0.284*** (0.0315)	-0.0610 (0.0718)	-0.0347 (0.0795)	-0.176** (0.0858)
Reference for religion: No religion				
Christianity	0.0448 (0.0610)	-0.0542 (0.0868)	0.178 (0.112)	-0.269** (0.125)
Jewish	-0.169 (0.265)	0.492 (0.328)	1.159*** (0.396)	0.0281 (0.308)
Muslim	-0.122 (0.203)	0.138 (0.419)	-0.117 (0.334)	0.522 (0.363)

Hindu	-0.551** (0.268)	0.0208 (0.352)	0.170 (0.411)	0.236 (0.468)
Africa traditional	0.0383 (0.0762)	-0.0893 (0.110)	0.179 (0.135)	-0.392*** (0.149)
Other religion	0.0204 (0.177)	-0.331 (0.268)	-0.0438 (0.344)	-0.560* (0.308)
Dwelling	-0.0618* (0.0321)	0.0960* (0.0492)	-0.0439 (0.0556)	0.196*** (0.0577)
African	0.0325 (0.0546)	0.274*** (0.0911)	0.310*** (0.104)	0.0681 (0.109)
Indian	0.0828 (0.215)	-0.224 (0.276)	-0.339 (0.303)	-0.212 (0.341)
White	-0.226 (0.193)	0.419** (0.209)	-0.102 (0.292)	0.668** (0.275)
Parent	-0.217* (0.117)	0.334 (0.243)	0.209 (0.289)	0.188 (0.296)
Grandparent	-0.395*** (0.142)	0.490* (0.275)	0.238 (0.332)	0.423 (0.334)
Uncle and ant	-0.0375 (0.141)	0.199 (0.270)	0.162 (0.317)	0.0725 (0.318)
Other relatives	0.217 (0.486)	-0.526 (0.633)	-0.676 (0.552)	-0.278 (0.814)
Reference Province: Western Cape				
Eastern Cape	-0.0640 (0.0693)	0.139 (0.114)	0.366*** (0.129)	-0.0863 (0.143)
Northern Cape	-0.00919 (0.0692)	-0.459*** (0.119)	-0.543*** (0.135)	-0.0479 (0.139)
Free State	-0.0467 (0.0783)	-0.220* (0.126)	0.00584 (0.154)	-0.209 (0.157)
KwaZulu-Natal	0.0548 (0.0653)	0.135 (0.105)	0.303** (0.125)	-0.0288 (0.132)
North West	-0.162** (0.0777)	-0.363*** (0.129)	-0.291* (0.155)	-0.0761 (0.159)
Gauteng	0.0242 (0.0700)	-0.159 (0.113)	-0.158 (0.135)	-0.00650 (0.138)
Mpumalanga	-0.0656 (0.0756)	-0.0192 (0.123)	0.00379 (0.143)	0.0758 (0.144)
Limpopo	-0.0993 (0.0727)	-0.311*** (0.115)	-0.201 (0.139)	-0.216 (0.144)
Reference Marital status: married				
Cohabiting	0.0165 (0.0504)	-0.181** (0.0780)	-0.107 (0.0924)	-0.148 (0.0925)
Widow	0.104 (0.105)	-0.324** (0.159)	-0.106 (0.193)	-0.456** (0.189)
Divorce	0.0608 (0.133)	0.0528 (0.206)	-0.121 (0.252)	0.175 (0.192)

Single	0.0314 (0.0376)	-0.0845 (0.0588)	-0.0600 (0.0673)	-0.0746 (0.0691)
Poverty status	-0.0508 (0.0428)	0.00487 (0.0668)	0.118 (0.0769)	0.0304 (0.0796)
Child Support Grant	0.0705** (0.0335)	-0.112** (0.0539)	-0.0930 (0.0632)	-0.150** (0.0696)
Stratified weight	Yes	Yes	Yes	Yes
Wave 5 dummy	Yes	Yes	Yes	Yes
Female total asset (IV)	0.0835*** (0.0100)			
First stage residual		-0.642*** (0.183)	-0.495** (0.204)	-0.720*** (0.211)
Constant	0.326 (0.314)	-0.764 (0.569)	-0.625 (0.666)	-1.917*** (0.680)
Observations	3,860	3,385	3,041	3,313
R-squared	0.348	0.104	0.095	0.050
F test model	45.15			

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1; CFA estimates are robust clustered with identification

Table 3.7 column (2 to 4) presents that women's decision-making has a significant positive influence on child weight-for-age (64.7%), weight-for-height (54.2%) and height-for-age (69.6%) using a control function approach (CFA). Existing literature has inferred a significant positive impact on the child's nutritional outcome (Rahman et al., 2015; Chilinda et al., 2021). Using CFA account for the unobserved heterogeneous (Wooldridge, 2015) effect of women's decision-making on the child's nutritional outcomes. The unobserved caregivers or mothers' ability is an issue to the causal effect of women's decision-making on child nutritional outcomes. The study employs total female assets as an IV, directly correlating with the women's decision-making, not child nutritional outcomes. The result means that women as primary caregivers can make some decisions about the choice of food intake and appropriate mealtime to improve a child's nutritional outcomes.

3.6 Discussion

This current study investigates the causal effect of women's decision-making on children's nutritional outcomes in South Africa, which has received little research. Many studies have used

cross-sectional datasets in the empirical examination of women's empowerment and child nutrition. While there was a large number of studies that employed logistic regression (Shroff et al., 2009; Rahman et al., 2015; McKenna et al., 2019; Salman et al., 2020; Chilinda et al., 2021; Paul & Saha, 2022), recently fewer studies have found a fixed effect (Adjaye-Gbewanyo et al., 2019), and IV (Lepine & Strobl, 2013; Melesse, 2021) in the investigation of women empowerment and child nutritional outcomes. Therefore, using a fixed effect estimator to control unobserved characteristics and time-invariance components in the effect of women's decision-making on child nutritional outcomes provides inconclusive evidence.

While most related topics use a cross-sectional dataset, a paucity of studies uses a panel dataset and a CFA method to explain the endogeneity issues (Altonji & Matzkin, 2005; Wooldridge, 2015) the study of child nutritional outcome and women's decision-making in South Africa case. The findings show that women's decision-making significantly and heterogeneously affects the child's nutritional outcomes. In other words, women can use their dynamic to improve the children's nutritional outcomes.

Furthermore, the result shows that household income positively affects child nutritional outcomes (Kirk et al., 2018). The results also show that a household income is likely to improve child nutritional outcomes (Burchi, 2010; Lepine & Strobl, 2013; Imai et al., 2014). This points to the importance of household income, which helps women decide on daily expenditures and large purchases. It is likely that household income also indirectly affects the choice of where the children attend school, who is to live with the family and where to live. Therefore, the dynamic of individuals might have played a significant role in improving child nutritional outcomes. When the price of daily consumption increases, the mothers can make personal or primary decisions to purchase alternative commodities (substitution effect) that are required to improve the child's nutritional outcomes. Also, if the price of durable commodities increases, mothers can decide to reduce disposable income (income effect) to influence the child's nutritional outcomes.

Decision-making has a significant positive influence on the two short-run anthropometric measurements of child nutrition; child weight-for-age and weight-for-height. The results mean that women are likely to make personal decisions about childcare, starting with breastfeeding for infants (0-11 months), food choices, and mealtime to improve the child's nutritional outcomes.

This finding is compatible with Dancer and Rammohan's (2009) study and Alao et al. (2017). There is a possibility that the mother's unobserved ability might have influenced the child's nutritional outcomes through the mother's decision-making. Other factors such as the mother's age, child gender, age, and child support grant significantly negatively affect the child's nutritional outcomes. At the same time, dwellings are likely to positively influence the child's weight-for-age and height-for-age (Ghazi et al., 2014).

The effect of other covariates on child nutrition is somewhat different. However, the estimation shows that female education at the primary level has a significant negative effect on child weight-for-age nutrition measures. Female education does not affect the child's nutritional outcomes (weight-for-height and height-for-age). This implies that the mother's education may not likely contribute to improvement in the child's nutritional outcomes. The finding is incompatible with the study of Alderman and Headey (2017). This finding calls for the attention of policy in providing an intervention that will enhance female human capital and improve child nutritional outcomes.

The findings in the current study show that cohabiting (household structure) as compared to married has a significant negative effect on the weight for age (nutrition outcome), all things being equal. On the other hand, household size has a significant positive influence on improved weight for age and height-for-age. A previous Bronte-Tinkew and DeJong (2004) study reported that cohabiting is likely to influence child malnutrition in height for age. Studies have shown that household composition influences child nutritional outcomes (Gribble et al., 2009; Yaya et al. (2022). Such a child can be stunted and underweight if the household size is relatively large, especially if the household is on a lower-income quantile (Gribble et al., 2009). Whereas household resources are likely to reduce malnutrition outcomes in children (Yaya et al., 2022). In addition, Lee et al. (2013) study reported that their caregivers might determine children's weight. Hence, it will be a risk for childhood development if the caregivers are overweight or otherwise have a deficiency in nutrition due to being underprivileged.

There is a red flag regarding child nutritional outcomes in some provinces, and there may be a need to further investigate child nutritional outcomes in those provinces. Those living in Northern Cape, Free State, North West, and Limpopo are compared to the Western Cape, all things being

equal. A similar effect was found in Northern Cape and North West compared to the Western Cape on the child weight-for-height. Notwithstanding, those living in the Eastern Cape and KwaZulu-Natal have a significant positive impact on their child's weight-for-height in comparison to the Western Cape. Mothers working in the agriculture sector are likely to have a decrease in their child's weight-for-height compared to those living in the Western Cape.

The overall result using a control function approach method shows that women's decision-making improves child height-for-age. This finding is incompatible with a recent study by Santoso et al. (2019) and Mckenna et al. (2019) in the case of DR Congo, where they found that women empowerment shows no relationship with child weight-for-height and height-for-age. However, employment status significantly negatively influences the child's height-for-age nutritional outcome. The data summary statistics revealed that a significantly higher percentage (about 65.7%) of women are unemployed. It is not a surprise that employment status significantly negatively influences a child's height for age. Some women may delay childbearing to participate in the labour market to contribute to better child nutritional outcomes (Melesse et al., 2018). Also, the dwelling has a significant positive effect on child weight-for-age and height-for-age nutritional outcomes. The study further investigates the effect of the age cohort of the child and mother on the nutritional outcomes of the children.

3.7 Conclusion and Policy Implications

As mentioned earlier, the South African government has formulated some policy measures to reduce children's malnutrition, such as the "Roadmap for Nutrition, Scaling Up Nutrition, Early Childhood Development Policy" in the 2013 National Development Plan. Also, South African Child Gauge (2020) published an article on how to stop child malnutrition and invest in children to drive national development" (May et al., 2020). Similarly, UNICEF (2020) aims to achieve zero hunger, which is number 2 in the Sustainable Development Goals in 2030 and includes zero child malnutrition. However, various policies have yet to impact children's nutritional outcomes in South Africa significantly. These plausible reasons may be household inequality and a significant record of female unemployment. In providing a plausible solution to child malnutrition, existing literature has emphasized women's decision-making /empowerment (Lepine & Strobl, 2013; Carlson et al., 2015; Melesse, 2021).

There is a need for further research to investigate whether women's decision-making could enhance child nutritional outcomes without household income. Furthermore, how the household could be aware and encouraged to allow the caregiver's decision-making to improve the child's nutritional outcomes should be investigated. Unlike a strand of literature in the study of Shroff et al. (2011), which suggested that educated mothers are likely to attend antenatal care programmes and improve their child's nutritional outcomes. The current study found that women's educational attainment contributed little to improving child nutritional outcomes.

For policy recommendations, the study suggests a developmental policy that will increase women's decision-making /empowerment in the household through investment in human development (education). The findings from the study also direct one's attention to the essence of the increase in female education and the public health policy that would improve the child's nutritional outcomes. Education concerning food choice, balanced diet, and proper meal time for children aged 0 - 5 years should be designed and disseminated to households expecting or having infants to improve the children's nutritional outcomes. This study further suggests gender-responsive policy for policymakers. Gender responsiveness could refer to a policy that pays attention to the unique needs of females, places value on their experience and remove the negative effect of gender norms and gender inequality (Mkandawire et al., 2018). There is a need for public awareness of gender equality (as well as women's decision-making) to improve child nutritional outcomes in South Africa. There is also a need to increase household awareness of child nutrition from antenatal care.

CHAPTER FOUR

Effect of Number of Children on Mother's Labour Income in South Africa

4.1 Introduction

This study investigates the effects of the number of children on the mother's labour income in South Africa. It may be challenging for women to cope with labour participation and childcare in the fertility period. The literature (Aguero and Marks, 2008; Azimi, 2015; Baranowska-Rataj & Matysiak, 2016) about motherhood revealed that women are likely to participate less in the labour market. This places mothers at a disadvantage in earning a higher income (Budig & Hodges, 2010; Livermore et al., 2011). Other studies (Benard & Correll, 2010; Kricheli-Katz, 2012) have conceptualized motherhood as a penalty and shown the negative effect of being a mother in the labour market. However, there is a paucity of literature on whether the number of women's children can heterogeneously affect the mother's labour income in the South African case. Other research areas, such as sociology and anthropology, have widely examined the effect of the motherhood penalty on female income. This transdisciplinary research provides a depth of understanding in the field of fertility, gender and labour income (Budig & Hodges, 2010; Budig et al., 2016). While these studies have advanced scholarship in this field, they have failed to correct sample selection bias in the study of the effect of the number of children on the mother's labour income using quantile regression. The new research foregrounds the study of labour market participation from mothers' earnings in South Africa by contributing to the methods and theory.

For instance, in a dynamic panel and non-parametric study on mothers' labour income distribution, controlling for sample selection bias is a phenomenon (cf. Buchinsky 1998; Arellano & Bonhomme, 2017). However, despite the importance of correction of sample selection bias in the previous studies, uncertainty remains whether the effect of the number of children and/or children aged below six years could lead to a disadvantage in the mother's labour income in South Africa. More so, there is a perpetual gender inequality regarding females in the South African labour market. For instance, the female unemployment rate has move-up from 26.6 to 31.3 in the 4th quarter between 2014 and 2019 in South Africa. At the same time, men's unemployment rate, which is at a reduced rate, moved from 22.4 to 27.2 within the same period (Stat SA, 2021).

Thus, the effect of the number of children may have caused a situation where mothers are not treated equally and subsequently underpaid or denied basic employment rights because policy on

employment was not applied equally. There is a possibility that fertile mothers will be able to increase the number of their children, especially where females are heads of the family (Posel, 2001).

This is because the arrival of a child would require an increase in the time allocation for childcare and a reduction in the time allocation for labour participation. It may be challenging, and there may not be a concomitant reduction in household general consumption or expenditure. In other words, the consequence of being a mother may increase the marginal propensity to consume without a substantial increase in labour income. Likewise, the energy needed to raise a child may reduce labour income (Budig & England, 2001; Livermore et al., 2011). McLanahan and Percheski (2008) argued that "family structure is a mechanism for the reproduction of gender inequality". The study emphasizes that "gender inequalities increases as the mothers incur more child-related cost". However, income inequality has significantly burdened motherhood globally and in South Africa.

Therefore, a mother's labour income is an important factor to consider in the labour market and is of unwavering interest to policymakers, stakeholders and scholars worldwide. Neglecting the mother's labour income has implications for health, household welfare, and economic growth for society at large (Acemoglu et al., 2004; Attanasio et al., 2008; Blundell et al., 2016). Existing studies have revealed that persistent low female labour participation and low income have consistently undermined the development process (Tsani et al., 2013; Sorsa et al., 2015); being a mother decreases female labour participation. In the case of South Africa, Magadla, Leibbrandt, and Mlatsheni (2019) examine the effect of the motherhood penalty with a focus on previously marginalized groups using a cross-sectional dataset from NIDS 2017. The study point to the fact that there is a wage gap between those that are mothers and non-mothers, and the motherhood penalty affects those in the lower-income (at 10th quantile) distribution. In addition, the study dichotomized children under the age of six years and above until 18 years. The study found that mothers with early-aged children under six years are more likely to have huge hurt in their wages than those with children aged above six years. However, their study did not further investigate sample selection bias.

Non-random sample selection is an inevitable issue in applied economics (Heckman, 1979; Buchinsky, 2002; Arellano & Bonhomme, 2017), such as in the study of the effect of the number of children on the mother's labour income. This study contributes to the literature associated with

the effect of the number of children in a family on the mother's labour income and control for sample selection bias in quantile regression using a panel dataset. The study compares the effect of the number of children (continuously measured) with children aged below six years (binary measured, that is, preschool age or older child). In their study, Budig and Hodges (2010) find that children under six years (preschool age) have a negative and significant effect on women's labour income in the United States. However, the current study finds a substantial sample selection bias; without correcting it, the results may be underestimated at different quantiles of mothers' labour income. Hence, the cumulative number of children heterogeneous affects the mother's labour income.

This study proceeds in the following way. Section 4.2 consists of conventional literature on women's labour income. Section 4.3 explain the research methodology, which comprises the identification strategy and econometric approach. Section 4.4 describes the data used and summary statistics. Section 4.5 explains the empirical results. Finally, section 4.6 discusses the findings to reach a certain conclusion and draws policy implications in Section 4.7.

4.2 Literature review

The theoretical literature on equal income distribution has its bedrock in Mincer's (1958) work. Also, the theory on female labour participation is traceable to Mincer's (1963) work on the life cycle of female labour supply. The economic theory proposed by Becker (1965) stresses the need to allocate time for the household between childcare and labour participation. Heckman and MaCurdy (1980) noted that the timing of labour market participation for women depends on whether they have children, among other factors. Existing studies have revealed that persistent low female labour participation and fertility have consistently undermined the labour market (Iacovou, 2001; Engelhardt & Prskawetz, 2004; Kim, 2014), low income and development process. In the literature, England (2005) emphasized that the choice of female labour participation can be determined by mother-friendly work, where she could occasionally switch between childcare and income satisfaction.

Livermore et al. (2011) postulate that the number of children may affect the mother's income directly and indirectly. Indirectly it may be through the choice relative to educational attainment and occupation type, while directly through the influence of unobserved effects between the number of children and the mother's income. The study indicates that the number of children,

whether one or two, does not affect the hourly wages of the mothers using the fixed effect in the case of Australia. On the other hand, Budig and Hodges's study (2010) revealed that the number of children significantly affects low-income women in the United States. Previous studies provide a depth of understanding in this area; however, many of their studies focus on developed countries. Empirically, Miller (2011) analyzed the effect of motherhood timing on career path using a dataset from the National Longitudinal Survey of Youth (NLSY) 1979 cohort and the instrumental variable (IV) technique. The study revealed that a delay in becoming a mother explains the higher income and the mother's income reduction for those that gave birth for the first time. The labour income received during maternity leave (or childcare) is cut-rate and may not increase. The expenses incurred during childcare come only from reduced labour income. However, if a mother decides not to have more than one child, there is the possibility that her labour income will increase. The break-off time from labour participation is short compared to someone with more than one child. Valentova (2019) reveals that a mother with a single child has a significant positive impact on female labour participation. There is another tradeoff between becoming a mother now or early and later. Hence, delaying motherhood may receive high labour income. The literature on labour income started by explaining a tradeoff between motherhood and female labour market participation.

The cumulative effect of the number of children may obstruct the capacity development of mothers if they are overwhelmed by childcare (Chevalier & Viitanen, 2003). The maternity leave during the mother's care for the child is likely to reduce training and capacity development. Invariably, the mother's opportunity for promotion and increased labour income may be reduced due to a reduction in time allocation to participation in the labour market. The decision of females to participate in the labour market or otherwise may be subject to the level of education and the health status of the mother and the child. Baranowska-Rataj and Matysiak (2016), in a cross-country study, use a dataset from the European Survey of Income and Living Conditions to investigate the causal effect of the number of children on female employment. The study uses the two-stage least square (2SLS) technique to control for the endogeneity issue by employing multiple births (twins) as an instrumental variable. This study suggests that multiple births have a significant positive effect on the number of children in the first stage of implementation of 2SLS. However, results show that the number of children negatively and significantly affects female paid work.

Furthermore, existing studies have also found a rise in the negative impact of the number of children on female labour income (Gamboa & Zuluaga, 2013; Dotti Sani, 2015). Budig and Hodges (2010) noted in the literature that family structure, resources and time allotted to participate in the labour market affect a mother's labour income differently. The study suggests a more adverse effect on those in the lower part of the income distribution. The study points to the fact that this adverse effect may be because of low household income and the number of children that the mother has. The study improves our understanding of the effect of the number of children on the distribution of female income. The study, however, does not further correct for sample selection bias in quantile regression. In responding to this shortcoming, this study investigates the impact of childbirth count on the distribution of women's labour income using quantile regression while correcting for sample selection bias.

4.3 Research Methodology

4.3.1 Data

The study uses a dataset from the South Africa National Income Dynamics Study (NIDS) 2008 to 2017 (i.e. Wave 1 to 5) (Dataset retrieved from <http://www.nids.uct.ac.za/nids-data/data-access>). NIDS is the first nationally representative panel study in South Africa. The study uses a penalised dataset to examine the effect of choice of the number of children on the distribution of mothers' labour income and accounts for a sample selection bias. The sample selection bias is likely to occur when some unemployed women and income are not accounted for. The motivation for the choice of the mother's age are discussed in the next paragraph.

4.3.2 Identification strategy and sample selection bias

The study identifies two main independent variables: the number of children (a continuous variable) and the children aged below six years (a dummy variable) on the mother's labour income. To estimate the mother's labour income from the cumulative number of children, the study selected females between 23 and 44 years as the sample of the population. This selection of this female age category is motivated by the fact that those below 23 years are likely to be in school studying for a career path. A considerable number of young graduates complete their first degree and start motherhood in South Africa after the age of 22 (Marteleto et al., 2008). More so, the current study points to the fact that a female at age 22 is youthful (Madhavan & Thomas, 2005) or borderline,

and she may not be a mother yet. The maximum age of the mother is 44 years. The literature informed the choice of 44 years because the fertility risk increases as the women's age increases (Cavazos-Rehg et al., 2015; Glick et al., 2021) and the baseline age for maternal fertility (Kovac et al., 2013).

Furthermore, existing literature has used hourly log wages (Budig & Hodges, 2010), but the study does not account for inflation in labour income received over time. This current study uses the log of real labour income (log labour income divided by deflator and uses 2017 as the base year). The study computed real labour income by using a deflator¹⁶ to divide the nominal labour income. The study follows the definition of labour income in the NIDS user manual (Brophy et al., 2018). According to Brophy et al. (2018), "the household income comprises labour income, government grant income, other income from the government, investment incomes¹⁷, remittance income, subsistence agricultural income and imputed rental. The labour market income consists of a main and second job, casual wages, self-employment, 13th cheque, bonus payment, profit share, help friends and extra piece-rate incomes."

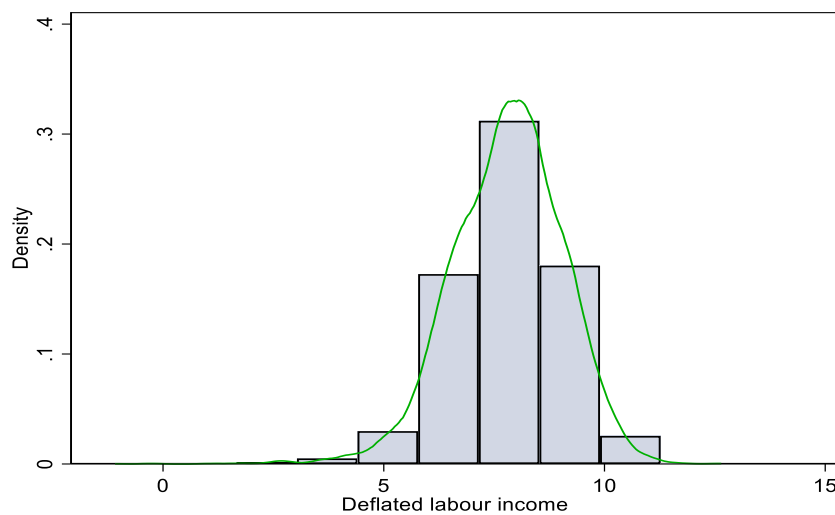


Figure 4.1 Histogram of mother labour income computed by the Author

¹⁶ For a technical application of how a deflator is computed, see De Villiers et al. (2013)

¹⁷ The investment income comprises dividend and rental incomes

Figure 4.1 presents the histogram of the mother's labour income. The log of deflated labour income ranges between -1.09 and 12.644, and the histogram shows a normally distributed income.

However, sample selection bias could arise due to some reasons or scenarios. The labour income may not be determined strictly by labour participation but by rental income, among other variables. The outcome (mother's labour income) is assumed to be determined by participation in the labour market, which has many missing values in the observation. The mother's labour income is the outcome variable of interest, and truncation depends on it because it is not always observed (due to missing data). Therefore, this study assumes sample selection bias. Having looked at other related studies, such as Budig and Hodges (2010) and Miller (2011), the study identified other influential variables such as education, mother's age, dwelling, and mother's health status, among others. The study generates years of experience (or job tenure) from the year of the interview minus when the primary occupation or job starts (date) condition on where the individual is currently being paid. In addition, the generation of the year of experience variable has much missing value because the job starting dates are not recorded for self-employed and casual workers. Eventually, this variable was not included in the primary analysis. The study creates an index of the women's decision-making using multiple correspondence analysis (MCA) from five decision-making variables, which include who decides on the day-to-day expenditure, who decides on large unusual purchases, who decides on where children go to school, which members are allowed to live in the household, and who decides on where the family should live. The standard deviation of the women's decision-making (or autonomy) index is one (1), and the mean is zero (0).

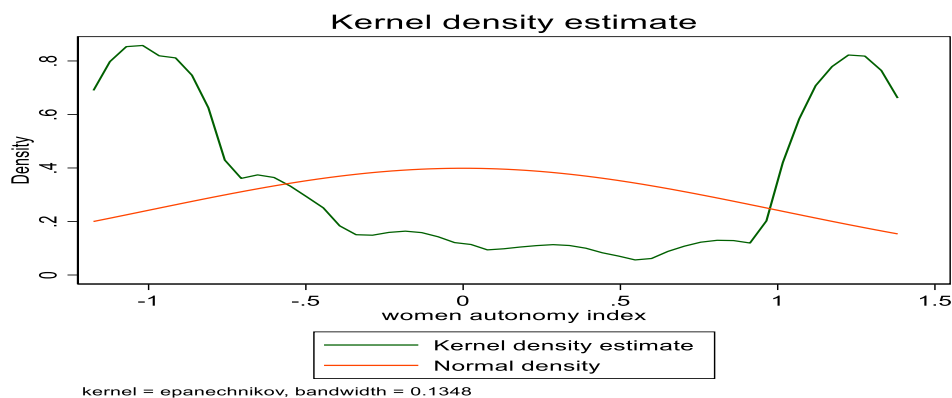


Figure 4.2 Kernel density of women's decision-making index computed by the Author

The kernel density of women's decision-making index presented is normally distributed (see Figure 4.2)

4.3.3 Motivation for exclusion restriction

Selection into the labour income equation relies on the mother's participation. In the process, sample selection bias exists, which can also be referred to as endogeneity bias. For instance, there is the possibility that some mothers may receive income from other means, such as rent, and so they do not participate in the labour market. As earlier mentioned, the composition of labour income includes self-employment income, bonus payment, profit sharing, and help from a friend's income. Hence, an individual with such an income may be subjective in her decision and not motivated to participate in the labour market. Also, some mothers may not be employed in the NIDS (2008) wave 1 but may later participate in the labour market in waves 3 and 4, but not in NIDS (2017) wave 5. Mothers may make a tradeoff between labour participation and child care. It is a concern whether the mother's labour income is accounted for.

According to Koné et al. (2019), exogenous variables in the income equation are assumed to be a set of exogenous variables in the selection equation. Hence, the variables predicting the income equation are similarly likely to predict selection. Exclusion restriction is significant because, without it, it may be hard to be assured of the result (Wooldridge, 2011). Wooldridge (2010) assumes the exclusion restrictions should be at least two variables. While one variable should be an instrument, another exogenous variable should determine selection. Marital status is assumed to be the exclusion variable in this study. The motivation for this is that married and/or cohabiting women are likely to be unstable at work due to the care of their child or family welfare. There is also a probability of a tradeoff between time spent at work and childcare at home for married women. They are more likely to take maternity leave and sick leave. Hence, marital status may influence labour participation. In the application, marriage and cohabiting are strongly significant in the selection equation, certifying exclusion restriction variables. The study follows the Heckman two-step model and generates the inverse Mills ratio (see: Tauchmann 2010 for details).

Hence, the Mills ratio as a variable is included in the estimation to control for sample selection bias, even in the quantile regression.

4.3.4 Econometric strategy

The study model is specified as follows:

$$\ln Y_{it}^* = \beta_0 + \beta_1 X_{it} + \varepsilon_{it} \quad (4.1)$$

Where $\ln Y_{it}$ is the natural logarithm of the mother's labour income, the dependent variable $i = 1, \dots, n$ is the sample from the population. X_{it} consists of regressors the number of children and age of the children below 6 years, and other covariates (maternal education, mother's age, married and cohabiting status, geographical location, province, and job characteristics). ε_{it} is the residual for the sample.

The study employs the Heckman selection model (Gronau 1974; Heckman 1976) to investigate sample selection bias in the effect of the number of children on a mother's labour income. The labour income equation is expressed as:

$$\ln Y_{it}^* = X_{it}\beta_1 + u_{1it} \quad (4.2)$$

However, labour income is not always observed. The labour income for observations is perceived if the mother participates in the labour market (the selection = x_{it}) is

$$x_{it}^* = z_{it}\gamma_1 + u_{2it} \quad (4.3)$$

where $\text{corr}(u_{1it}, u_{2it}) = \rho$.

The Heckman model yields a reliable, asymptotic efficient analysis for all the coefficients in the model. In the application, similar covariates affect both income and the selection equation. However, one or more variables must be included in the selection equation (Buchinsky, 1998) but excluded in the income equation, that is, an exclusion restriction variable. Furthermore, the study investigates the effect of the number of children on the mother's labour income distribution using a conditional (10th – 90th) quantile regression (Buchinsky, 1998; Koenker, 2004; Budig & Hodges, 2010).

4.4 Summary Statistics

Table 4.1 presents the summary statistics of the variables of interest. The female labour participation is a binary variable. The average proportion of those participating is 40.3%, and the non-participants are 59.7%. Female labour participation is low, and existing studies have revealed that females are more unemployed than males (Banerjee et al., 2008; Viljoen & Dunga, 2013). This points to the fact that female unemployment is increasing, and they are vulnerable when there is a social and economic imbalance.

The explanatory variable is the number of children. The number of children is a discrete numerical variable with a minimum of one child and a maximum of nine in the household. In addition, a binary category of the age of the children is generated. The average of those children aged below six years is about 41.4% and 58.6%. It is assumed that mothers with preschool-age children are likely to pay a more significant motherhood penalty compared to those that have older children. A large percentage of females have an education above the primary level. This may have been reflected in the geographical location where the average (50.6%) resides in urban areas.

Furthermore, about 83.6% of the sample are black South Africans. In contrast, Coloured females are at 14.1%, whites are 1.5%, and Indians are 0.8% of the sample. The family structure consists of married, cohabiting, widowed, divorced and single mothers in our sample. However, there is a possibility of change in the family structure over a period, as those that were not married in the 2008 wave might have been married in 2017. Repositioning is inevitable; hence, this may affect the sample selection. The average of married people is 27.7%, and 10.7% cohabiting with a partner. A large proportion of the family structures are headed by single mothers (56.8%). The divorcées

and widows are 2% and 2.8%, respectively, of the sample. Looking at the proportion of provinces, Kwazulu- Natal (28.7%) has the most in the sample, followed by Gauteng (11.4%). The wave dummies show that the dataset increases from one wave to another, except for wave 5, which is slightly lower than wave 4. The total number of observations is 13017, but the key variable, the mother's labour income, is lower because of missing values (Miller, 2011). In addition, the year of experience in the current job has about a 70% reduction in the observations compared to the number of identification and some variables. Women's decision-making index was created from five related decision-making variables using multiple correspondence analysis (MCA). The decision-making index has a mean of zero (0) and a standard deviation of one (1). The women in the sample are not likely to struggle in decision-making in the household because they have the education to supply the ability to make personal decisions.

Table 4.1 Descriptive Statistics

Variables	Obs.	Mean	Std.Dev.	Min.	Max.
Dependent Variable					
Log of mother's labour income	5171	7.327	1.17	-0.364	11.68
Independent Variables					
Number of children	12954	2.104	1.155	1	9
Children Aged below 6 years	13263	0.414	0.493	0	1
Ever birth	13262	0.991	0.097	0	1
Labour market					
Female labour participation	13263	0.403	0.491	0	1
Years of experience in current job	4000	4.668	5.038	0	33
Education					
No schooling	13263	0.031	0.173	0	1
Primary	13263	0.083	0.277	0	1
Primary but below matric	13263	0.509	0.500	0	1
Matric	13263	0.188	0.391	0	1
Post matric	13263	0.166	0.372	0	1
University	13263	0.021	0.145	0	1
Others diploma	13263	0.001	0.038	0	1
Family structure					
Married	13263	0.277	0.448	0	1
Cohabiting	13263	0.107	0.309	0	1
Widow	13263	0.028	0.165	0	1
Divorce	13263	0.02	0.139	0	1
Single	13263	0.568	0.495	0	1

Race					
African	13263	0.836	0.371	0	1
Indian	13263	0.008	0.089	0	1
White	13263	0.015	0.121	0	1
Coloured	13263	0.141	0.348	0	1
Demographic Factors					
Child's Gender	13263	0.5	0.5	0	1
Child's age	13263	6.805	4.006	0	14
Mother's age	13263	32.811	6.062	23	44
Mother's health status	13263	0.92	0.271	0	1
Life satisfaction	13263	0.595	0.491	0	1
Women's decision-making index	13263	0	1	-1.04	1.247
Daily household expenditures	13263	0.511	0.5	0	1
Decision on large unusual purchases	13263	0.427	0.495	0	1
Decision on where children go to school	13263	0.567	0.496	0	1
Decision on where household should live	13263	0.397	0.489	0	1
Who is allowed to live in a household	13263	0.403	0.491	0	1
Geographical location					
Farm	13263	0.060	0.238	0	1
Urban	13263	0.506	0.500	0	1
Traditional	13263	0.433	0.496	0	1
Job Characteristics / Primary occupation					
Private household Exterritorial org	13263	0.039	0.193	0	1
Agriculture hunting, forestry and fish	13263	0.023	0.15	0	1
Mining and quarrying	13263	0.004	0.064	0	1
Manufacturing	13263	0.024	0.153	0	1
Electricity gas & water supply	13263	0.002	0.041	0	1
Construction	13263	0.007	0.082	0	1
Wholesale and retail trade	13263	0.007	0.082	0	1
Transport storage and communication	13263	0.066	0.249	0	1
Financial intermediation insurance	13263	0.004	0.066	0	1
Community social & per.	13263	0.024	0.153	0	1
Provinces					
Western Cape	13263	0.11	0.313	0	1
Eastern Cape	13263	0.106	0.308	0	1
Northern Cape	13263	0.075	0.264	0	1
Free State	13263	0.059	0.237	0	1
KwaZulu-Natal	13263	0.287	0.453	0	1
Northwest	13263	0.075	0.264	0	1
Gauteng	13263	0.114	0.318	0	1
Mpumalanga	13263	0.077	0.266	0	1
Limpopo	13263	0.096	0.295	0	1

4.5 Empirical analysis

In this section, the study presents the estimations. First, the study estimates a similar model without including years of experience, correcting for selection bias. Second, the study creates a mills ratio, and the last analysis included the mills' ratio and corrected for sample selection bias. In addition, the study reports a marginal effect of the age and the children on the mother's labour income. It is noteworthy that the inclusion of the year of experience in the current job constraints the empirical results¹⁸. Hence, the main results presented in the study.

4.5.1 Without correcting for sample selection

Table 4.2 presents the effect of the number of children on the mother's labour income using pooled ordinary least squares (OLS) with robust standard error and quantile regression bootstrapped. Column (1) of the OLS results reports that the cumulative number of children has a significant negative relationship with the mother's labour income. This implies that the cumulative effect of the number of children reduces the mother's labour income by 3.2%. The children under six years have a negative relationship with the mother's labour income, but it is not statistically significant. The mother's age, education and health significantly positively affect the labour income. This implies that education and a good state of health are likely to increase labour income. Women's decision-making has a positive but insignificant relationship with labour income. The African and Coloured groups have a significant negative association with the mother's labour income. In addition, the geographical location of those in an urban environment indicates that living in an

¹⁸ In the appendix 4 Table 4.1A, the study presents the estimation that included year of experience on the current job. The year of experience has a positive significant relationship and heterogeneous effect on the mother labour income. The inclusion of the year of experience in the model for the correction of sample selection bias shows that children aged below six years has a significant positive and varied effect on mother labour income using OLS and quantile regression respectively. Without correcting for sample selection bias, the result shows that children aged less than 6 years has a negative relationship and varied effect on the distribution of mother labour income, but it is not statistically significant. This result does not make sense. Therefore, the year of experience on the current job was not included in the main result presented in this current study.

urban location improves labour income. For those living traditionally, the result shows that it has a positive relationship with labour income, but it is not statistically significant. In addition, for mothers in the Free State, the result indicates a significant negative relationship with labour income. Hence, *ceteris paribus*, using the OLS, is unlikely not to be biased, and there is a clear indication that without correcting for sample selection bias, the results may be doubtful.

Columns (2) to (10) present the estimation of the mother's labour income distribution from the cumulative effect of the number of children using a quantile regression bootstrapped. The results indicate that the cumulative effect of the number of children significantly negatively affects the distribution of the mother's labour income. This implies that the cumulative effect of the number of children will put mothers at a disadvantage in labour income distribution even without correcting for sample selection bias. However, the children below six years harm the mother's labour income of those assumed to be lower income earners, but it is not statistically significant. At the same time, children aged below six years have a positive effect on the labour income distribution of those on 0.2 to 0.9 quantiles without sample selection, albeit not statistically significant. Typically, children under six years are likely to be preschool children. Invariably, the mothers of those children are likely to spend more time preparing them for crèche or preschool and take and fetch them from school daily. Some women may be nursing their child at this age if the child's age is between zero and the first six months. Mothers in this group are expected to be on maternity leave; hence, they are likely to participate less in the labour market, and less income is expected. More so, there will be a break in career progression (Knoef & Been, 2014) for the care of their child or children aged below six years. Women's decision-making has a varying effect on labour income. The study finds that those from 0.5 and 0.7 quantiles significantly positively affect their labour income. Mothers with some level of decision-making are likely to participate in the labour market and earn income. However, the result may not be consistent without correcting for sample selection bias.

Table 4.2 Quantile regression without correcting for sample selection bias

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90
Variables	Labour income	Labour income	Labour income	Labour income	Labour income	Labour income	Labour income	Labour income	Labour income	Labour income
Number of children	-0.032** (0.013)	-0.052*** (0.019)	-0.052*** (0.018)	-0.056*** (0.017)	-0.042*** (0.015)	-0.031** (0.013)	-0.033** (0.013)	-0.034** (0.014)	-0.030 (0.021)	-0.033* (0.018)
Children Aged below 6 years	-0.009 (0.025)	-0.008 (0.038)	0.008 (0.034)	0.029 (0.031)	0.028 (0.024)	0.021 (0.028)	0.033 (0.023)	0.027 (0.031)	0.022 (0.020)	0.003 (0.031)
Education	0.369*** (0.013)	0.292*** (0.013)	0.313*** (0.019)	0.331*** (0.021)	0.345*** (0.016)	0.376*** (0.011)	0.383*** (0.012)	0.388*** (0.014)	0.393*** (0.014)	0.410*** (0.023)
Mother's age	0.019*** (0.002)	0.021*** (0.004)	0.014*** (0.003)	0.014*** (0.003)	0.016*** (0.002)	0.016*** (0.003)	0.017*** (0.003)	0.018*** (0.003)	0.020*** (0.003)	0.020*** (0.003)
Women's decision-making	0.014 (0.012)	0.001 (0.021)	0.006 (0.018)	0.017 (0.016)	0.015 (0.012)	0.032* (0.019)	0.031** (0.015)	0.033*** (0.011)	0.022* (0.013)	0.025 (0.018)
Race Ref. India										
African	-0.541*** (0.098)	-0.388* (0.199)	-0.623*** (0.199)	-0.587*** (0.103)	-0.540*** (0.141)	-0.525*** (0.071)	-0.444*** (0.114)	-0.457*** (0.158)	-0.508*** (0.164)	-0.576*** (0.172)
Coloured	-0.434*** (0.106)	-0.260 (0.235)	-0.397* (0.219)	-0.332*** (0.128)	-0.339** (0.156)	-0.342*** (0.076)	-0.306*** (0.113)	-0.327** (0.144)	-0.460*** (0.177)	-0.530*** (0.168)
White	0.133 (0.120)	0.349 (0.289)	0.202 (0.235)	0.206* (0.106)	0.211 (0.192)	0.187** (0.080)	0.202* (0.111)	0.138 (0.189)	0.063 (0.197)	0.017 (0.181)
Mother's health status	0.214*** (0.054)	0.324** (0.128)	0.167*** (0.059)	0.221*** (0.049)	0.245*** (0.059)	0.209*** (0.081)	0.179*** (0.049)	0.138** (0.067)	0.093 (0.064)	0.063 (0.076)
Geo. Location Ref: Farm										
Urban	0.211*** (0.053)	0.337*** (0.095)	0.349*** (0.091)	0.287*** (0.058)	0.194*** (0.041)	0.181*** (0.058)	0.143** (0.057)	0.094** (0.039)	0.124** (0.060)	0.096 (0.087)
Traditional	0.033 (0.057)	0.116 (0.098)	0.170 (0.113)	0.082 (0.061)	-0.014 (0.053)	-0.018 (0.059)	-0.019 (0.058)	-0.034 (0.040)	-0.004 (0.065)	-0.004 (0.066)
Job characteristics Ref: Private households exterritorial org										
Agriculture hunting forestry & f	0.694***	1.036***	0.877***	0.778***	0.712***	0.659***	0.640***	0.505***	0.438***	0.364***

	(0.051)	(0.098)	(0.082)	(0.045)	(0.049)	(0.046)	(0.051)	(0.051)	(0.049)	(0.059)
Mining and quarrying	1.598***	1.691***	1.657***	1.721***	1.723***	1.554***	1.555***	1.435***	1.370***	1.187***
	(0.103)	(0.256)	(0.156)	(0.210)	(0.101)	(0.097)	(0.119)	(0.090)	(0.122)	(0.136)
Manufacturing	0.793***	1.069***	0.912***	0.781***	0.801***	0.753***	0.757***	0.637***	0.608***	0.527***
	(0.045)	(0.100)	(0.062)	(0.055)	(0.046)	(0.054)	(0.029)	(0.034)	(0.060)	(0.081)
Electricity gas and water supply	1.130***	1.304***	1.105***	0.913***	1.059***	1.036***	1.167***	1.084***	1.067***	0.886***
	(0.166)	(0.163)	(0.127)	(0.217)	(0.336)	(0.285)	(0.251)	(0.278)	(0.175)	(0.328)
Construction	0.702***	0.714***	0.508***	0.475***	0.647***	0.625***	0.724***	0.594***	0.552***	0.820***
	(0.101)	(0.191)	(0.106)	(0.123)	(0.136)	(0.078)	(0.131)	(0.072)	(0.181)	(0.200)
Wholesale and retail trade	0.704***	1.023***	0.850***	0.768***	0.744***	0.616***	0.602***	0.526***	0.469***	0.415***
	(0.034)	(0.068)	(0.037)	(0.046)	(0.041)	(0.029)	(0.034)	(0.038)	(0.037)	(0.039)
Transport storage & comm.	1.159***	1.296***	1.142***	1.044***	1.135***	1.085***	1.012***	1.004***	0.952***	1.141***
	(0.093)	(0.178)	(0.116)	(0.101)	(0.128)	(0.118)	(0.094)	(0.116)	(0.211)	(0.169)
Financial intermediation	1.015***	1.352***	1.141***	1.008***	0.962***	0.866***	0.846***	0.827***	0.764***	0.728***
	(0.045)	(0.106)	(0.057)	(0.041)	(0.039)	(0.050)	(0.059)	(0.062)	(0.045)	(0.141)
Community social & personal	0.821***	0.722***	0.690***	0.705***	0.782***	0.814***	0.842***	0.821***	0.817***	0.742***
	(0.035)	(0.088)	(0.056)	(0.051)	(0.047)	(0.047)	(0.042)	(0.037)	(0.036)	(0.046)
Province Ref. Western Cape										
Eastern Cape	-0.043	-0.023	-0.104*	-0.006	0.004	0.003	-0.047	-0.073	-0.124***	-0.146
	(0.054)	(0.123)	(0.063)	(0.059)	(0.079)	(0.047)	(0.071)	(0.077)	(0.047)	(0.098)
Northern Cape	-0.018	0.032	-0.031	-0.026	-0.011	0.026	-0.041	-0.094	-0.098	-0.060
	(0.049)	(0.108)	(0.061)	(0.068)	(0.063)	(0.061)	(0.051)	(0.069)	(0.064)	(0.089)
Free State	-0.148**	-0.074	-0.101	-0.144**	-0.130	-0.127	-0.118*	-0.115	-0.126*	-0.106
	(0.064)	(0.137)	(0.071)	(0.061)	(0.080)	(0.095)	(0.068)	(0.080)	(0.074)	(0.075)
KwaZulu-Natal	0.060	0.137	0.126**	0.169**	0.151**	0.111**	0.039	0.021	-0.045	-0.077
	(0.052)	(0.112)	(0.061)	(0.084)	(0.071)	(0.053)	(0.049)	(0.059)	(0.052)	(0.051)
Northwest	0.162**	0.283**	0.162**	0.224**	0.186**	0.175***	0.134*	0.115*	0.100	0.015
	(0.063)	(0.134)	(0.070)	(0.107)	(0.083)	(0.062)	(0.079)	(0.059)	(0.079)	(0.071)
Gauteng	0.193***	0.389***	0.250***	0.296***	0.231***	0.213***	0.159***	0.121*	0.093*	0.135**
	(0.051)	(0.093)	(0.060)	(0.063)	(0.055)	(0.050)	(0.041)	(0.064)	(0.052)	(0.063)
Mpumalanga	0.088	0.254**	0.111	0.165**	0.081	0.055	-0.000	0.055	0.035	0.076
	(0.059)	(0.114)	(0.092)	(0.079)	(0.050)	(0.053)	(0.059)	(0.064)	(0.086)	(0.079)
Limpopo	-0.211***	-0.128	-0.208***	-0.173**	-0.133*	-0.156*	-0.131**	-0.143*	-0.130*	-0.167**

Wave Ref. Wave 1 dummy	(0.069)	(0.139)	(0.057)	(0.086)	(0.074)	(0.080)	(0.058)	(0.077)	(0.072)	(0.065)
Wave 2 dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wave 3 dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wave 4 dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wave 5 dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Married	0.088*** (0.029)	0.085* (0.046)	0.108** (0.045)	0.151*** (0.048)	0.130*** (0.031)	0.100*** (0.028)	0.077** (0.035)	0.069* (0.038)	0.072** (0.031)	0.045 (0.030)
Cohabiting	-0.042 (0.038)	-0.059 (0.062)	-0.040 (0.077)	-0.054 (0.056)	-0.057 (0.048)	-0.046 (0.032)	-0.049 (0.047)	-0.039 (0.050)	0.021 (0.044)	0.017 (0.045)
Constant	4.680*** (0.157)	3.375*** (0.302)	4.387*** (0.311)	4.516*** (0.167)	4.616*** (0.194)	4.811*** (0.153)	4.928*** (0.150)	5.223*** (0.263)	5.421*** (0.166)	5.815*** (0.213)
Observations	5,058	5,058	5,058	5,058	5,058	5,058	5,058	5,058	5,058	5,058
R-squared	0.510									

All standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

4.5.2 Heckman sample selection with two-step option

Table 4.3 presents the estimation of the Heckman sample selection with a two-step option result. Column (1) shows the labour income model, which consists of variables such as the number of children, mother's education, mother's age, women's decision-making, geographical location, provinces, and job characteristics. The result shows that the number of children significantly negatively influences the mother's labour income. This means that when the number of children increases, there is a probability that the mother's labour income will be reduced. The inverse Mills ratio or lambda is also statistically significant; hence, the exclusion restrictions assumption is satisfied, and there is a sample selection bias in the form of missing values in the outcome variable. Furthermore, the inverse Mills ratio generated was included in the quantile regression model to correct the sample selection bias. The dataset consists of 13263 observations in the sample, 5058 observations are included in the analysis without correcting for selection bias, and about 13150 observations are included in two steps Heckman selected into the labour income equation; therefore, about 8205 observations are missing (or omitted values).

Table 4.3 column (2) presents the selection model comprised of a dummy of labour market income as opposed dummy of labour participation. Other variables include the exclusion restrictions (married and cohabiting), women's decision-making, children aged below six years, race, mother's health, dwelling, province women's decision-making and waves dummies. The exclusion restrictions are variables that are not included in the first (or labour income) model (Certo et al., 2016), which are strongly significant in the model. The results reveal that children aged below six years have a significant negative influence on the mother's labour participation. Conversely, a mother's participation in the labour market outside the home may be detrimental to children's early childhood development. The current study has reported that a mother's presence is vital for children's health, cognitive development, and responsiveness (Ruhm, 2004; Gupta et al., 2008). The following paragraph explains the results of the corrected sample selection. The results clearly distinguish between without and correcting for sample selection bias in estimating a mother's labour income from the effect of the number of children and preschool-age children.

Table 4.3 Heckman Selection bias two-step

Variables	(1) Labour income	(2) Selection
Number of children	-0.0310** (0.0121)	
Children aged below 6 years	-0.0953** (0.0390)	-0.151*** (0.0252)
Education	0.545*** (0.0551)	0.325*** (0.0123)
Mother's age	0.0368*** (0.00565)	0.0322*** (0.00226)
Women's decision-making	0.0860*** (0.0276)	0.136*** (0.0125)
African	-0.471*** (0.145)	0.181 (0.131)
Coloured	-0.257 (0.163)	0.398*** (0.137)
White	0.261 (0.170)	0.313* (0.162)
Mother's health status	0.348*** (0.0666)	0.234*** (0.0450)
Urban	0.139** (0.0599)	-0.126** (0.0505)
Traditional	-0.267** (0.109)	-0.533*** (0.0530)
Agriculture hunting forestry	0.686*** (0.0536)	
Mining and quarrying	1.600*** (0.116)	
Manufacturing	0.794*** (0.0507)	
Electricity gas and water supply	1.123*** (0.189)	
Construction	0.692*** (0.0885)	
Wholesale and retail trade	0.708*** (0.0353)	
Transport storage and comm.	1.151*** (0.112)	
Financial intermediation ins.	1.019*** (0.0531)	
Community social and perso.	0.819*** (0.0324)	

Eastern Cape	-0.151** (0.0702)	-0.216*** (0.0573)
Northern Cape	-0.170** (0.0748)	-0.289*** (0.0549)
Free State	-0.252*** (0.0778)	-0.208*** (0.0656)
KwaZulu-Natal	-0.0168 (0.0612)	-0.134** (0.0544)
Northwest	-0.00832 (0.0896)	-0.300*** (0.0654)
Gauteng	0.121* (0.0635)	-0.128** (0.0568)
Mpumalanga	0.0322 (0.0696)	-0.0993 (0.0632)
Limpopo	-0.308*** (0.0778)	-0.186*** (0.0646)
Wave 2 dummy	0.150*** (0.0554)	-0.137*** (0.0433)
Wave 3 dummy	0.500*** (0.0474)	-0.0291 (0.0413)
Wave 4 dummy	0.838*** (0.0496)	0.115*** (0.0398)
Wave 5 dummy	1.053*** (0.0470)	0.0528 (0.0405)
Married		-0.103*** (0.0287)
Cohabiting		-0.101** (0.0398)
Constant	2.889*** (0.593)	-2.064*** (0.174)
Observations	5058	13,150
lambda/mills ratio	0.846*** (0.264)	
rho	0.799	
sigma	1.058	

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

4.5.3 With correction for sample selection

Table 4.4 shows that the cumulative effect of the number of children has a significant negative relationship with the mother's income using OLS in Column (1). The cumulative effect of the number of children may be a constraint, reducing the full utilization of women's educational capacity and shrinking their income. This result is compatible with the findings of Budig and Hodges (2010), namely, that the number of children disadvantages the mother in the issues of labour income. Furthermore, the class of children under six years has a significant negative relationship with their mother's labour income. In other words, a unit increase in preschool-age children is likely to reduce the mother's labour income after correcting for sample selection bias. This implies that women with preschool-age children tend to spend more time on childcare, which is likely to reduce the time available for labour participation and invariably reduce labour income.

The mother's educational attainment tends to increase the labour income; however, sample selection bias overestimates the result without correcting for sample selection bias. The findings support the findings of Miller (2011), who established that educated women have an advantage in labour earnings. Also, the results show that the mother's age has a great potential to influence their labour income (Sheran, 2007). At the same time, the African (57.7%) and Coloured (48.3%) groups have a significant negative relationship with the mother's labour income compared to India, *ceteris paribus*. The historical antecedent of apartheid has ended, but the lingering effect of income inequality remains pronounced among the racial groups for black (African).

Furthermore, the mothers living in an urban location are likely to experience an increase in their labour income compared to a farming area. Those in the traditional location are likely to have an insignificant increase in income as compared to a farming location. Living in an urban environment may relatively reduce travelling time and mobility costs, which compensate for a lower worker income. The urban location result is consistent with and without correcting for sample selection bias, and the literature indicates that the income grows with urban mass for the benefit of labour (Di Addario & Patacchini, 2008). There is a high chance that those mothers living in a traditional location in South Africa face a high cost of mobility. This implies that they are likely to reside far distance from their workplace. Mothers in the Free State (14.5%) and the Limpopo (20.7%) are likely to receive less labour income than in the Western Cape. At the same time, those in Gauteng

(19.2%) and Northwest (15.9%) are likely to show an improvement in their labour income. The results of the provinces also point to the fact that correcting for sample selection is important.

Furthermore, Table 4, columns (2) to (10), presents quantile regression correcting for sample selection bias. The quantile regression analysis shows that the cumulative effect of the number of children has a significant negative effect (with an irregular pattern) on the mother's labour income distribution, all things being equal. This finding is like that of Budig and Hodges (2010), who reported that mothers are largely at an income disadvantage, especially those with the lowest income distribution. There is a notable change in the effect of children aged below six years on the labour income distribution between uncorrected and corrected sample selection at all quantiles. The children below six years hurt the mother's labour income, albeit it is not statistically significant at the lower and upper-income distributions.

The mother's age and education significantly positively affect the mother's labour income distribution with a higher degree of variation after correcting for sample selection bias. The positive effects of mothers' health status on their labour income distribution are fairly stronger after correcting for sample selection bias. Women's decision-making positively influences the labour income of those who are likely to be high-income receivers. The higher earners may have high savings in their bank account, even when the child of care increases their expenses and reduce time because they are likely to decide to buy expensive child-mother products. The upper-income earners are also more likely to increase their maternity leave and stay at home (Simonsen & Skipper, 2012).

Also, living in an urban area significantly affects the mother's labour income distribution. Therefore, the analysis could have presented overestimated results without correcting sample selection bias. This study found that job characteristics have a significant positive effect on the mother's labour income distribution after correcting for sample selection bias. This implies that the opportunity to participate in the labour market will increase the mother's labour income.

Table 4.4 Heckman Model correcting for sample selection bias in Quantile regression

Variables	(1) OLS Labour income	(2) 0.10 Labour income	(3) 0.20 Labour income	(4) 0.30 Labour income	(5) 0.40 Labour income	(6) 0.50 Labour income	(7) 0.60 Labour income	(8) 0.70 Labour income	(9) 0.80 Labour income	(10) 0.90 Labour income
Number of children	-0.031** (0.012)	-0.051* (0.027)	-0.052*** (0.018)	-0.044*** (0.015)	-0.031** (0.014)	-0.028** (0.014)	-0.027** (0.013)	-0.040*** (0.013)	-0.023* (0.014)	-0.035** (0.017)
Children aged below 6 years	-0.097*** (0.034)	-0.111 (0.076)	-0.061 (0.053)	-0.064 (0.044)	-0.093** (0.041)	-0.079** (0.039)	-0.054 (0.038)	-0.054 (0.037)	-0.046 (0.039)	-0.079 (0.048)
Education	0.550*** (0.049)	0.466*** (0.110)	0.484*** (0.076)	0.538*** (0.063)	0.581*** (0.059)	0.591*** (0.056)	0.561*** (0.055)	0.548*** (0.053)	0.520*** (0.056)	0.557*** (0.069)
Mother's age	0.037*** (0.005)	0.035*** (0.011)	0.032*** (0.008)	0.035*** (0.006)	0.039*** (0.006)	0.038*** (0.006)	0.035*** (0.006)	0.035*** (0.005)	0.033*** (0.006)	0.034*** (0.007)
Women's decision-making	0.088*** (0.025)	0.086 (0.055)	0.083** (0.038)	0.091*** (0.031)	0.108*** (0.030)	0.115*** (0.028)	0.104*** (0.027)	0.104*** (0.026)	0.074*** (0.028)	0.094*** (0.035)
Race Ref. India										
African	-0.470*** (0.102)	-0.391 (0.275)	-0.460** (0.190)	-0.543*** (0.158)	-0.420*** (0.149)	-0.446*** (0.140)	-0.391*** (0.137)	-0.372*** (0.132)	-0.457*** (0.140)	-0.467*** (0.174)
Coloured	-0.253** (0.121)	-0.143 (0.311)	-0.093 (0.215)	-0.178 (0.178)	-0.065 (0.169)	-0.120 (0.159)	-0.136 (0.155)	-0.158 (0.150)	-0.316** (0.158)	-0.337* (0.197)
White	0.263** (0.126)	0.431 (0.320)	0.498** (0.221)	0.355* (0.183)	0.392** (0.173)	0.375** (0.163)	0.348** (0.159)	0.296* (0.154)	0.131 (0.163)	0.197 (0.202)
Mother's health status	0.350*** (0.065)	0.454*** (0.131)	0.281*** (0.090)	0.385*** (0.075)	0.409*** (0.071)	0.355*** (0.067)	0.299*** (0.065)	0.247*** (0.063)	0.177*** (0.067)	0.186** (0.083)
Geographical Location Ref: Farm										
Urban	0.138** (0.056)	0.241** (0.116)	0.279*** (0.080)	0.196*** (0.066)	0.094 (0.063)	0.075 (0.059)	0.079 (0.058)	0.037 (0.056)	0.089 (0.059)	0.031 (0.073)
Traditional	-0.273*** (0.099)	-0.200 (0.215)	-0.111 (0.148)	-0.278** (0.123)	-0.416*** (0.116)	-0.410*** (0.110)	-0.327*** (0.107)	-0.317*** (0.103)	-0.211* (0.109)	-0.262* (0.136)

Job characteristics Ref: Private households extraterritorial org

Agriculture hunting forestry & f	0.686*** (0.050)	1.047*** (0.120)	0.870*** (0.083)	0.813*** (0.069)	0.703*** (0.065)	0.663*** (0.061)	0.622*** (0.060)	0.502*** (0.058)	0.442*** (0.061)	0.376*** (0.076)
Mining and quarrying	1.600*** (0.104)	1.646*** (0.255)	1.677*** (0.176)	1.682*** (0.146)	1.723*** (0.138)	1.589*** (0.130)	1.549*** (0.127)	1.449*** (0.123)	1.384*** (0.130)	1.171*** (0.161)
Manufacturing	0.795*** (0.045)	1.100*** (0.112)	0.928*** (0.077)	0.811*** (0.064)	0.805*** (0.061)	0.758*** (0.057)	0.730*** (0.056)	0.653*** (0.054)	0.581*** (0.057)	0.537*** (0.071)
Electricity gas and water supply	1.122*** (0.166)	1.346*** (0.396)	1.172*** (0.273)	1.028*** (0.227)	1.049*** (0.215)	1.053*** (0.202)	1.181*** (0.197)	0.998*** (0.191)	1.021*** (0.202)	0.879*** (0.251)
Construction	0.692*** (0.100)	0.793*** (0.198)	0.523*** (0.137)	0.509*** (0.114)	0.646*** (0.107)	0.665*** (0.101)	0.709*** (0.099)	0.607*** (0.096)	0.552*** (0.101)	0.819*** (0.126)
Wholesale and retail trade	0.709*** (0.034)	1.018*** (0.078)	0.873*** (0.054)	0.779*** (0.045)	0.737*** (0.042)	0.626*** (0.040)	0.595*** (0.039)	0.529*** (0.038)	0.469*** (0.040)	0.420*** (0.049)
Transport storage & comm.	1.151*** (0.092)	1.292*** (0.241)	1.195*** (0.166)	1.090*** (0.138)	1.101*** (0.131)	1.078*** (0.123)	1.014*** (0.120)	1.005*** (0.116)	0.958*** (0.123)	1.145*** (0.153)
Financial intermediation ins.	1.019*** (0.045)	1.358*** (0.115)	1.154*** (0.079)	1.051*** (0.066)	0.974*** (0.062)	0.893*** (0.059)	0.861*** (0.057)	0.849*** (0.055)	0.750*** (0.058)	0.743*** (0.073)
Community social & personal s	0.819*** (0.035)	0.740*** (0.071)	0.710*** (0.049)	0.727*** (0.041)	0.768*** (0.039)	0.799*** (0.036)	0.848*** (0.035)	0.829*** (0.034)	0.804*** (0.036)	0.750*** (0.045)
Province Ref. Western Cape										
Eastern Cape	-0.152** (0.062)	-0.139 (0.135)	-0.172* (0.093)	-0.092 (0.077)	-0.138* (0.073)	-0.116* (0.069)	-0.155** (0.067)	-0.193*** (0.065)	-0.193*** (0.068)	-0.245*** (0.085)
Northern Cape	-0.173*** (0.065)	-0.117 (0.145)	-0.184* (0.100)	-0.183** (0.083)	-0.225*** (0.078)	-0.166** (0.074)	-0.224*** (0.072)	-0.232*** (0.070)	-0.208*** (0.074)	-0.212** (0.092)
Free State	-0.253*** (0.070)	-0.142 (0.149)	-0.167 (0.103)	-0.236*** (0.085)	-0.253*** (0.080)	-0.222*** (0.076)	-0.248*** (0.074)	-0.249*** (0.072)	-0.194** (0.076)	-0.209** (0.094)
KwaZulu-Natal	-0.017 (0.055)	0.065 (0.117)	0.073 (0.081)	0.088 (0.067)	0.068 (0.063)	0.030 (0.060)	-0.028 (0.058)	-0.069 (0.056)	-0.087 (0.059)	-0.149** (0.074)
Northwest	-0.011 (0.077)	0.123 (0.176)	0.024 (0.121)	0.056 (0.101)	-0.008 (0.095)	-0.030 (0.090)	-0.049 (0.087)	-0.075 (0.085)	-0.003 (0.089)	-0.139 (0.111)
Gauteng	0.120** (0.054)	0.350*** (0.121)	0.194** (0.083)	0.208*** (0.069)	0.157** (0.065)	0.139** (0.062)	0.080 (0.060)	0.032 (0.058)	0.054 (0.061)	0.060 (0.076)
Mpumalanga	0.032	0.225* (0.121)	0.079 (0.083)	0.086 (0.069)	0.030 (0.065)	-0.008 (0.062)	-0.043 (0.060)	-0.042 (0.058)	0.004 (0.061)	-0.015 (0.076)

Limpopo	(0.061) -0.308*** (0.075)	(0.133) -0.180 (0.150)	(0.092) -0.274*** (0.104)	(0.076) -0.283*** (0.086)	(0.072) -0.272*** (0.081)	(0.068) -0.280*** (0.077)	(0.066) -0.213*** (0.075)	(0.064) -0.250*** (0.072)	(0.068) -0.191** (0.076)	(0.084) -0.252*** (0.095)
Wave Ref. Wave 1 dummy										
Wave 2 dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wave 3 dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wave 4 dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wave 5 dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mills ratio	0.864*** (0.235)	0.843 (0.529)	0.803** (0.365)	0.980*** (0.303)	1.090*** (0.286)	1.043*** (0.270)	0.876*** (0.264)	0.790*** (0.255)	0.613** (0.269)	0.720** (0.335)
Constant	2.847*** (0.518)	1.769 (1.179)	2.505*** (0.814)	2.395*** (0.676)	2.271*** (0.639)	2.631*** (0.602)	3.110*** (0.587)	3.549*** (0.568)	4.114*** (0.600)	4.284*** (0.747)
Observations	5,058	5,058	5,058	5,058	5,058	5,058	5,058	5,058	5,058	5,058
R-squared	0.510									

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

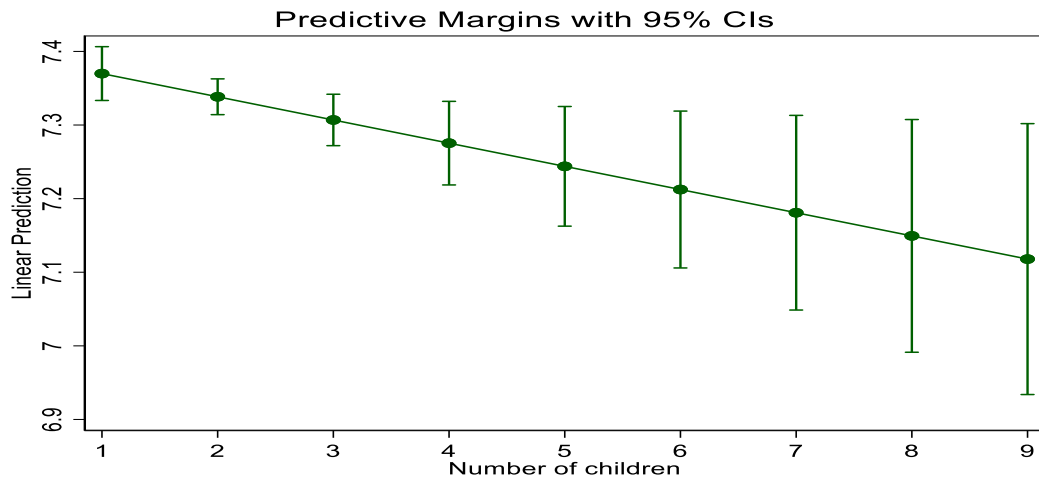


Figure 4.1 Visual effect of the Number of children

Figure 4.1 displays a visual presentation of the effect of the number of children on a mother's labour income. The marginal effect of the cumulative number of children decreases on the labour income, and the effect is not statistically significant difference from each other at 95% confidence intervals. The expected mother labour income reduced as the number of children gradually increased (Wrohlich, 2011).

4.6 Discussion

The study compared the results without and with correcting for sample selection, using the OLS and quantile regression in the study of the effect of the number of children on a mother's labour income. Our findings clearly show that the analysis presents overestimated results without correcting for sample selection bias. The current study accounts for inflation in labour income, which makes this study different from existing related studies. The findings point to two new pieces of evidence in the South African case. First, the results reveal that the number of children negatively and heterogeneously affects the mother's labour income distribution (Budig & Hodges, 2010). For the cumulative number of children, the findings show that women at the lowest income distribution (such as 0.20 and 0.30 quantiles) are largely disadvantaged in their labour income

compared to those on the other quantiles. This study explains a unique pattern of income inequality among mothers with the number of children in South Africa. Women that earn very little may not afford daycare or nanny (child cost), and they are likely to participate less in the labour market if they spend more time on childcare. Budig and Hodges (2010) in the United States found a similar result: the number of children explains women's earnings disadvantage in the lower-income distribution. It is noted in the literature that women at the lower quantiles of income distribution find it challenging to combine work and family (Budig & Hodges, 2010). However, it is important to point out that women are motivated differently to participate in the labour market, even with childcare. Hence, a balance between family responsibilities and labour market participation for women with some children (Kuziemko et al., 2018) is important.

Second, women with children below six years are largely disadvantaged in their labour income. This indicates that mothers with preschool-age children (in early childhood) demand physical (Budig & Hodges, 2010) and emotional attention for childcare. Mothers with children of preschool age are either likely to be nursing mothers or on maternity leave and, therefore, less likely to participate in the labour market. They are likely to face a problem of underutilization of potential or capacity. Those mothers in the upper-income distribution will likely trade off their time allocation between childcare and labour participation. Even having some children pose a long time adverse effect on the mother's potential and labour income (Zhu, 2012). The current results show that Black South African women with some children are largely disadvantaged in their labour income as compared to other groups. The findings further revealed that mothers suffer various degrees of labour income disadvantage by racial group. Whites have a greater advantage over other groups (Budig & England, 2001; Budig & Hodges, 2010). Also, the findings reveal across the income distribution, regardless of job characteristics, that mothers at the lowest income distribution are largely at a disadvantage.

Third, the study found that women's decision-making heterogeneity affects their income. This is compatible with the study of Debnath (2015). Van Biljon et al. (2018) remark in their study that women with some levels of decision-making are unlikely not to participate in the labour market and earn income. Women's decision-making will influence child education outcomes (Alfano et al., 2010).

4.7 Conclusion and Policy recommendations

This current study is the first to investigate the effect of the number of children on the mother's labour income distribution in the South African context and correct for sample selection bias by employing the Heckman selection model in quantile regression. The econometric findings show that one could have an overestimated effect on the number of children and underestimated children aged below six years on mothers' labour income without correcting for sample selection bias. The finding is that the cumulative number of children has a negative and irregular pattern on the mother's labour income distribution. Furthermore, the number of children tends to differentiate mothers economically. For instance, mothers with a limited number of children (e.g. less than 3) are likely to be better off economically. At the same time, those with an increased number of children (e.g. above 3) are likely to be worse economically unless they have resources from household income.

Notably, there may be a female income gap due to a break in career path and the underutilization of potential that arises from the cumulative effect of the number of children and preschool-age childcare. The findings also show that mothers at the lower income level might be Black, living in traditional locations and poor. The study proposed investment in a childcare centre and low-cost mobility or transport for those located in the traditional and farming environment. Finally, the findings reveal that there is a requirement for policies that enable flexible time management in the workplace for mother-child care.

The study suggests policies such as regular talks on family planning, as this is likely to reduce the cumulative effect of the number of children on mothers' labour income. Also, the study suggests that both government and the stakeholders in the labour market should support raising awareness of family planning and contraceptives. It is believed that higher education is likely to pave the way for labour market participation (Weiss et al., 2014). Also, the study suggests the protection of women through a vital labour market institution (Gammage et al., 2020). The country may learn from China's family planning (two-child) policy implemented in 2016 (Wang et al., 2017); perhaps, it may reduce the increase in the number of children and allow full labour participation of females after giving birth to two children. When the number of children is reduced, the

cumulative period spent during maternity leave will be reduced, and time for potential capacity development is likely to increase. The use of contraceptives should be encouraged (Pasha et al., 2015) and child spacing for a better health outcome for mother and child. Using contraceptives will reduce unplanned pregnancies and increase labour market participation (John et al., 2020). Invariably, non-economic (health) and economic policies should be considered necessary.

Furthermore, this study suggests capacity building and lifelong learning policies will limit the disadvantaged position mothers always find themselves in when they return to the labour market. Finally, this study suggests entrepreneurship development programmes for mothers are essential for them to become self-sufficient in generating an income and having time for the early childhood development of their children too.

CHAPTER FIVE

Overall Conclusion

5.1 Empirical Summary

The summary of this current study could take different patterns; however, Figure 5.1 describe the trajectory from the number of children (or childbirth count) through labour income to women's decision-making and child nutritional outcomes. The study indicated that the mother's labour income is negatively impacted by childbirth count (Budig & Hodges, 2014; Cukrowska-Torzewska, 2016). It is essential to know that women are primary caregivers, and women are expected to trade off time between childcare and labour participation to earn income. Therefore, the women's potential capacity may suffer inactive during childcare. More so, childbirth count may worsen the mothers' earnings because more children could mean more time spent outside active labour participation to receive income. However, the effect of childbirth count varies on the distribution of the mother's labour income. Studies have reported that upper-income mothers are likely to receive income for maternity leave, so the effect of childbirth count may be minimal on their income as compared to lower-income mothers (Budig & Hodges, 2014; Bailey et al., 2019). When the mothers have income from labour participation, that may increase their self-esteem, self-confidence and empowerment to make personal decisions. The findings show that women's decision-making positively correlates with labour income. Arguably, labour income has a reverse causality with women's decision-making. The study suggests that if there is a need to empower women to enhance their decision-making, they need to address the number of children they have. Women's decision-making is likely relatively low for those that are lower-income receivers.

Social income assistance, such as child support grants (CSG), old age pension (OAP) payments, and other income inequality reduction mechanisms, should be used to support individuals who earn lower incomes and those who are less empowered. Hence, the current study found that non-labour income like OAP transfer will likely empower women to improve their decision-making. Also, the study found that the exogenous income has a varying effect on the women's decision-

making distribution. In addition, studies have found that child support grants improve women's autonomy (Patel & Hochfeld, 2011; Patel et al., 2015). However, a strand of the literature has found that CSG may be insufficient to empower women against child nutritional deficiencies (Van der Berg et al., 2020).

Another study has found that OAP is likely to be more effective in empowering women to reduce child nutritional deprivations (Duflo 2000, 2003). The current research has found that women's decision-making (or autonomy) has a significant positive effect on the child's dietary outcomes. The findings in the recent study are compatible with the investigations of Shafiq et al. (2019), Esseilfie et al. (2020) and Melesse (2021).

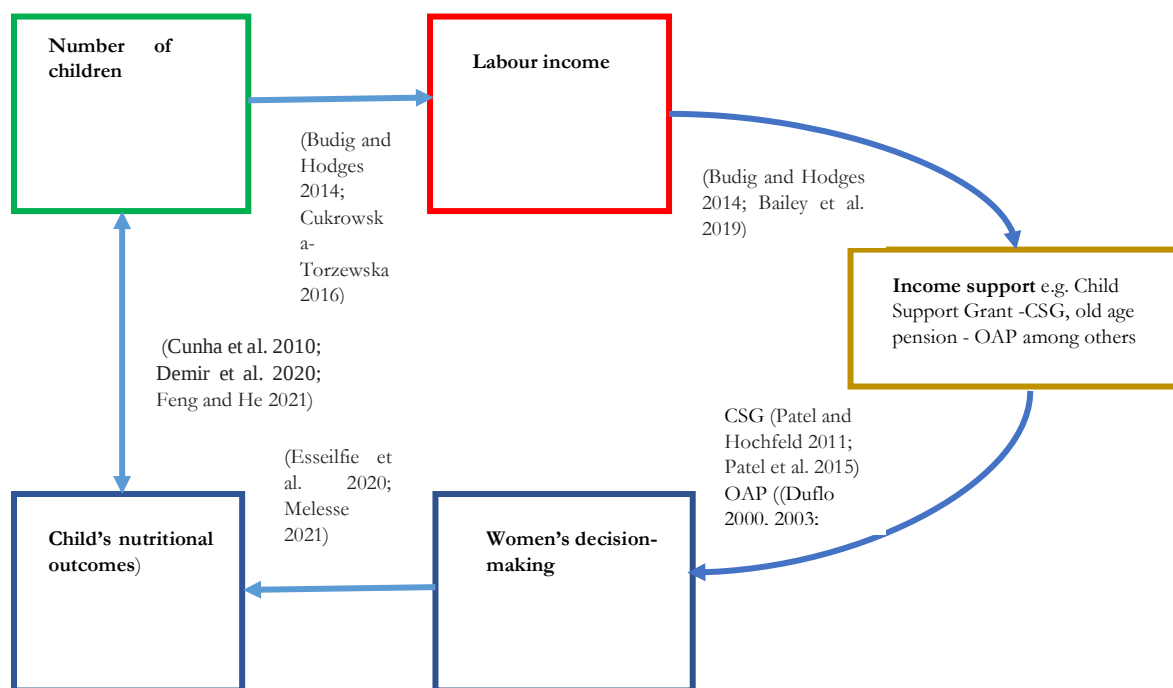


Figure 5.1 Conceptual flow chat of motherhood to child nutritional outcomes

The current study improves our understanding of the varying effects of women's choices on the nutritional outcomes of the child. The women's decision-making has a heterogeneous effect on height-for-age is different from weight-for-age and weight-for-height for children. Improving women's decision-making is likely to improve child nutritional outcomes through a mechanism

such as food choice, meal time, and food purchase, among others. It is not to say that enhancing child nutritional outcomes is solely women's affairs. Men's contribution may be direct (such as purchasing food among other family needs) and indirect (by supporting women emotionally and financially). Extant literature has long confirmed that women's fertility is a vital determinant of the gender income gap (Contreras et al., 2005; Sorsa et al., 2015) and inequality. The study envisages that the increase in the number of children will likely worsen child nutritional outcomes. Existing studies have found that the number of siblings (household size) hurts the children's nutritional status (Kumar & Ram, 2013).

Similarly, a more recent study has found that the number of children is likely to reduce the nutritional quality (Feng and He, 2021) in the case of China. Existing studies have found that parental investment in children at early childhood development is likely to enhance short and long-term health and cognitive outcomes (Cunha et al., 2010; Demir et al., 2020). Also, a strand of the literature has revealed that birth weight (or nutritional outcome) has a positive relationship with parental investments (Datar et al., 2010). Therefore, the study motivates development and health policies that would enhance human development and empower women in decision-making to improve child nutrition and health outcomes.

5.2 Concluding Remarks and Contributions

This session highlights the current study's concluding remarks and contributions to the existing body of knowledge.

5.2.1 The Effect of OAP Transfer on Household Decision-making

Chapter 2 investigated the effect of OAP transfer on household decision-making in South Africa using the regression discontinuity design and quantile treatment effect. The study identified those eligible (aged 60) to receive OAP transfer as treated and otherwise as untreated. The essay used multiple correspondence analysis (MCA) to construct a household decision-making index using all relevant decision-making questions in the NIDS Wave 5 dataset. The OAP transfer aims to reduce income inequalities among previously marginalized groups. It was initially established in 1920 to make available a token income to the Whites and Coloured who do not have a retirement plan (Duflo, 2000; Woolard & Leibbrandt, 2013; Tondini et al., 2017). The eligibility to benefit

from the OAP transfer is subject to the lower age limit of 60 for individuals (the first and most essential criteria) and the administrative means test (the second criteria). Studies have unveiled the importance of the OAP transfer because of the uncommon practice of giving social grants in South Africa, which is unpopular in developing countries. Following the study of Ambler (2016), this could lead to a belief that OAP transfer has a uniform or average effect on the decision-making for all individual households using a regression discontinuity (RD) design. The RD design required validity and manipulation tests; hence, the study found no systemic manipulation in the age of the recipients of the OAP social grant.

Furthermore, the study found that OAP transfer yielded varying degrees of improvement in household ability to make personal decisions using quantile regression and quantile treatment effects. The findings showed that the OAP social grant positively affected household decision-making at 0.25 quantile. It implies that only those on the 'first quartile' of decision-making distribution were likely to improve their decision-making empowerment due to the OAP transfer. In addition, it does not affect the decision-making of those on the extreme lower and upper part of the distribution of household decision-making. The effect of OAP transfer on household decision-making revealed that the income shock has a heterogeneous effect on decision-making, and the outcome for the men has similar results. However, there is a need for awareness of the importance of women's decision-making empowerment, whether for the young or elderly.

Women's decision-making empowerment is vital to be considered because women are home keepers, and their importance in the household achievement or prospect cannot be overemphasized. The non-economic contribution of women includes

- looking after the children,
- taking and fetching them from school,
- helping the children with the homework,
- making a choice of a balanced diet and satisfying the emotional need of the family in general (children and spouse).

Women's decision-making empowerment is essential because they have the heart of commitment to household welfare, which is not quantified in monetary or economic terms. They make a desirable scale of preference when the resources are not sufficient or scarce for daily purchase, durable commodities, affordable location to live and who can benefit from living with the household. These are non-economic values that women decision-making mostly added to the

outcome of the household. Without wise decision-making contributions from women, available resources are likely to be insufficient for the household's needs. A recent study has shown that women believe in men's contribution to the economy while women make a non-economic contribution (Kadić Abaz & Hadžić, 2020). Notwithstanding this, women contribute to the economic and non-economic components of the household. However, women living with males are advised to keep a joint family purse.

5.2.2 The Effect of Women's Decision-making on Child Nutrition

Using a panelised NIDS dataset from 2014/15 to 2017, Chapter 3 examined the impact of women's decision-making on child's nutritional outcomes in South Africa. Children under the age of six and women aged 15 to 44 were identified in the study. The NIDS data were used to calculate three anthropometric measures of child nutrition: weight-for-age, weight-for-height, and height-for-age indicators. Five decision-making questions are used in the study's MCA to produce a women's decision-making index. A fixed-effects estimator was used to remove time-invariant confounding variables and account for clustering and attrition problems. However, the results lacked any firm conclusions.

A control function approach (CFA) was employed for a robustness check to control for endogeneity. A control function approach is similar to the two-stage least square (2SLS). The study used the total female asset as an instrumental variable (IV). In the first stage, the IV satisfied the relevance assumption as the real asset has a significant positive relationship with the women's decision-making. The residuals were predicted and plugged into the second stage. The results revealed that women's decision-making had a significant positive causal effect on child's nutritional outcomes. The results are compatible with existing studies examining women's autonomy's impact on child dietary outcomes (Dancer and Rammohan, 2009; Carlson et al., 2015). In addition, the study by Benjamin-Neelon et al. (2018) has found that the environment contributes to improving the nutritional outcome in the case of central North Carolina. The findings in the current study are compatible with their study as it found that dwelling (assumed as a proxy for environment or neighbourhood) has a significant positive effect on the children's height-for-age and weight-for-age nutritional measures. The current study found that being a widow (not only a single parent) significantly negatively affects nutritional outcomes, unlike the study of Tain and

Wang (2019), where they found that being a single parent improves the food consumption and nutritional diet intake of the children.

5.2.3 The Effect of the Number of Children on Mothers' Labour Income

Chapter 4 estimated the effect of the childbirth count on mothers' labour income distribution in South Africa. This study provided an empirical inference using a panelized dataset of the NIDS from 2008 to 2017 and quantile regression with corrections for sample selection bias. The choice of females between 23 and 44 years was motivated by completing a first-degree and baseline reproductive age before the high risk of fertility. The study found that women with many children were likely to be disadvantaged concerning their labour income, and the effect was substantial for those who were low-income earners. The cumulative number of children has a negative effect on a mother's labour income (Budig & Hodges, 2010) might suggest overestimated results without correcting for sample selection bias. Magadla et al. (2019) have estimated the motherhood penalty in South Africa and compared the outcome of mothers with non-mothers. The study improves our understanding of the motherhood penalty but does not account for sample selection bias. One of the causes of sample selection bias is that some individuals start labour participation during the data collection and may not yet receive labour income. In comparison, some may be out of their job but still receive income during the data collection.

Without correcting for sample selection bias, the study found that the effect of children aged below six years on the mothers' labour income distribution was inconclusive. While after correcting for sample selection bias, the study discovered that children below six years harm the distribution of the mothers' labour income, and those who are middle-income earners were disproportionately affected. The childbirth counts and children below six years heterogeneous affect the mothers' labour income distribution. The varying effect on mothers' labour income is because of varied time allocation to work and childcare and unobserved individual characteristics. Mothers who have younger or more children are likely to take time off work for the day of their children's immunization, sick leave, or periodic mother-child medical care appointments. The women's time allocation implies the mother's trade-off time between labour participation for income and childcare (Del Boca & Locatelli, 2006; Miller, 2011). Therefore, when a mother works in a family-friendly institution, there is a probability that she will be able to balance time allocation between childcare and labour market participation to receive an income.

5.3 Policy recommendation

The outcomes of this study suggest some important policy implications for women and children in South Africa.

The first essay on the effect of OAP transfer on household decision-making suggests a continuance of the social scheme as a developmental policy that improves the household's welfare and women's decision-making.

In the second essay, the study suggests that the government and stakeholders should proffer possible solutions to child health. It proposes the necessity for raising compelling awareness of gender equality and women empowerment. In an attempt to empower women, the government and stakeholders may establish a Self Help Group (SHG) linkage (microfinance) programme, as suggested in the study of Swain and Wallentin (2008) in the case of India. "The SHG maybe consist of 10-20 fewer privileged women who formed a group for financial services. The SHGs are mostly formed and managed by the members with the external support of staff from a microfinance institution, non-governmental organization, or government agencies. The group may start by saving and lending out of member resources for the first six months after the establishment. Then, SHG involves in periodic training, education and other social services according to the suggestion of Swain and Wallentin (2008)". Existing studies have argued that educational attainment may improve women's decision-making (Batool and Batool, 2018) and empowerment. Education is likely to increase self-esteem and the opportunity to participate in the labour market (Heaton et al., 2005) to earn income. Women participating in the labour market tend to make personal decisions compared to those not participating in the labour market (Sheikh et al., 2016). If government or stakeholders cannot empower women, a social grant should be provided to improve women's decision-making. Improving women's decision-making may enhance the use of contraceptives (Abada and Tenkorang, 2012; Santoso et al., 2019) to prevent unwanted children.

The third essay suggests that the government and stakeholders in the labour market should support and raise awareness of family planning, contraceptives, and child spacing. The use of contraceptives should be encouraged (Pasha et al. 2015) and child spacing for a better health outcome for mother and child. Using contraceptives will reduce unplanned pregnancies and increase labour market participation (John et al., 2020). The study suggests implementing the two-

child policy by following China's family planning (Wang et al., 2017). Also, leave policies in South Africa favour only those that are in former employment (professionals and public service) and some private sector. Like elsewhere, maternal leave varied from one sector to another (Walsh et al., 2019). An existing study has revealed that the current maternity leave policy is individualistic and negatively affects mothers and children (Boswell & Boswell, 2009). Hence the current study suggests that policymakers should improve maternity leave to close the gap in the leave allocation in the different sectors and pursue social equality.

5.4 Limitations and Further Research

The limitation in Chapter 2 is that the study used a cross-sectional dataset of the NIDS 2017 (Wave 5). As a result, it is advisable to exercise care in assuming that the results would be the same in all previous waves of the NIDS dataset. However, the study suggested that future research considers the trend analysis associated with the outcomes of social schemes; the future study might be interested in the causal effect of social grants on the welfare recipient and chronic health-related issues and compare the household composition of recipients with that of non-recipients.

In Chapter 3, the current study relies on the NIDS dataset, where women are assumed to be caregivers. It will be interesting to have a dataset showing men's and women's contributions to improving child nutritional outcomes. Further studies are expected to investigate how improving women's decision-making affects child nutrition, particularly by considering the different age groups of mothers and children. Also, another study may examine the impact of women's empowerment on child nutritional outcomes for children aged 0 to 14. In doing so, the study will likely follow the trajectory from childhood to toddler or teenager. Children within this age cohort will likely remain in the sample for at least ten years.

In Chapter 4, this study improves one's understanding of the effect of the number of children on the mother's labour income distribution. However, more outstanding research on young mothers is recommended; intergenerational transmission of income inequalities may be investigated in the case of underage mothers.

References

- Abada, T., & Tenkorang, E. Y. (2012). Women's autonomy and unintended pregnancies in the Philippines. *Journal of biosocial science*, 44(6), 703-718.
- Acemoglu, D., Autor, D. H., & Lyle, D. (2004). Women, war, and wages: The effect of female labor supply on the wage structure at midcentury. *Journal of Political Economy*, 112(3), 497-551.
- Adato, M., De la Briere, B., Mindek, D., & Quisumbing, A. R. (2000). The Impact of Progresa on Women's Status and Intra-household Relations; Final Report (No. 600-2016-40133), Washington DC: International Food Policy Research Institute.
- Adedokun, S. T., & Yaya, S. (2021). Factors associated with adverse nutritional status of children in sub-Saharan Africa: Evidence from the Demographic and Health Surveys from 31 countries. *Maternal & Child Nutrition*, 17(3), e13198.
- Adisa, T. A., Abdulraheem, I., & Isiaka, S. B. (2019). Patriarchal hegemony: Investigating the impact of patriarchy on women's work-life balance. *Gender in Management: An International Journal*, Vol. 34 No. 1, pp. 19-33.
- Adjaye-Gbewonyo, K., Vollmer, S., Avendano, M., & Harttgen, K. (2019). Agricultural trade policies and child nutrition in low-and middle-income countries: a cross-national analysis. *Globalization and health*, 15(1), 1-17.
- Afridi, F. (2012). Female Labour Force Participation and Child Female Labour Force Participation and Child Education in India : The Effect of the National Rural Employment Guarantee Scheme. IZA Discussion Paper No. 6593.
- Aguero, J. M., & Marks, M. S. (2011). Motherhood and female labour supply in the developing world evidence from infertility shocks. *Journal of Human Resources*, 46(4), 800-826.
- Aguero, J., Carter, M., & Woolard, I. (2006). The impact of unconditional cash transfers on nutrition: The South African Child Support Grant. Southern Africa Labour Development Research Unit (SALDRU) Working Paper Series No. 06/08
- Aizer, A., & Cunha, F. (2012). *The production of human capital: Endowments, investments and fertility* (NBER Working Paper No. 18429). Cambridge, MA: National Bureau of Economic Research.
- Alaofè, H., Zhu, M., Burney, J., Naylor, R., & Douglas, T. (2017). Association between women's empowerment and maternal and child nutrition in Kalale District of Northern Benin. *Food and nutrition bulletin*, 38(3), 302-318.
- Albertini, M. (2008). Equalizing or not? The effect of changing household characteristics on income inequality. *European Sociological Review*, 24(3), 285-298.
- Alcázar, L., Balarin, M., & Espinoza Iglesias, K. H. (2016). Impacts of the Peruvian Conditional Cash Transfer Program on Womens Empowerment: A Quantitative and Qualitative Approach. *Partnership for Economic Policy Working Paper* 2016-25

- Alderman, H., & Headey, D. D. (2017). How important is parental education for child nutrition? *World Development*, 94, 448-464.
- Alfano, M., Arulampalam, W., & Kambhampati, U. (2010, November). Female autonomy and education of the subsequent generation: Evidence from India. In *Cape Town: 5th IZA/World Bank Conference on Employment and Development, Capetown*.
- Allendorf, K. (2007). Do women's land rights promote empowerment and child health in Nepal? *World Development*, 35(11), 1975-1988
- Altonji, J. G., & Matzkin, R. L. (2005). Cross section and panel data estimators for nonseparable models with endogenous regressors. *Econometrica*, 73(4), 1053-1102.
- Amadu, I., Seidu, A. A., Duku, E., Frimpong, J. B., Jnr, J. E. H., Aboagye, R. G., ... & Ahinkorah, B. O. (2021). Risk factors associated with the coexistence of stunting, underweight, and wasting in children under 5 from 31 Sub-Saharan African countries. *BMJ open*, 11(12), e052267.
- Amate-Fortes, I., Guarnido-Rueda, A., Martínez-Navarro, D., & Oliver-Márquez, F. J. (2021). Measuring inequality in income distribution between men and women: what causes gender inequality in Europe?. *Quality & Quantity*, 55(2), 395-418.
- Ambler, K. (2016). Bargaining with grandma: The impact of the South African pension on household decision-making. *Journal of Human Resources*, 51(4), 900-932.
- Ambler, K., Jones, K. M., & O'Sullivan, M. (2021). *Increasing Women's Empowerment: Implications for Family Welfare* (No. 14861). IZA Discussion Papers.
- Anderson, S., & Eswaran, M. (2009). What determines female autonomy? Evidence from Bangladesh. *Journal of Development Economics*, 90(2), 179-191.
- Andrew, M. K., Mitnitski, A. B., & Rockwood, K. (2008). Social vulnerability, frailty and mortality in elderly people. *PloS one*, 3(5), e2232.
- Angel-Urdinola, D., & Wodon, Q. (2010). Income generation and intra-household decision making: A gender analysis for Nigeria. *Gender disparities in Africa's labor market*, 381.
- Angrist, J. D., & Pischke, J. S. (2009). *Mostly harmless econometrics: An empiricist's companion*. Princeton university press.
- Antman, F. M. (2014). Spousal employment and intra-household bargaining power. *Applied Economics Letters*, 21(8), 560-563
- Arber S. (1999) Unequal Partners: Inequality in Earnings and Independent Income within Marriage. In: McKie L., Bowlby S., Gregory S., Campling J. (eds) *Gender, Power and the Household*. Palgrave Macmillan, London. https://doi.org/10.1057/9780230376632_10
- Ardington, C., & Case, A. (2009). Health: analysis of the NIDS wave 1 Dataset Discussion Paper no. 2. *Southern Africa Labour and Development Research Unit Cape Town*.

- Ardington, C., & Gasealahwe, B. (2012). Health: Analysis of the NIDS Wave 1 and 2 datasets. Cape Town: SALDRU, University of Cape Town. (SALDRU Working Paper Number 80 / NIDS Discussion Paper 2012/3)
- Arellano, M., & Bonhomme, S. (2017). Quantile selection models with an application to understanding changes in wage inequality. *Econometrica*, 85(1), 1-28.
- Argent, J. (2009). Household Income: Report on NIDS Wave 3. Technical Paper no. 3. Cape Town: Southern Africa Labour and Development Research Unit.
- Arulampalam, W., Bhaskar, A., & Srivastava, N. (2016). Does greater autonomy among women provide the key to better child nutrition?. *IZA Discussion Paper No.9781*
- Atake, E. H., & Ali, P. G. (2019). Women's empowerment and fertility preferences in high fertility countries in Sub-Saharan Africa. *BMC Women's Health*, 19(1), 1-14.
- Attanasio, O., Low, H., & Sánchez-Marcos, V. (2008). Explaining changes in female labor supply in a life-cycle model. *American Economic Review*, 98(4), 1517-52.
- Azimi, E. (2015). The effect of children on female labor force participation in urban Iran. *IZA Journal of Labor & Development*, 4(1), 5.
- Baah-Boateng, W. (2012). Labour market discrimination in Ghana: A gender dimension. LAMBERT Academic Publishing. Germany
- Bailey, M. J., Byker, T. S., Patel, E., & Ramnath, S. (2019). *The long-term effects of California's 2004 Paid Family Leave Act on women's careers: Evidence from US tax data* (No. w26416). National Bureau of Economic Research.
- Banerjee, A., Galiani, S., Levinsohn, J., McLaren, Z., & Woolard, I. (2008). Why has unemployment risen in the new South Africa? 1. *Economics of Transition*, 16(4), 715-740.
- Baranowska-Rataj, A., & Matysiak, A. (2016). The causal effects of the number of children on female employment-do European institutional and gender conditions matter? *Journal of Labor Research*, 37(3), 343-367.
- Barnet, B., Arroyo, C., Devoe, M., & Duggan, A. K. (2004). Reduced school dropout rates among adolescent mothers receiving school-based prenatal care. *Archives of Pediatrics & Adolescent Medicine*, 158(3), 262-268.
- Barnett, C., A. Jamal, A., & Monroe, S. L. (2021). Earned income and women's segmented empowerment: experimental evidence from Jordan. *American Journal of Political Science*, 65(4), 954-970.
- Basu, K. (2006). Gender and say: A model of household behaviour with endogenously determined balance of power. *The Economic Journal*, 116(511), 558-580.
- Batool, S. A., & Batool, S. S. (2018). Impact of Education on Women's Empowerment: Mediation Role of Income and Self-Esteem. *Journal of Research & Reflections in Education (JRRE)*, 12(1).

- Beauchamp, T. L. & Childress, J. E (1983). Principles of biomedical ethics (2nd ed.). Oxford, England: *Oxford University Press*
- Becker, G. S. (1964). Human capital theory. *Columbia, New York, 1964*.
- Becker, G. S. (1965). A Theory of the Allocation of Time. *The Economic Journal*, 75(299), 493-517.
- Becker, G. S. (1981). Altruism in the Family and Selfishness in the Market Place. *Economica*, 48(189), 1-15.
- Benard, S., & Correll, S. J. (2010). Normative discrimination and the motherhood penalty. *Gender & Society*, 24(5), 616-646.
- Benjamin-Neelon, S. E., Vaughn, A. E., Tovar, A., Østbye, T., Mazzucca, S., & Ward, D. S. (2018). The family child care home environment and children's diet quality. *Appetite*, 126, 108-113.
- Bennett, R., & Zaidi, A. (2016). Ageing and development: Putting gender back on the agenda. *International Journal on Ageing in Developing Countries*, 1(1), 5-19.
- Bergmann, B. (1995). Becker's theory of the family: Preposterous conclusions. *Feminist Economics*, 1(1), 141-150.
- Bhorat, H., & Goga, S. (2013). The gender wage gap in post-apartheid South Africa: A re-examination. *Journal of African Economies*, 22(5), 827–848.
- Black, R. E., Morris, S. S., & Bryce, J. (2003). Where and why are 10 million children dying every year?. *The Lancet*, 361(9376), 2226-2234.
- Black, S., Furman, J., Rackstraw, E., & Rao, N. (2016). The long-term decline in US prime-age male labour force participation. *VoxEU.org*.
- Blanden, J., & Gregg, P. (2004). Family income and educational attainment: a review of approaches and evidence for Britain. *Oxford Review of Economic Policy*, 20(2), 245-263.
- Bloom, D. E., Canning, D., Fink, G., & Finlay, J. E. (2009). Fertility, female labor force participation, and the demographic dividend. *Journal of Economic growth*, 14(2), 79-101.
- Blundell, R., Costa Dias, M., Meghir, C., & Shaw, J. (2016). Female labor supply, human capital, and welfare reform. *Econometrica*, 84(5), 1705-1753.
- Booyesen, F., Van Der Berg, S., Burger, R., Von Maltitz, M., & Du Rand, G. (2008). Using an asset index to assess trends in poverty in seven Sub-Saharan African countries. *World Development*, 36(6), 1113-1130.
- Boswell, R., & Boswell, B. (2009). Motherhood deterred: Access to maternity benefits in South Africa. *Agenda*, 23(82), 76-85.
- Branson, N., & Wittenberg, M. (2019). Longitudinal and cross-sectional weights in the NIDS data 1–5 [NIDS technical paper number 9]. *Southern Africa Labour and Development Research Unit, University of Cape Town*, 3.

- Breen, R., & Chung, I. (2015). Income inequality and education. *Sociological Science*, 2(Aug 2015).
- Bronte-Tinkew, J., & DeJong, G. (2004). Children's nutrition in Jamaica: do household structure and household economic resources matter?. *Social science & medicine*, 58(3), 499-514.
- Brophy, T., Branson, N., Daniels, R. C., Leibbrandt, M., Mlatsheni, C., & Woolard, I. (2018). National income dynamics study panel user manual. *Technical Note Release*.
- Brüderl, J., & Ludwig, V. (2015). Fixed-effects panel regression. *The Sage handbook of regression analysis and causal inference*, 327, 357.
- Brunson, E. K., Shell-Duncan, B., & Steele, M. (2009). Women's autonomy and its relationship to children's nutrition among the Rendille of northern Kenya. *American Journal of Human Biology: The Official Journal of the Human Biology Association*, 21(1), 55-64.
- Buchinsky, M. (1998). The dynamics of changes in the female wage distribution in the USA: a quantile regression approach. *Journal of Applied Econometrics*, 13(1), 1-30.
- Buchinsky, M. (2002). Quantile regression with sample selection: Estimating women's return to education in the US. In *Economic applications of quantile regression* (pp. 87-113). Physica, Heidelberg.
- Budig, M. J., & England, P. (2001). The wage penalty for motherhood. *American Sociological Review*, 204-225.
- Budig, M. J., & Hodges, M. J. (2010). Differences in disadvantage: Variation in the motherhood penalty across white women's earnings distribution. *American Sociological Review*, 75(5), 705-728.
- Budig, M. J., & Hodges, M. J. (2014). Statistical models and empirical evidence for differences in the motherhood penalty across the earnings distribution. *American Sociological Review*, 79(2), 358-364.
- Budig, M. J., Misra, J., & Boeckmann, I. (2016). Work-family policy trade-offs for mothers? Unpacking the cross-national variation in motherhood earnings penalties. *Work and Occupations*, 43(2), 119-177.
- Burchi, F. (2010). Child nutrition in Mozambique in 2003: the role of mother's schooling and nutrition knowledge. *Economics & Human Biology*, 8(3), 331-345.
- Burger, R., & Jafta, R. (2006). Returns to race: Labour market discrimination in post-apartheid South Africa. *Department of Economics, University of Stellenbosch*.
- Cabeza-García, L., Del Brio, E. B., & Oscanoa-Victorio, M. L. (2018). Gender factors and inclusive economic growth: The silent revolution. *Sustainability (Switzerland)*, 10(1), 1-14.
- Cairns, J. E., Baudron, F., Hassall, K. L., Ndhlela, T., Nyagumbo, I., McGrath, S. P., & Haefele, S. M. (2022). Revisiting strategies to incorporate gender-responsiveness into maize breeding in Southern Africa. *Outlook on Agriculture*, 51(2), 178-186.

- Calonico, S., Cattaneo, M. D., & Titiunik, R. (2014). Robust data-driven inference in the regression-discontinuity design. *The Stata Journal*, 14(4), 909-946.
- Carlson, G. J., Kordas, K., & Murray-Kolb, L. E. (2015). Associations between women's autonomy and child nutritional status: a review of the literature. *Maternal & Child Nutrition*, 11(4), 452-482.
- Carlson, G. J., Kordas, K., & Murray-Kolb, L. E. (2015). Associations between women's autonomy and child nutritional status: a review of the literature. *Maternal & Child Nutrition*, 11(4), 452-482.
- Casale, D. (2004). What has the feminisation of the labour market 'bought' women in South Africa? Trends in labour force participation, employment and earnings, 1995–2001. *Journal of Interdisciplinary Economics*, 15(3-4), 251-275.
- Casale, D. (2016). Analysing the links between child health and education outcomes: Evidence from NIDS Waves 1-4. Cape Town: SALDRU, University of Cape Town. SALDRU Working Paper Number 179/ NIDS Discussion Paper 2016/6.
- Casale, D. M., & Posel, D. R. (2002). The continued feminisation of the labour force in South Africa: An analysis of recent data and trends. *South African Journal of Economics*, 70(1), 156-184.
- Case, A., & Jensen, R. T. (2007). 7. Does Money Protect Health Status? Evidence from South African Pensions (pp. 287-312). University of Chicago Press.
- Cattaneo, M. D., Frandsen, B. R., & Titiunik, R. (2015). Randomization inference in the regression discontinuity design: An application to party advantages in the US Senate. *Journal of Causal Inference*, 3(1), 1-24.
- Cattaneo, M. D., Idrobo, N., & Titiunik, R. (2017). A practical introduction to regression discontinuity designs. *Cambridge Elements: Quantitative and Computational Methods for Social Science-Cambridge University Press I*.
- Cattaneo, M. D., Jansson, M., & Ma, X. (2018). Manipulation testing based on density discontinuity. *The Stata Journal*, 18(1), 234-261.
- Cavazos-Rehg, P. A., Krauss, M. J., Spitznagel, E. L., Bommarito, K., Madden, T., Olsen, M. A., ... & Bierut, L. J. (2015). Maternal age and risk of labor and delivery complications. *Maternal and child health journal*, 19(6), 1202-1211.
- Certo, S. T., Busenbark, J. R., Woo, H. S., & Semadeni, M. (2016). Sample selection bias and Heckman models in strategic management research. *Strategic Management Journal*, 37(13), 2639-2657.
- Chakraborty, T., & De, P. (2011). Mother's autonomy and child welfare: A new measure and some new evidence. *IZA discussion paper 5438*, Bonn
- Chari, A. V., Heath, R., Maertens, A., & Fatima, F. (2017). The causal effect of maternal age at marriage on child wellbeing: Evidence from India. *Journal of Development Economics*, 127, 42-55.

- Chevalier, A., & Viitanen, T. K. (2003). The long-run labour market consequences of teenage motherhood in Britain. *Journal of Population Economics*, 16(2), 323-343.
- Chiappori, P. A. (1992). Collective labour supply and welfare. *Journal of Political Economy*, 100(3), 437-467.
- Chiappori, P. A. (1997). Collective Models of Household Behaviour: The Sharing Rule Approach. *Intrahousehold Resource Allocation in Developing Countries: Models, Methods and Policy* edited by L. Haddad, J. Hoddinott & H. Alderman. Baltimore: The Johns Hopkins University Press.
- Chilinda, Z. B., Wahlqvist, M. L., Lee, M. S., & Huang, Y. C. (2021). Higher maternal autonomy is associated with reduced child stunting in Malawi. *Scientific reports*, 11(1), 1-12.
- Chisadza, C., Yitbarek, E., & Nicholls, N. (2020). Women Empowerment and Child Obesity: Evidence in Comoros, Malawi, and Mozambique. In *Women and Sustainable Human Development* (pp. 267-284). Palgrave Macmillan, Cham.
- Christiansen, L. E., Lin, M. H. H., Pereira, M. J., Topalova, P., & Turk, R. (2016). Unlocking female employment potential in Europe: Drivers and Benefits. European and the strategy, Policy, and Review Departmental Paper Serie (International Monetary Fund), under the guidance of Petya Koeva Brooks.
- Cohen, D., & Reid, E. (1999). The vulnerability of women: is this a useful construct for policy and programming?. *Vivre et penser le sida en Afrique, Paris, Karthala-Codesria-IRD*, 377-388.
- Contreras, D., Puentes, E., & Bravo, D. (2005). Female labour force participation in greater Santiago, Chile: 1957–1997. A synthetic cohort analysis. *Journal of International Development*, 17(2), 169-186.
- Cornish, H., Walls, H., Ndirangu, R., Ogbureke, N., Bah, O. M., Tom-Kargbo, J. F., ... & Ranganathan, M. (2021). Women's economic empowerment and health related decision-making in rural Sierra Leone. *Culture, health & sexuality*, 23(1), 19-36.
- Cukrowska-Torzewska, E. (2016). How much does it cost to rear children in Poland?. *European Journal of Women's Studies*, 23(2), 200-216.
- Cunha, F., Heckman, J. J., & Schennach, S. M. (2010). Estimating the technology of cognitive and noncognitive skill formation. *Econometrica*, 78(3), 883-931.
- Cunningham, K., Ruel, M., Ferguson, E., & Uauy, R. (2015). Women's empowerment and child nutritional status in South Asia: a synthesis of the literature. *Maternal & child nutrition*, 11(1), 1-19.
- Cunningham, S. (2021). Causal inference. In *Causal Inference*. Yale University Press.
- Dancer, D., & Rammohan, A. (2009). Maternal autonomy and child nutrition: evidence from rural Nepal. *Indian Growth and Development Review*, 2(1), 18-38.

- Datar, A., Kilburn, M. R., & Loughran, D. S. (2010). Endowments and parental investments in infancy and early childhood. *Demography*, 47(1), 145-162.
- de Groot, R., Palermo, T., Handa, S., Ragno, L. P., & Peterman, A. (2017). Cash transfers and child nutrition: pathways and impacts. *Development Policy Review*, 35(5), 621-643.
- de Lettenhove, M. K. (2012). Conditional Cash Transfers in Latin America. *Reflets et Perspectives de la vie économique*, 51(2), 5-18.
- De Onis, M., Monteiro, C., Akre, J., & Glugston, G. (1993). The worldwide magnitude of protein-energy malnutrition: an overview from the WHO Global Database on Child Growth. *Bulletin of the World Health Organization*, 71(6), 703.
- Debnath, S. (2015). The impact of household structure on female autonomy in developing countries. *The Journal of Development Studies*, 51(5), 485-502.
- Del Boca, D., & Locatelli, M. (2006). The Determinants of Motherhood and Work Status: A Survey. IZA Discussion Paper No. 2414, Available at <http://dx.doi.org/10.2139/ssrn.947056>
- Demir, F., Ghosh, P., & Liu, Z. (2020). Effects of motherhood timing, breastmilk substitutes and education on the duration of breastfeeding: Evidence from Egypt. *World Development*, 133, 105014.
- Dewey, K. G., & Begum, K. (2011). Long-term consequences of stunting in early life. *Maternal & Child Nutrition*, 7, 5-18.
- Di Addario, S., & Patacchini, E. (2008). Wages and the city. Evidence from Italy. *Labour Economics*, 15(5), 1040-1061.
- Doherty, T., Chopra, M., Nkonki, L., Jackson, D., & Persson, L. A. (2006). A longitudinal qualitative study of infant-feeding decision making and practices among HIV-positive women in South Africa. *The Journal of nutrition*, 136(9), 2421-2426.
- Dotti Sani, G. M. (2015). Within-couple inequality in earnings and the relative motherhood penalty. A cross-national study of European countries. *European Sociological Review*, 31(6), 667-682.
- Dubihlela, J., & Dubihlela, D. (2014). Social grants impact on poverty among the female-headed households in South Africa: A case analysis. *Mediterranean Journal of Social Sciences*, 5(8), 160-160.
- Duflo, E. (2000). Grandmothers and Granddaughters: The Effects of Old Age Pension on Child Health in South Africa, Photocopy, Department of Economics, Massachusetts Institute of Technology Working Paper 00-05.
- Duflo, E. (2003). Grandmothers and granddaughters: old-age pensions and intrahousehold allocation in South Africa. *The World Bank Economic Review*, 17(1), 1-25.
- Dungumaro, E. W. (2008). Gender differentials in household structure and socioeconomic characteristics in South Africa. *Journal of Comparative Family Studies*, 39(4), 429-451.

- Durrant, G. B., & Goldstein, H. (2010). Analysing the probability of attrition in a longitudinal survey.
- Dworkin, G. (1976). Autonomy and behavior control. *Hastings Center Report*, 23-28.
- Dworkin, R. (1978). No right answer. *NYUL Rev.*, 53, 1.
- Edmonds, E. V. (2006). Child labour and schooling responses to anticipated income in South Africa. *Journal of Development Economics*, 81(2), 386-414.
- Engelhardt, H., & Prskawetz, A. (2004). On the changing correlation between fertility and female employment over space and time. *European Journal of Population/Revue européenne de Démographie*, 20(1), 35-62.
- England, P. (2005). Gender inequality in labor markets: The role of motherhood and segregation. *Social Politics: International Studies in Gender, State & Society*, 12(2), 264-288.
- Erosa, A., Fuster, L., & Restuccia, D. (2016). A quantitative theory of the gender gap in wages. *European Economic Review*, 85, 165-187.
- Essilfie, G., Sebu, J. and Annim, S.K., 2020. Women's empowerment and child health outcomes in Ghana. *African Development Review*, 32(2), pp.200-215.
- Etinzock, M. N., & Kollamparambil, U. (2019). Subjective well-being impact of old age pension in South Africa: A difference in difference analysis across the gender divide. *South African Journal of Economic and Management Sciences*, 22(1), 1-12.
- Euwals, R., Knoef, M., & Van Vuuren, D. (2011). The trend in female labour force participation: what can be expected for the future?. *Empirical Economics*, 40(3), 729-753.
- Fall, C. H., Sachdev, H. S., Osmond, C., Restrepo-Mendez, M. C., Victora, C., Martorell, R., ... & Richter, L. M. (2015). Association between maternal age at childbirth and child and adult outcomes in the offspring: a prospective study in five low-income and middle-income countries (COHORTS collaboration). *The Lancet Global Health*, 3(7), e366-e377.
- Fanzo, J. (2012). The nutrition challenge in Sub-Saharan Africa (No. 2012-012). United Nations Development Programme, *Regional Bureau for Africa*.
- Feng, Q., & He, Q. (2021). Do Siblings Reduce Children's Dietary Quality in China?. *The BE Journal of Economic Analysis & Policy*, 21(4), 1411-1419.
- Firpo, S., Fortin, N. M., & Lemieux, T. (2009). Unconditional quantile regressions. *Econometrica*, 77(3), 953-973.
- Fitzpatrick, C., Archambault, I., Janosz, M., & Pagani, L. S. (2015). Early childhood working memory forecasts high school dropout risk. *Intelligence*, 53, 160-165.
- Fortin, B., & Lacroix, G. (1997). A test of the unitary and collective models of household labour supply. *The Economic Journal*, 107(443), 933-955.

- Fotuhi, H., Amiri, A., & Taheriyoun, A. R. (2019). A novel approach based on multiple correspondence analysis for monitoring social networks with categorical attributed data. *Journal of Statistical Computation and Simulation*, 89(16), 3137-3164.
- Frandsen, B. R., Frölich, M., & Melly, B. (2012). Quantile treatment effects in the regression discontinuity design. *Journal of Econometrics*, 168(2), 382-395.
- Frison, S., Kerac, M., Checchi, F., & Prudhon, C. (2016). Anthropometric indices and measures to assess change in the nutritional status of a population: a systematic literature review. *BMC nutrition*, 2(1), 1-11.
- Frölich, M., & Melly, B. (2008). Unconditional quantile treatment effects under endogeneity. IZA Discussion Paper No. 3288. Bonn, Germany: Institute for the Study of Labour
- Frost, M. B., Forste, R., & Haas, D. W. (2005). Maternal education and child nutritional status in Bolivia: finding the links. *Social Science & Medicine*, 60(2), 395-407.
- Gamboa, L. F., & Zuluaga, B. (2013). Is there a motherhood penalty? Decomposing the family wage gap in Colombia. *Journal of Family and Economic Issues*, 34(4), 421-434.
- Gammage, S., Sultana, N., & Glinski, A. (2020). Reducing vulnerable employment: Is there a role for reproductive health, social protection, and labor market policy?. *Feminist Economics*, 26(1), 121-153.
- Gangl, M., & Ziefle, A. (2009). Motherhood, labor force behavior, and women's careers: An empirical assessment of the wage penalty for motherhood in Britain, Germany, and the United States. *Demography*, 46(2), 341-369.
- Gashi, A., Rizvanolli, A., & Adnett, N. (2019). Bucking the trend: female labor market participation in Kosovo. *Croatian Economic Survey*, 21(2), 85-116.
- Ge, K. Y., & Chang, S. Y. (2001). Definition and measurement of child malnutrition. *Biomedical and environmental sciences: BES*, 14(4), 283-291.
- Ghazi, H. F., Isa, Z. M., Shah, S. A., Abdal Qader, M. A., & Hasan, T. N. (2014). The relationship between the neighborhood safety and nutritional status of children in Baghdad City, Iraq. *Journal of Nutrition and Metabolism*, 32 – 37.
- Gilbert, P. (2000). Toleration or Autonomy? *Journal of Applied Philosophy*, 17(3), 299-302.
- Glick, I., Kadish, E., & Rottenstreich, M. (2021). Management of pregnancy in women of advanced maternal age: Improving outcomes for mother and baby. *International journal of women's health*, 13, 751.
- Gold, R., Kennedy, B., Connell, F., & Kawachi, I. (2002). Teen births, income inequality, and social capital: developing an understanding of the causal pathway. *Health & Place*, 8(2), 77-83.
- Gordon, D., & Miller, D. L. (2012). The South African Pension Program and the Health of the Elderly and their Families: Regression Discontinuity Evidence from October Household Surveys.

- Gordon, D., Nandy, S., Pantazis, C., Pemberton, S., & Townsend, P. (2003). *Child Poverty in the Developing World*. Bristol, England: Policy Press.
- Govender, J. (2016). Social justice in South Africa. *Civitas-Revista de Ciências Sociais*, 16(2), 237-258.
- Grantham-McGregor, S., Cheung, Y. B., Cueto, S., Glewwe, P., Richter, L., Strupp, B., & International Child Development Steering Group. (2007). Developmental potential in the first 5 years for children in developing countries. *The Lancet*, 369(9555), 60-70.
- Green, E. P., Blattman, C., Jamison, J., & Annan, J. (2015). Women's entrepreneurship and intimate partner violence: A cluster-randomized trial of microenterprise assistance and partner participation in post-conflict Uganda (SSM-D-14-01580R1). *Social Science & Medicine*, 133, 177-188.
- Greenacre, M. (2017). *Correspondence analysis in practice*. Chapman and Hall/CRC.
- Greenacre, M. J. (2010). Correspondence analysis. *Wiley Interdisciplinary Reviews: Computational Statistics*, 2(5), 613-619.
- Gribble, J. N., Murray, N. J., & Menotti, E. P. (2009). Reconsidering childhood undernutrition: can birth spacing make a difference? An analysis of the 2002–2003 El Salvador National Family Health Survey. *Maternal & child nutrition*, 5(1), 49-63.
- Grogan, L., & Summerfield, F. (2019). Government Transfers, Work, and Wellbeing: Evidence from the Russian Old-Age Pension. *Journal of Population Economics*, 32(4), 1247-1292.
- Gronau, R. (1974). Wage comparisons--A selectivity bias. *Journal of Political Economy*, 82(6), 1119-1143.
- Grün, C. (2004). Direct and indirect gender discrimination in the South African labour market. *International Journal of Manpower*, Emerald Group Publishing Limited, Vol. 25 Nos 3/4,
- Gupta, N. D., Smith, N., & Verner, M. (2008). The impact of Nordic countries' family friendly policies on employment, wages, and children. *Review of Economics of the Household*, 6(1), 65-89.
- Guvuriro, S., & Booysen, F. (2021). Family-type public goods and intra-household decision-making by co-resident South African couples. *Review of Development Economics*, 25(3), 1629-1647.
- Hagen-Zanker, J., Bastagli, F., Harman, L., Barca, V., Sturge, G., & Schmidt, T. (2016). Understanding the impact of cash transfers: the evidence. *ODI Briefing*. London: Overseas Development Institute.
- Hamoudi, A., & Thomas, D. (2014). Endogenous coresidence and program incidence: South Africa's old-age pension. *Journal of Development Economics*, 109, 30-37.
- Handa, S., Peterman, A., Davis, B., & Stampini, M. (2009). Opening up Pandora's box: The effect of gender targeting and conditionality on household spending behaviour in Mexico's Progresa program. *World Development*, 37(6), 1129-1142.

- Heaton, T. B., Huntsman, T. J., & Flake, D. F. (2005). The effects of status on women's autonomy in Bolivia, Peru, and Nicaragua. *Population research and policy review*, 24(3), 283-300.
- Heckman, J. J. (1976). The common structure of statistical models of truncation, sample selection and limited dependent variables and a simple estimator for such models. In *Annals of Economic and Social Measurement, Volume 5, Number 4* (pp. 475-492). NBER.
- Heckman, J. J. (1979). Sample selection bias as a specification error. *Econometrica: Journal of the Econometric Society*, 153-161.
- Heckman, J., & MaCurdy, T. (1980). A dynamic model of female labor supply. *Review of Economic Studies*, 47(1), 47-74.
- Hendriks, J., & Erasmus, J. (2005). Religion in South Africa: The 2001 population census data. *Journal of Theology for Southern Africa*, (121), 88.
- Hidrobo, M., Hoddinott, J., Margolies, A., Moreira, V., & Peterman, A. (2012). Impact evaluation of cash, food vouchers, and food transfers among Colombian refugees and poor Ecuadorians in Carchi and Sucumbíos. *Washington, DC: International Food Policy Research Institute*.
- Iacovou, M. (2001). Fertility and female labour supply. ISER Working Paper Series, No. 2001-19, University of Essex, Institute for Social and Economic Research (ISER), Colchester.
- Ifechelobi, J. N. (2014). Feminism: Silence and voicelessness as tools of patriarchy in chimamanda adichie's purple hibiscus. *African Research Review*, 8(4), 17-27.
- Imai, K. S., Ananim, S. K., Kulkarni, V. S., & Gaiha, R. (2014). Women's empowerment and prevalence of stunted and underweight children in rural India. *World Development*, 62, 88-105.
- Ismail, R., & Jajri, I. (2012). Gender wage differentials and discrimination in Malaysian labour market. *World Applied Sciences Journal*, 19(5), 719-728.
- John, N. A., Tsui, A. O., & Roro, M. (2020). Quality of contraceptive use and women's paid work and earnings in Peri-Urban Ethiopia. *Feminist Economics*, 26(1), 23-43.
- Kabeer, N. (2005). Gender equality and women's empowerment: A critical analysis of the third millennium development goal 1. *Gender & Development*, 13(1), 13-24.
- Kadić Abaz, A., & Hadžić, A. (2020). Economic activity of women and young women in Bosnia and Herzegovina under the umbrella of traditional views of women's role in society. *Economic research-Ekonomska istraživanja*, 33(1), 2591-2605.
- Kamiya, Y., Nomura, M., Ogino, H., Yoshikawa, K., Siengsounthone, L., & Xangsayarath, P. (2018). Mothers' autonomy and childhood stunting: evidence from semi-urban communities in Lao PDR. *BMC women's health*, 18(1), 1-9.
- Keeton, G. (2014). Inequality in South Africa. *The Journal of the Helen Suzman Foundation*, 74(1), 26-31.

- Ketani, N., & Tanga, P. T. (2019). The role of fathers receiving social grants in decisionmaking processes within poor rural households in Alice, Eastern Cape of South Africa. *Social Work*, 55(4), 391-405.
- Khan, S., Zaheer, S., & Safdar, N. F. (2019). Determinants of stunting, underweight and wasting among children < 5 years of age: evidence from 2012-2013 Pakistan demographic and health survey. *BMC public health*, 19(1), 1-15.
- Khatab, K. (2010). Childhood malnutrition in Egypt using geosadditive Gaussian and latent variable models. *The American journal of tropical medicine and hygiene*, 82(4), 653.
- Kim, H. S. (2014). Female labour force participation and fertility in South Korea. *Asian Population Studies*, 10(3), 252-273.
- Kirk, A., Kilic, T., & Carletto, C. (2018). Composition of household income and child nutrition outcomes evidence from Uganda. *World development*, 109, 452-469.
- Klemp, M., & Weisdorf, J. (2019). Fecundity, fertility and the formation of human capital. *The Economic Journal*, 129(618), 925-960.
- Knoef, M., & Been, J. (2014). Estimating a panel data sample selection model with part-time employment: selection issues in wages over the life-cycle, Gepresenteerd tijdens de jaarlijkse conferentie van de International Association for Applied Econometrics, June 2014, London.
- Koenker, R. (2004). Quantile regression for longitudinal data. *Journal of Multivariate Analysis*, 91(1), 74-89.
- Koné, S., Bonfoh, B., Dao, D., Koné, I., & Fink, G. (2019). Heckman-type selection models to obtain unbiased estimates with missing measures outcome: theoretical considerations and an application to missing birth weight data. *BMC Medical Research Methodology*, 19(1), 1-13.
- Kovac, J. R., Addai, J., Smith, R. P., Coward, R. M., Lamb, D. J., & Lipshultz, L. I. (2013). The effects of advanced paternal age on fertility. *Asian Journal of Andrology*, 15(6), 723.
- Kricheli-Katz, T. (2012). Choice, discrimination, and the motherhood penalty. *Law & Society Review*, 46(3), 557-587.
- Kuhn, U., & Ravazzini, L. (2017). The impact of female labour force participation on household income inequality in Switzerland. *Schweizerische Zeitschrift für Soziologie/Swiss Journal of Sociology*, 43(1), 115-135.
- Kumar, A., & Ram, F. (2013). Influence of family structure on child health: evidence from India. *Journal of biosocial science*, 45(5), 577-599.
- Kuziemko, I., Pan, J., Shen, J., & Washington, E. (2018). *The mommy effect: Do women anticipate the employment effects of motherhood?* (No. w24740). National Bureau of Economic Research.
- Lartey, A. (2008). Maternal and child nutrition in Sub-Saharan Africa: challenges and interventions. *Proceedings of the Nutrition Society*, 67(1), 105-108.

- Lee, H. S., Duffey, K. J., Kim, C. I., & Popkin, B. M. (2013). The relationship between family and child weight status by household structure in South Korea: 2007–2010. *Nutrition & diabetes*, 3(6), e73-e73.
- Leibbrandt, M., & Woolard, I. (1999). Household incomes, poverty and inequality in a multivariate framework. *DPRU Working Paper No. 99/31*. Cape Town: Development Policy Research Unit, University of Cape Town
- Leibbrandt, M., Woolard, I., & de Villiers, L. (2009). Methodology: Report on NIDS wave 1. *Technical paper*, 1.
- Lépine, A., & Strobl, E. (2013). The effect of women's bargaining power on child nutrition in rural Senegal. *World Development*, 45, 17-30.
- Lin, W., & Wooldridge, J. M. (2019). Testing and correcting for endogeneity in nonlinear unobserved effects models. In *Panel Data Econometrics* (pp. 21-43). Academic Press.
- Lindahl, L. (2011). A comparison of family and neighbourhood effects on grades, test scores, educational attainment and income—evidence from Sweden. *The Journal of Economic Inequality*, 9(2), 207-226.
- Livemore, T., Rodgers, J., & Siminski, P. (2011). The effect of motherhood on wages and wage growth: evidence for Australia. *Economic Record*, 87, 80-91.
- Lloyd-Sherlock, P., Saboia, J., & Ramírez-Rodríguez, B. (2012). Cash transfers and the well-being of older people in Brazil. *Development and Change*, 43(5), 1049-1072.
- Lundberg, S., & Pollak, R. A. (1994). Noncooperative bargaining models of marriage. *The American Economic Review*, 84(2), 132-137.
- Lutz, H. (2010). Gender in the migratory process. *Journal of Ethnic and Migration Studies*, 36(10), 1647-1663.
- Madhavan, S., & Thomas, K. J. (2005). Childbearing and schooling: New evidence from South Africa. *Comparative Education Review*, 49(4), 452-467.
- Madiba, S., Chelule, P. K., & Mokgatle, M. M. (2019). Attending informal preschools and daycare centers is a risk factor for underweight, stunting and wasting in children under the age of five years in underprivileged communities in South Africa. *International Journal of Environmental Research and Public Health*, 16(14), 2589.
- Magadla, S. S., Leibbrandt, M., & Mlatsheni, C. (2019). Does a motherhood penalty exist in the post-apartheid South African labour market? (SALDRU Working Paper No. 247). Cape Town: Southern Africa Labour and Development Research Unit, University of Cape Town
- Majlesi, K. (2016). Labor market opportunities and women's decision making power within households. *Journal of Development Economics*, 119, 34-47
- Makama, G. A. (2013). Patriarchy and gender inequality in Nigeria: The way forward. *European scientific journal*, 9(17).

- Marteleteo, L., Lam, D., & Ranchhod, V. (2008). Sexual behavior, pregnancy, and schooling among young people in urban South Africa. *Studies in Family Planning*, 39(4), 351-368.
- Mattila-Wiro, P. (1999) 'Economic theories of the household: a critical review', Working Paper no. 159, World Institute for Development Economics Research.
- May, J., Witten, C., & Lake, L. (2020). South African Child Gauge 2020. *Cape Town: Children's Institute, University of Cape Town*.
- McCrary, J. (2008). Manipulation of the running variable in the regression discontinuity design: A density test. *Journal of econometrics*, 142(2), 698-714.
- McElroy, M. B., & Horney, M. J. (1990). Nash-bargained household decisions: reply. *International Economic Review*, 237-242.
- McKenna, C. G., Bartels, S. A., Pablo, L. A., & Walker, M. (2019). Women's decision-making power and undernutrition in their children under age five in the Democratic Republic of the Congo: A cross-sectional study. *PloS one*, 14(12), e0226041.
- McLanahan, S., & Percheski, C. (2008). Family structure and the reproduction of inequalities. *Annu. Rev. Sociol*, 34, 257-276.
- McLanahan, S., Tach, L., & Schneider, D. (2013). The causal effects of father absence. *Annual Review of Sociology*, 39, 399-427.
- Melesse, M. B. (2021). The effect of women's nutrition knowledge and empowerment on child nutrition outcomes in rural Ethiopia. *Agricultural Economics*, 52(6), 883-899.
- Melesse, M. B., Dabissa, A., & Bulte, E. (2018). Joint land certification programmes and women's empowerment: Evidence from Ethiopia. *The Journal of Development Studies*, 54(10), 1756-1774.
- Merttens, F., Hurrell, A., Marzi, M., Attah, R., Farhat, M., Kardan, A., & MacAuslan, I. (2013). Kenya hunger safety net programme monitoring and evaluation component. *Impact Evaluation Final Report. Oxford Policy Management*.
- Miller, A. R. (2011). The effects of motherhood timing on career path. *Journal of Population Economics*, 24(3), 1071-1100.
- Mincer, J. (1958). Investment in human capital and personal income distribution. *Journal of political economy*, 66(4), 281-302.
- Mincer, J. (1963). Market prices, opportunity costs, and income effects. *Measurement in Economics*, 67-82.
- Mohapatra, K. K. (2012). Women workers in informal sector in India: understanding the occupational vulnerability. *International Journal of Humanities and Social Science*, 2(21), 197-207.
- Molyneux, M. (2006). Mothers at the service of the new poverty agenda: progreso/oportunidades, Mexico's conditional transfer programme. *Social Policy & Administration*, 40(4), 425-449.

- Mumtaz, Z., & Salway, S. (2009). Understanding gendered influences on women's reproductive health in Pakistan: moving beyond the autonomy paradigm. *Social science & medicine*, 68(7), 1349-1356.
- Nankinga, O., Kwagala, B., & Walakira, E. J. (2019). Maternal employment and child nutritional status in Uganda. *PloS one*, 14(12), e0226720.
- National Planning Commission. (2013). National development plan vision 2030.
- Neves, D., Samson, M., van Niekerk, I., Hlatshwayo, S., & Du Toit, A. (2009). The use and effectiveness of social grants in South Africa. Research Report to FinMark Trust. Johannesburg: FinMark Trust.
- Ntuli, M. (2007). *Determinants of South African women's labour force participation, 1995-2004* (No. 3119). IZA Discussion Papers.
- Onis, M. D., Onyango, A. W., Borghi, E., Siyam, A., Nishida, C., & Siekmann, J. (2007). Development of a WHO growth reference for school-aged children and adolescents. *Bulletin of the World Health Organization*, 85, 660-667.
- Pacelli, L., Pasqua, S., & Villosio, C. (2013). Labor market penalties for mothers in Italy. *Journal of Labor Research*, 34(4), 408-432.
- Pahl, J. (2008). Family finances, individualisation, spending patterns and access to credit. *The Journal of Socio-Economics*, 37(2), 577-591.
- Pasha, O., Goudar, S. S., Patel, A., Garces, A., Esamai, F., Chomba, E., ... & Goldenberg, R. L. (2015). Postpartum contraceptive use and unmet need for family planning in five low-income countries. *Reproductive health*, 12(2), 1-7.
- Pasha, O., Goudar, S. S., Patel, A., Garces, A., Esamai, F., Chomba, E., ... & Goldenberg, R. L. (2015). Postpartum contraceptive use and unmet need for family planning in five low-income countries. *Reproductive health*, 12(2), 1-7.
- Patel, L., & Hochfeld, T. (2011). It buys food but does it change gender relations? Child Support Grants in Soweto, South Africa. *Gender & Development*, 19(2), 229-240.
- Patel, L., Knijn, T., & Van Wel, F. (2015). Child support grants in South Africa: a pathway to women's empowerment and child well-being?. *Journal of social Policy*, 44(2), 377-397
- Paul, P., & Saha, R. (2022). Is maternal autonomy associated with child nutritional status? Evidence from a cross-sectional study in India. *PloS one*, 17(5), e0268126.
- Pesch, M. H., Miller, A. L., Appugliese, D. P., Kaciroti, N., Rosenblum, K. L., & Lumeng, J. C. (2016). Low-income mothers' feeding goals predict observed home mealtime and child feeding practices. *Child: care, health and development*, 42(6), 934-940.
- Peterson, K. E., Mitchell, M., Zaslavsky, A. M., Feldman, B. S., & Ezzati, M. (2009). Contraceptive Use, Birth Spacing, and Autonomy: An Analysis of the Oportunidades Program in Rural Mexico. *Studies in Family Planning*, 40(1), 51-62.

- Pongou, R., Ezzati, M., & Salomon, J. A. (2006). Household and community socioeconomic and environmental determinants of child nutritional status in Cameroon. *BMC public health*, 6(1), 98.
- Posel, D. R. (2001). Who are the heads of household, what do they do, and is the concept of headship useful? An analysis of headship in South Africa. *Development Southern Africa*, 18(5), 651-670.
- Posel, D., & Rogan, M. (2009). Women, income and poverty: Gendered access to resources in post-apartheid South Africa. *Agenda*, 23(81), 25-34.
- Posel, D., Fairburn, J. A., & Lund, F. (2006). Labour migration and households: A reconsideration of the effects of the social pension on labour supply in South Africa. *Economic modelling*, 23(5), 836-853.
- Powell, D. (2020). Quantile treatment effects in the presence of covariates. *Review of Economics and Statistics*, 102(5), 994-1005.
- Rahman, M. M., Saima, U., & Goni, M. A. (2015). Impact of maternal household decision-making autonomy on child nutritional status in Bangladesh. *Asia Pacific Journal of Public Health*, 27(5), 509-520.
- Ralston, M., Schatz, E., Menken, J., Gómez-Olivé, F. X., & Tollman, S. (2019). Policy shift: South Africa's old age pensions' influence on perceived quality of life. *Journal of Aging & Social Policy*, 31(2), 138-154.
- Ranchhod, V. (2006). The effect of the South African old-age pension on labour supply of the elderly. *South African Journal of Economics*, 74(4), 725-744.
- Rayhan, M. I., & Khan, M. S. H. (2006). Factors causing malnutrition among under five children in Bangladesh. *Pak J Nutr*, 5(6), 558-62.
- Rodgers, Y. V. D. M., & Zveglic Jr, J. E. (2014). Inclusive growth and gender inequality in Asia's labor markets. In Ravi Kanbur, Changyong Rhee, and Juzhong Zhuang (eds.), *Inequality in Asia and the Pacific: Trends, Driver, and Policy Implication* (pp. 103 -133), Manila: Asian Development Bank and Routledge.
- Roy, P. K., Haque, S., Jannat, A., Ali, M., & Khan, M. S. (2017). Contribution of women to household income and decision making in some selected areas of Mymensingh in Bangladesh. *Progressive Agriculture*, 28(2), 120-129.
- Ruhm, C. J. (2004). Parental employment and child cognitive development. *Journal of Human Resources*, 39(1), 155-192.
- Rüttenauer, T., & Ludwig, V. (2019). Fixed Effects Individual Slopes: Accounting and Testing for Heterogeneous Effects in Panel Data or Other Multilevel Models. *Sociological Methods & Research*, 0049124120926211.
- Saaka, M. (2020). Women's decision-making autonomy and its relationship with child feeding practices and postnatal growth. *Journal of Nutritional Science*, 9.

- Sahn, D. E., & Younger, S. D. (2005). Improvements in children's health: Does inequality matter? *The Journal of Economic Inequality*, 3(2), 125-143.
- Salman, K. K., Salawu, M. B., Oni, O. A., & Obi-Egbedi, O. (2020). Does Maternal Autonomy Influence Child Nutrition in Rural Nigeria?. *Journal of Hunger & Environmental Nutrition*, 1-20.
- Sandersa, D., Hendricksb, M., Krollc, F., Puoaned, T., Ramokoloe, V., Swartf, R., & Tsolekileg, L. (2019). The triple burden of malnutrition in childhood: Causes, policy implementation and recommendations. *Child and Adolescent Health*, 145.
- Santoso, M. V., Kerr, R. B., Hoddinott, J., Garigipati, P., Olmos, S., & Young, S. L. (2019). Role of women's empowerment in child nutrition outcomes: a systematic review. *Advances in Nutrition*, 10(6), 1138-1151.
- Sartorius, B., Sartorius, K., Green, R., Lutge, E., Scheelbeek, P., Tanser, F., ... & Slotow, R. (2020). Spatial-temporal trends and risk factors for undernutrition and obesity among children (< 5 years) in South Africa, 2008–2017: findings from a nationally representative longitudinal panel survey. *BMJ open*, 10(4), e034476.
- Schatz, E., Gómez-Olivé, X., Ralston, M., Menken, J., & Tollman, S. (2012). The impact of pensions on health and wellbeing in rural South Africa: does gender matter?. *Social science & medicine*, 75(10), 1864-1873.
- Schotte, S., Zizzamia, R., & Leibbrandt, M. (2017). Social stratification, life chances and vulnerability to poverty in South Africa. Cape Town: SALDRU, UCT. (SALDRU Working Paper Number 208)
- Schotte, S., Zizzamia, R., & Leibbrandt, M. (2018). A poverty dynamics approach to social stratification: The South African case. *World Development*, 110, 88-103.
- Self, S. (2015). Spousal-Differences in Perception of Female Autonomy in Household Decision-Making in Nepal. *Development Journal of the South*, 1(1), 65–81.
- Shafiq, A., Hussain, A., Asif, M., Hwang, J., Jameel, A., & Kanwel, S. (2019). The effect of “women's empowerment” on child nutritional status in Pakistan. *International Journal of Environmental Research and Public Health*, 16(22), 4499.
- Sheikh A.Q., Meraj, M., & Sadaqat, M. (2016). Gender equality and socio-economic development through women's empowerment in Pakistan. *Ritsumeikan Journal of Asia Pacific Studies*, 34, 124-140.
- Sheran, M. (2007). The career and family choices of women: A dynamic analysis of labor force participation, schooling, marriage, and fertility decisions. *Review of Economic Dynamics*, 10(3), 367-399.
- Shroff, M. R., Griffiths, P. L., Suchindran, C., Nagalla, B., Vazir, S., & Bentley, M. E. (2011). Does maternal autonomy influence feeding practices and infant growth in rural India?. *Social Science & Medicine*, 73(3), 447-455.

- Shroff, M., Griffiths, P., Adair, L., Suchindran, C., & Bentley, M. (2009). Maternal autonomy is inversely related to child stunting in Andhra Pradesh, India. *Maternal & Child Nutrition*, 5(1), 64-74.
- Simonsen, M., & Skipper, L. (2012). The family gap in wages: What wombmates reveal. *Labour Economics*, 19(1), 102-112.
- Skoufias, E. (1998). Determinants of child health during the economic transition in Romania. *World Development*, 26(11), 2045-2056.
- Smith, L. C., & Haddad, L. J. (2000). Explaining Child Malnutrition in Developing Countries: A Cross-Country Analysis. International Food Policy Research Institute (IFPRI) Research Report (Vol. 111). Washington:
- Smith, L. C., Ramakrishnan, U., Ndiaye, A., Haddad, L., & Martorell, R. (2003). The importance of Women's status for child nutrition in developing countries: international food policy research institute (IFPRI) research report abstract 131. *Food and Nutrition Bulletin*, 24(3), 287-288.
- Sorsa, P., Mares, J., Didier, M., Guimaraes, C., Rabate, M., Tang, G., & Tuske, A. (2015). Determinants of the low female labour force participation in India. OECD Economics Department Working Papers, No. 1207, OECD Publishing, Paris
- Soudien, C. (2004). Constituting the class': An analysis of the process of 'integration' in South African schools. *Changing class: Education and social change in post-apartheid South Africa*, 89, 114.
- South African Government (2019) Old age pension retrieved from the website: <https://www.gov.za/services/social-benefits-retirement-and-old-age/old-age-pension>
- Southern Africa Labour and Development Research Unit. National Income Dynamics Study (2017), Wave 5 [dataset]. Version 1.0.0 Pretoria: Department of Planning, Monitoring, and Evaluation [funding agency]. Cape Town: Southern Africa Labour and Development Research Unit [implementer], 2018. Cape Town: DataFirst [distributor], 2018. DOI: <https://doi.org/10.25828/fw3h-v708>
- Ssentongo, P., Ssentongo, A. E., Ba, D. M., Ericson, J. E., Na, M., Gao, X., ... & Schiff, S. J. (2021). Global, regional and national epidemiology and prevalence of child stunting, wasting and underweight in low-and middle-income countries, 2006–2018. *Scientific reports*, 11(1), 1-12.
- Standish-White, J., & Finn, A. (2015). *Unconditional cash transfers and children's educational outcomes: Evidence from the old-age pension programme in South Africa*. SALDRU Working Paper 147, Southern Africa Labour and Development Research Unit, University of Cape Town.
- StataCorp, L. P. (2007). *Stata multivariate statistics: reference manual*. Stata Press Publication.
- Statistics South Africa, (2017). Poverty Trends in South Africa: An examination of absolute poverty between 2006 and 2015. *Pretoria: Statistics South Africa*.

- Statistics South Africa, (2017). Poverty Trends in South Africa: An examination of absolute poverty between 2006 and 2015. *Pretoria: Statistics South Africa*.
- Statistics South Africa, 2018, Quarterly Labour Force Survey, *Quarter 2*
- Statistics South Africa. (2021). *Quarterly labour force survey, Quarter 2*. Statistics South Africa.
- Statistics South Africa. (2021). *Quarterly labour force survey, Quarter 2*. Statistics South Africa.
- Subramanian, S. V., Kawachi, I., & Smith, G. D. (2007). Income inequality and the double burden of under-and over-nutrition in India. *Journal of Epidemiology & Community Health*, 61(9), 802-809.
- Surender, R., Noble, M., Wright, G., & Ntshongwana, P. (2010). Social assistance and dependency in South Africa: An analysis of attitudes to paid work and social grants. *Journal of Social Policy*, 39(2), 203-221.
- Swain, R. B., & Wallentin, F. Y. (2008). *Economic or non-economic factors: What empowers women?* (No. 2008: 11). Working paper.
- Szwarcwald, C. L., de Andrade, C. L. T., & Bastos, F. I. (2002). Income inequality, residential poverty clustering and infant mortality: a study in Rio de Janeiro, Brazil. *Social Science & Medicine*, 55(12), 2083-2092.
- Taghizade Moghaddam, H., Khodaei, G. H., Ajilian Abbasi, M., & Saeidi, M. (2015). Infant and Young Child Feeding: A key area to Improve Child Health. *International Journal of Pediatrics*, 3(6.1), 1083-1092.
- Tauchmann, H. (2010). Consistency of Heckman-type two-step estimators for the multivariate sample-selection model. *Applied Economics*, 42(30), 3895-3902.
- Thistlethwaite, D. L., & Campbell, D. T. (1960). Regression-discontinuity analysis: An alternative to the ex post facto experiment. *Journal of Educational Psychology*, 51(6), 309.
- Tian, X., & Wang, H. (2019). The Impact of Having One Parent Absent on Children'Food Consumption and Nutrition in China. *Nutrients*, 11(12), 3077.
- Tondini, A., Ardington, C., & Woolard, I. (2017). Public pensions and elderly informal employment: Evidence from a change in retirement age in South Africa. Working Paper 05, SALDRU
- Totouom, A., Mboutchouang, V. D. P., & Kaffo Fotio, H. (2018). The effects of education on labour force participation in Cameroon: A gender perspective. *African Development Review*, 30(1), 45-55.
- Traissac, P., & Martin-Prevel, Y. (2012). Alternatives to principal components analysis to derive asset-based indices to measure socio-economic position in low-and middle-income countries: the case for multiple correspondence analysis. *International journal of epidemiology*, 41(4), 1207-1208.

- Tsani, S., Paroussos, L., Fragiadakis, C., Charalambidis, I., & Capros, P. (2013). Female labour force participation and economic growth in the South Mediterranean countries. *Economics Letters*, 120(2), 323-328.
- UNICEF. (2020). The state of food security and nutrition in the world 2020.
- United Nations Children's Fund (UNICEF) (2020), World Health Organization, International Bank for Reconstruction and Development/The World Bank. Levels and trends in child malnutrition: Key Findings of the 2020 Edition of the Joint Child Malnutrition Estimates. Geneva: World Health
- United Nations Children's Fund (UNICEF) (2021), World Health Organization, International Bank for Reconstruction and Development/The World Bank. Levels and trends in child malnutrition: key findings of the 2021 edition of the joint child malnutrition estimates. Geneva: World Health Organization.
- Urke, H. B., Bull, T., & Mittelmark, M. B. (2011). Socioeconomic status and chronic child malnutrition: wealth and maternal education matter more in the Peruvian Andes than nationally. *Nutrition Research*, 31(10), 741-747.
- Valentova, M. (2019). The impact of parental leave policy on the intensity of labour-market participation of mothers: Do the number of children and pre-birth work engagement matter?. *Journal of European Social Policy*, 29(3), 428-445.
- Van Biljon, C., Von Fintel, D. I. E. T. E. R., & Pasha, A. (2018). *Bargaining to work: the effect of female autonomy on female labour supply* (No. 04/2018).
- Van der Berg, S. (2014). Inequality, poverty and prospects for redistribution. *Development Southern Africa*, 31(2), 197-218.
- Van der Berg, S., Zuze, L., & Bridgman, G. (2020). *The impact of the coronavirus and lockdown on children's welfare in South Africa: Evidence from NIDS-CRAM wave 1*. Department of Economics, University of Stellenbosch.
- Viljoen, D. J., & Dunga, S. H. (2013). Determining the factors that influence female unemployment in a South African township. *International Journal of Social Sciences and Humanity Studies*, 5(1), 63-72.
- Vorster, H. H. (2010). The link between poverty and malnutrition: A South African perspective. *Health SA Gesondheid*, 15(1).
- Walker, S.P., Wachs, T.D., Grantham-McGregor, S., Black, M.M., Nelson, C.A., Huffman, S.L., Baker-Henningham, H., Chang, S.M., Hamadani, J.D., Lozoff, B. and Gardner, J.M.M., (2011). Inequality in early childhood: risk and protective factors for early child development. *The Lancet*, 378(9799),1325-1338.
- Walsh, D. S., Gantt, N. L., Irish, W., Sanfey, H. A., & Stein, S. L. (2019). Policies and practice regarding pregnancy and maternity leave: an international survey. *The American Journal of Surgery*, 218(4), 798-802.

- Wang, F., Zhao, L., & Zhao, Z. (2017). China's family planning policies and their labor market consequences. *Journal of Population Economics*, 30(1), 31-68.
- Waqas, M., & Awan, M. S. (2019). Do cash transfers effect women empowerment? Evidence from Benazir Income Support Program of Pakistan. *Women's Studies*, 48(7), 777-792.
- Weiss, F., Klein, M., & Grauenhorst, T. (2014). The effects of work experience during higher education on labour market entry: learning by doing or an entry ticket?. *Work, employment and society*, 28(5), 788-807.
- Wood, H. J. (2019). Gender inequality: The problem of harmful, patriarchal, traditional and cultural gender practices in the church. *HTS: Theological Studies*, 75(1), 1-8.
- Woolard, I., & Leibbrandt, M. (2013). The evolution and impact of unconditional cash transfers in South Africa. *Development Challenges in a Postcrisis World*, 363.
- Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data*. MIT press.
- Wooldridge, J. M. (2011). Instructor's Solutions Manual for Econometric analysis of cross section and panel data. *Second edition MIT Press*.
- Wooldridge, J. M. (2015). Control function methods in applied econometrics. *Journal of Human Resources*, 50(2), 420-445.
- World Bank. (2004). Unlocking the employment potential in the Middle East and North Africa: Toward a new social contract. *The World Bank*.
- World Health Organization. (2006). WHO child growth standards: length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age: methods and development. Geneva: World Health Organization.
- Wrohlich, K. (2011). Labor supply and child care choices in a rationed child care market. Discussion paper 1169
- Yaya, S., Odusina, E. K., Uthman, O. A., & Bishwajit, G. (2020). What does women's empowerment have to do with malnutrition in Sub-Saharan Africa? Evidence from demographic and health surveys from 30 countries. *Global health research and policy*, 5(1), 1-11.
- Yaya, S., Oladimeji, O., Odusina, E. K., & Bishwajit, G. (2022). Household structure, maternal characteristics and children's stunting in Sub-Saharan Africa: evidence from 35 countries. *International Health*, 14(4), 381-389.
- Yusof, S. A., & Duasa, J. (2010). Household decision-making and expenditure patterns of married men and women in Malaysia. *Journal of family and economic issues*, 31(3), 371-381.
- Zere, E., & McIntyre, D. (2003). Inequities in under-five child malnutrition in South Africa. *International Journal for Equity in Health*, 2(1), 1-10.
- Zhang, X., Zhao, X., & Harris, A. (2009). Chronic diseases and labour force participation in Australia. *Journal of health economics*, 28(1), 91-108.

Zhu, A. W. (2012). Working and caring for large families: do mothers face a trade-off?. *Journal of Population Research*, 29(4), 329-350.

Appendix 1

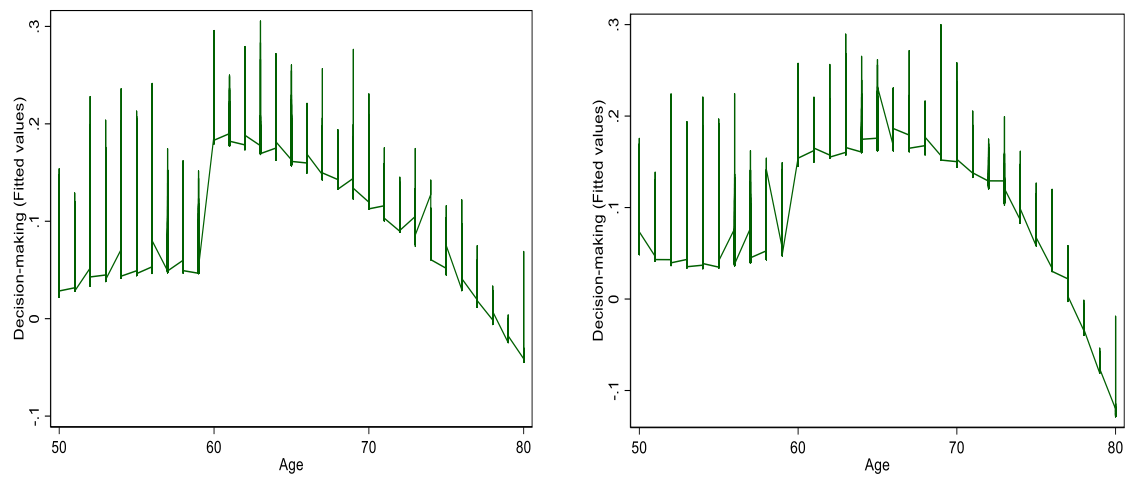


Figure A1: Quadratic and Cubic plot of age on predicted decision-making for women

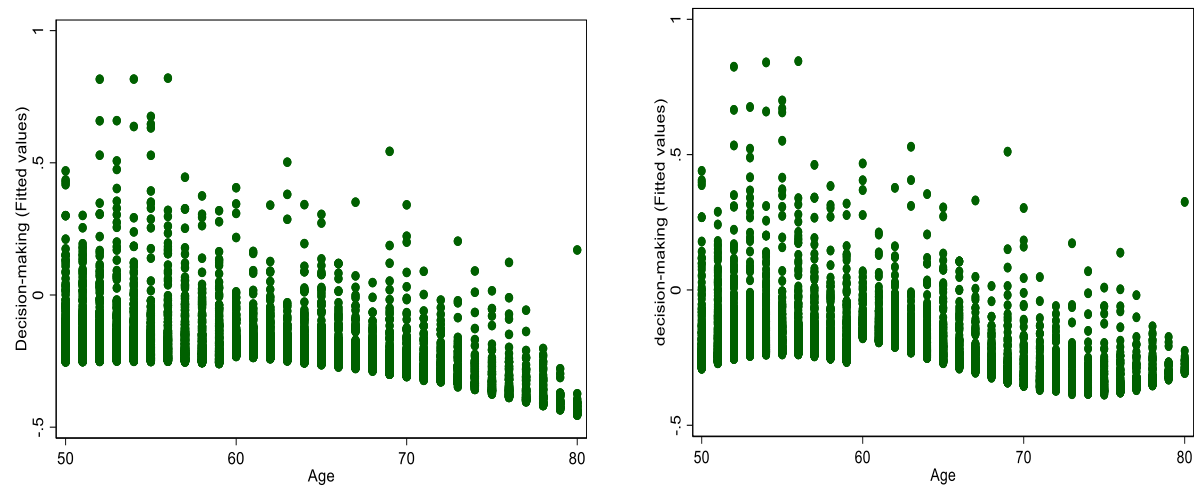


Figure A2: Quadratic and Cubic plot of age on predicted decision-making for men

Appendix 2

Table 4.1A OLS and Quantile regression without correcting for sample selection bias: Year of experience included

Variables	(1) OLS Labour income	(2) 0.10 Labour income	(3) 0.20 Labour income	(4) 0.30 Labour income	(5) 0.40 Labour income	(6) 0.50 Labour income	(7) 0.60 Labour income	(8) 0.70 Labour income	(9) 0.80 Labour income	(10) 0.90 Labour income
Number of children	-0.039*** (0.013)	-0.028* (0.016)	-0.046** (0.020)	-0.051* (0.028)	-0.046** (0.021)	-0.048*** (0.016)	-0.039*** (0.012)	-0.040*** (0.015)	-0.027** (0.013)	-0.033 (0.021)
Children Aged < 6 yrs.	0.043* (0.025)	0.073* (0.042)	0.057 (0.037)	0.080*** (0.030)	0.062*** (0.024)	0.058* (0.033)	0.031 (0.022)	0.044* (0.025)	0.041* (0.023)	-0.011 (0.031)
Education	0.378*** (0.014)	0.337*** (0.021)	0.332*** (0.023)	0.340*** (0.021)	0.356*** (0.015)	0.374*** (0.011)	0.372*** (0.016)	0.378*** (0.012)	0.404*** (0.012)	0.400*** (0.019)
Mother's age	0.007*** (0.003)	0.002 (0.004)	-0.000 (0.002)	0.002 (0.003)	0.003 (0.002)	0.007** (0.003)	0.006** (0.003)	0.009*** (0.003)	0.009** (0.004)	0.010** (0.005)
Year of experience	0.039*** (0.003)	0.031*** (0.005)	0.036*** (0.004)	0.039*** (0.004)	0.039*** (0.003)	0.038*** (0.004)	0.037*** (0.003)	0.035*** (0.004)	0.035*** (0.004)	0.033*** (0.004)
Women's decision-makin	0.023* (0.013)	0.032 (0.027)	0.033** (0.017)	0.020 (0.016)	0.024* (0.014)	0.029* (0.015)	0.028* (0.015)	0.026* (0.013)	0.018 (0.014)	-0.009 (0.019)
African	-0.562*** (0.094)	-0.621*** (0.196)	-0.589*** (0.142)	-0.455*** (0.128)	-0.510*** (0.118)	-0.602*** (0.113)	-0.560*** (0.134)	-0.494*** (0.129)	-0.384*** (0.143)	-0.633* (0.356)
Coloured	-0.468*** (0.103)	-0.522*** (0.198)	-0.344** (0.164)	-0.204 (0.164)	-0.346*** (0.125)	-0.477*** (0.125)	-0.433*** (0.145)	-0.369*** (0.140)	-0.314** (0.137)	-0.621* (0.368)
White	0.034 (0.114)	0.184 (0.251)	0.204 (0.137)	0.185 (0.167)	0.076 (0.124)	0.014 (0.108)	0.084 (0.114)	0.097 (0.195)	0.193 (0.152)	-0.095 (0.401)
Mother's health status	0.138** (0.061)	0.221*** (0.083)	0.241*** (0.073)	0.202** (0.093)	0.127 (0.086)	0.070 (0.088)	0.042 (0.066)	0.022 (0.053)	-0.009 (0.059)	0.047 (0.063)
Urban	0.237*** (0.052)	0.323*** (0.092)	0.317*** (0.076)	0.316*** (0.074)	0.206*** (0.049)	0.166*** (0.056)	0.154*** (0.049)	0.120*** (0.041)	0.130** (0.051)	0.198*** (0.066)

Traditional	0.110** (0.056)	0.163** (0.080)	0.180** (0.081)	0.189** (0.091)	0.079 (0.067)	0.054 (0.057)	0.046 (0.046)	0.057 (0.042)	0.025 (0.041)	0.120 (0.081)
Agriculture hunting for.	0.291*** (0.055)	0.325*** (0.077)	0.294*** (0.056)	0.284*** (0.064)	0.276*** (0.042)	0.270*** (0.047)	0.258*** (0.050)	0.205*** (0.050)	0.278*** (0.046)	0.339*** (0.077)
Mining and quarrying	1.113*** (0.104)	1.033*** (0.373)	0.950*** (0.150)	1.183*** (0.188)	1.252*** (0.104)	1.161*** (0.094)	1.112*** (0.118)	1.070*** (0.110)	1.083*** (0.099)	1.078*** (0.132)
Manufacturing	0.356*** (0.050)	0.341*** (0.115)	0.354*** (0.078)	0.299*** (0.069)	0.319*** (0.056)	0.351*** (0.053)	0.349*** (0.059)	0.316*** (0.049)	0.387*** (0.066)	0.470*** (0.072)
Electricity gas and water	0.681*** (0.152)	0.551 (0.366)	0.585** (0.227)	0.610** (0.243)	0.573*** (0.199)	0.680*** (0.230)	0.776*** (0.270)	0.718*** (0.163)	0.793*** (0.175)	0.739** (0.289)
Construction	0.369*** (0.101)	-0.020 (0.073)	0.106 (0.164)	0.162 (0.136)	0.307** (0.120)	0.305** (0.134)	0.454*** (0.106)	0.388*** (0.067)	0.393*** (0.088)	0.621*** (0.218)
Wholesale and retail trade	0.281*** (0.040)	0.300*** (0.089)	0.287*** (0.036)	0.271*** (0.048)	0.279*** (0.034)	0.259*** (0.039)	0.265*** (0.046)	0.226*** (0.044)	0.262*** (0.042)	0.284*** (0.054)
Transport storage & com.	0.713*** (0.087)	0.701*** (0.171)	0.618*** (0.078)	0.625*** (0.116)	0.626*** (0.089)	0.590*** (0.087)	0.642*** (0.114)	0.650*** (0.150)	0.833*** (0.117)	0.923*** (0.146)
Financial intermediation	0.595*** (0.049)	0.694*** (0.094)	0.578*** (0.042)	0.552*** (0.080)	0.536*** (0.063)	0.535*** (0.056)	0.544*** (0.054)	0.512*** (0.043)	0.544*** (0.053)	0.561*** (0.081)
Community social & per.	0.370*** (0.041)	0.034 (0.093)	0.088* (0.048)	0.238*** (0.065)	0.338*** (0.033)	0.407*** (0.037)	0.461*** (0.053)	0.474*** (0.036)	0.522*** (0.047)	0.580*** (0.076)
Eastern Cape	-0.116** (0.054)	-0.126 (0.098)	-0.107 (0.074)	-0.090** (0.045)	-0.047 (0.071)	-0.106 (0.070)	-0.124** (0.058)	-0.153*** (0.055)	-0.175*** (0.058)	-0.171* (0.094)
Northern Cape	-0.012 (0.049)	-0.028 (0.116)	0.046 (0.058)	0.015 (0.061)	0.006 (0.050)	-0.066 (0.068)	-0.035 (0.060)	-0.095** (0.046)	-0.118** (0.054)	-0.024 (0.077)
Free State	-0.100 (0.067)	-0.098 (0.097)	-0.034 (0.089)	-0.046 (0.087)	-0.057 (0.076)	-0.117 (0.077)	-0.083 (0.067)	-0.049 (0.074)	-0.102 (0.071)	-0.050 (0.083)
KwaZulu-Natal	0.023 (0.051)	0.079 (0.108)	0.131* (0.075)	0.146*** (0.054)	0.085 (0.053)	-0.001 (0.062)	-0.022 (0.042)	-0.028 (0.057)	-0.049 (0.051)	-0.077 (0.059)
North West	0.124* (0.066)	0.148 (0.119)	0.204** (0.082)	0.204** (0.081)	0.187* (0.101)	0.149** (0.074)	0.094** (0.046)	0.012 (0.077)	0.036 (0.083)	0.087 (0.115)
Gauteng	0.201*** (0.050)	0.324*** (0.062)	0.264*** (0.064)	0.292*** (0.063)	0.225*** (0.045)	0.172** (0.077)	0.169*** (0.057)	0.127* (0.074)	0.094* (0.052)	0.155* (0.080)

Mpumalanga	0.028 (0.060)	0.146 (0.095)	0.148** (0.075)	0.086 (0.052)	0.055 (0.080)	0.008 (0.084)	-0.019 (0.060)	-0.013 (0.078)	-0.024 (0.063)	-0.053 (0.072)
Limpopo	-0.185** (0.073)	-0.184 (0.158)	-0.182 (0.111)	-0.207** (0.101)	-0.109 (0.073)	-0.181** (0.077)	-0.103* (0.056)	-0.133 (0.086)	-0.098 (0.061)	-0.108 (0.086)
Wave dummy2	0.279*** (0.051)	0.079 (0.069)	0.165*** (0.047)	0.303*** (0.072)	0.274*** (0.066)	0.332*** (0.044)	0.385*** (0.044)	0.377*** (0.051)	0.398*** (0.070)	0.417*** (0.073)
Wave dummy3	0.559*** (0.042)	0.597*** (0.062)	0.562*** (0.057)	0.611*** (0.049)	0.566*** (0.046)	0.593*** (0.043)	0.617*** (0.052)	0.588*** (0.044)	0.555*** (0.054)	0.530*** (0.069)
Wave dummy4	0.855*** (0.040)	0.848*** (0.073)	0.824*** (0.052)	0.870*** (0.054)	0.866*** (0.033)	0.909*** (0.039)	0.929*** (0.049)	0.928*** (0.053)	0.913*** (0.049)	0.846*** (0.069)
Waved ummy5	1.090*** (0.040)	1.064*** (0.072)	1.076*** (0.060)	1.119*** (0.058)	1.100*** (0.052)	1.137*** (0.040)	1.198*** (0.048)	1.166*** (0.042)	1.130*** (0.044)	1.094*** (0.066)
Married	0.102*** (0.029)	0.163*** (0.045)	0.134*** (0.026)	0.124*** (0.038)	0.138*** (0.030)	0.088** (0.045)	0.105** (0.041)	0.085*** (0.030)	0.046* (0.028)	0.067** (0.029)
Cohabiting	0.003 (0.038)	-0.022 (0.079)	-0.039 (0.059)	-0.004 (0.061)	-0.031 (0.045)	-0.001 (0.031)	-0.008 (0.041)	0.002 (0.055)	0.031 (0.038)	0.025 (0.074)
Constant	5.306*** (0.163)	4.733*** (0.273)	5.062*** (0.270)	4.984*** (0.243)	5.332*** (0.207)	5.522*** (0.195)	5.650*** (0.196)	5.729*** (0.168)	5.736*** (0.158)	6.123*** (0.420)
Observations	3,928	3,928	3,928	3,928	3,928	3,928	3,928	3,928	3,928	3,928
R-squared	0.515									

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table 4.2A Heckman Selection bias two-step

Variables	(1) Labour income	(2) Selection
Number of children	-0.0343*** (0.0129)	
Children aged below 6 years	-6.31e-05 (0.0354)	-0.154*** (0.0272)
Education	0.482*** (0.0538)	0.378*** (0.0133)
Mother's age	0.0162*** (0.00472)	0.0305*** (0.00246)
Year of experience	0.0392*** (0.00266)	
Women's decision-making	0.0535** (0.0227)	0.125*** (0.0136)
African	-0.540*** (0.133)	0.200 (0.141)
Coloured	-0.373** (0.153)	0.485*** (0.147)
White	0.110 (0.156)	0.333* (0.173)
Mother's health status	0.222*** (0.0682)	0.299*** (0.0506)
Urban	0.183*** (0.0567)	-0.166*** (0.0536)
Traditional	-0.0766 (0.106)	-0.630*** (0.0568)
Agriculture hunting forestry	0.285*** (0.0560)	
Mining and quarrying	1.110*** (0.109)	
Manufacturing	0.355*** (0.0536)	
Electricity gas and water supply	0.690*** (0.167)	
Construction	0.362*** (0.0854)	
Wholesale and retail trade	0.284*** (0.0425)	
Transport storage and comm.	0.706*** (0.103)	
Financial intermediation ins.	0.599*** (0.0554)	

Community social and personals.	0.373*** (0.0409)	
Eastern Cape	-0.170*** (0.0639)	-0.223*** (0.0615)
Northern Cape	-0.0897 (0.0662)	-0.291*** (0.0582)
Free State	-0.156** (0.0723)	-0.231*** (0.0705)
KwaZulu-Natal	-0.0203 (0.0558)	-0.137** (0.0581)
North West	0.0366 (0.0830)	-0.302*** (0.0708)
Gauteng	0.164*** (0.0582)	-0.139** (0.0606)
Mpumalanga	-0.00570 (0.0648)	-0.119* (0.0677)
Limpopo	-0.235*** (0.0738)	-0.195*** (0.0700)
Wave 2 dummy	0.266*** (0.0491)	-0.0386 (0.0478)
Wave 3 dummy	0.571*** (0.0466)	0.0527 (0.0457)
Wave 4 dummy	0.897*** (0.0507)	0.174*** (0.0441)
Wave 5 dummy	1.126*** (0.0493)	0.151*** (0.0446)
Married		-0.129*** (0.0312)
Cohabiting		-0.120*** (0.0434)
Constant	4.336*** (0.543)	-2.396*** (0.188)
Observations	3,928	12,020
Lambda/mills	0.407* (0.216)	
rho	0.506	
sigma	0.803	

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4.3A Heckman Model correcting for sample selection bias in Quantile regression

Variables	(1) OLS Labour income	(2) 0.10 Labour income	(3) 0.20 Labour income	(4) 0.30 Labour income	(5) 0.40 Labour income	(6) 0.50 Labour income	(7) 0.60 Labour income	(8) 0.70 Labour income	(9) 0.80 Labour income	(10) 0.90 Labour income
Number of children	-0.035*** (0.013)	-0.027 (0.023)	-0.033** (0.014)	-0.048* (0.028)	-0.036** (0.016)	-0.048*** (0.013)	-0.042*** (0.014)	-0.038*** (0.014)	-0.027** (0.012)	-0.033* (0.017)
Children Aged < 6 yrs.	-0.001 (0.033)	0.015 (0.065)	-0.004 (0.027)	-0.002 (0.032)	-0.005 (0.036)	-0.008 (0.044)	-0.021 (0.029)	-0.001 (0.027)	0.014 (0.037)	-0.049 (0.035)
Education	0.484*** (0.051)	0.463*** (0.122)	0.465*** (0.066)	0.526*** (0.041)	0.532*** (0.072)	0.506*** (0.061)	0.505*** (0.059)	0.462*** (0.051)	0.464*** (0.084)	0.485*** (0.075)
Mother's age	0.016*** (0.005)	0.016 (0.010)	0.013* (0.007)	0.018*** (0.004)	0.019*** (0.006)	0.019*** (0.005)	0.019*** (0.005)	0.017*** (0.005)	0.015* (0.008)	0.017*** (0.006)
Year of experience	0.039*** (0.003)	0.033*** (0.006)	0.034*** (0.004)	0.039*** (0.003)	0.038*** (0.004)	0.038*** (0.003)	0.035*** (0.003)	0.034*** (0.003)	0.035*** (0.004)	0.034*** (0.004)
Women decision-making	0.054** (0.022)	0.068 (0.051)	0.074*** (0.028)	0.078*** (0.019)	0.078*** (0.028)	0.072*** (0.022)	0.075*** (0.028)	0.053** (0.025)	0.034 (0.032)	0.017 (0.022)
African	-0.540*** (0.099)	-0.636*** (0.157)	-0.537*** (0.114)	-0.424*** (0.147)	-0.434** (0.184)	-0.565*** (0.147)	-0.520*** (0.099)	-0.449*** (0.160)	-0.345** (0.141)	-0.546** (0.262)
Coloured	-0.370*** (0.122)	-0.431* (0.227)	-0.176 (0.148)	-0.032 (0.198)	-0.155 (0.247)	-0.335** (0.168)	-0.320** (0.137)	-0.273* (0.164)	-0.227 (0.182)	-0.459 (0.295)
White	0.110 (0.120)	0.283 (0.245)	0.338** (0.131)	0.327* (0.178)	0.246 (0.189)	0.083 (0.152)	0.174 (0.127)	0.177 (0.177)	0.262 (0.163)	-0.000 (0.308)
Mother's health status	0.223*** (0.072)	0.313* (0.161)	0.333*** (0.081)	0.373*** (0.082)	0.272** (0.106)	0.171* (0.092)	0.139* (0.078)	0.091 (0.069)	0.050 (0.093)	0.109 (0.079)
Urban	0.183*** (0.056)	0.294** (0.137)	0.226*** (0.076)	0.197* (0.101)	0.119* (0.072)	0.084 (0.059)	0.096* (0.055)	0.066 (0.042)	0.101 (0.070)	0.162*** (0.055)
Traditional	-0.080 (0.101)	-0.044 (0.266)	-0.096 (0.108)	-0.158 (0.137)	-0.255 (0.158)	-0.205 (0.130)	-0.182* (0.104)	-0.112 (0.103)	-0.093 (0.170)	-0.028 (0.131)

Agriculture hunting for.	0.285*** (0.055)	0.324*** (0.110)	0.272*** (0.051)	0.274*** (0.073)	0.291*** (0.049)	0.248*** (0.050)	0.262*** (0.044)	0.208*** (0.059)	0.271*** (0.057)	0.331*** (0.077)
Mining and quarrying	1.110*** (0.104)	1.006*** (0.233)	0.936*** (0.202)	1.191*** (0.226)	1.238*** (0.058)	1.153*** (0.073)	1.138*** (0.088)	1.098*** (0.129)	1.105*** (0.094)	1.055*** (0.072)
Manufacturing	0.356*** (0.050)	0.296*** (0.113)	0.370*** (0.077)	0.304*** (0.054)	0.328*** (0.065)	0.338*** (0.055)	0.363*** (0.051)	0.345*** (0.044)	0.397*** (0.073)	0.467*** (0.065)
Electricity gas and water	0.689*** (0.152)	0.529* (0.283)	0.662*** (0.233)	0.661*** (0.149)	0.642** (0.263)	0.599*** (0.192)	0.779*** (0.196)	0.774*** (0.169)	0.812*** (0.196)	0.693** (0.284)
Construction	0.362*** (0.101)	0.049 (0.173)	0.111 (0.110)	0.139 (0.150)	0.321** (0.138)	0.294** (0.138)	0.457*** (0.095)	0.392*** (0.089)	0.381*** (0.101)	0.602*** (0.205)
Wholesale and retail trade	0.284*** (0.040)	0.278*** (0.071)	0.303*** (0.046)	0.280*** (0.048)	0.284*** (0.042)	0.264*** (0.041)	0.275*** (0.050)	0.252*** (0.039)	0.262*** (0.063)	0.270*** (0.052)
Transport storage & com.	0.706*** (0.087)	0.669*** (0.148)	0.664*** (0.148)	0.648*** (0.103)	0.615*** (0.099)	0.628*** (0.091)	0.661*** (0.122)	0.668*** (0.132)	0.822*** (0.162)	0.890*** (0.180)
Financial intermediation	0.599*** (0.049)	0.672*** (0.069)	0.604*** (0.055)	0.573*** (0.052)	0.555*** (0.073)	0.535*** (0.047)	0.553*** (0.057)	0.542*** (0.059)	0.546*** (0.050)	0.565*** (0.078)
Community social & per.	0.373*** (0.041)	0.016 (0.079)	0.115** (0.059)	0.247*** (0.063)	0.330*** (0.039)	0.413*** (0.051)	0.475*** (0.049)	0.499*** (0.052)	0.522*** (0.051)	0.563*** (0.034)
Eastern Cape	-0.171*** (0.062)	-0.155 (0.136)	-0.187** (0.086)	-0.197*** (0.056)	-0.140 (0.089)	-0.156** (0.064)	-0.221*** (0.081)	-0.199*** (0.058)	-0.209*** (0.049)	-0.203*** (0.068)
Northern Cape	-0.091 (0.063)	-0.094 (0.133)	-0.084 (0.110)	-0.115* (0.067)	-0.131* (0.069)	-0.154** (0.077)	-0.153** (0.067)	-0.150*** (0.046)	-0.167** (0.085)	-0.094 (0.105)
Free State	-0.157** (0.073)	-0.165* (0.099)	-0.104 (0.105)	-0.143 (0.087)	-0.151 (0.106)	-0.219*** (0.072)	-0.196** (0.086)	-0.096 (0.081)	-0.132 (0.100)	-0.072 (0.101)
KwaZulu-Natal	-0.021 (0.054)	0.055 (0.112)	0.094 (0.061)	0.083 (0.092)	0.017 (0.064)	-0.045 (0.066)	-0.091 (0.063)	-0.066 (0.070)	-0.067 (0.061)	-0.095 (0.080)
North West	0.035 (0.077)	0.107 (0.109)	0.098 (0.096)	0.040 (0.105)	0.051 (0.128)	0.043 (0.086)	-0.044 (0.079)	-0.072 (0.090)	-0.016 (0.097)	0.045 (0.126)
Gauteng	0.164*** (0.054)	0.306*** (0.086)	0.237*** (0.080)	0.234*** (0.083)	0.139** (0.068)	0.126* (0.066)	0.092 (0.064)	0.088 (0.054)	0.088 (0.063)	0.159** (0.074)
Mpumalanga	-0.006 (0.061)	0.126 (0.095)	0.083 (0.073)	0.051 (0.104)	-0.014 (0.075)	-0.026 (0.090)	-0.087 (0.063)	-0.045 (0.058)	-0.050 (0.088)	-0.048 (0.076)

Limpopo	-0.236*** (0.079)	-0.198* (0.106)	-0.261** (0.102)	-0.307*** (0.090)	-0.202* (0.107)	-0.220*** (0.074)	-0.201*** (0.077)	-0.174** (0.085)	-0.102 (0.085)	-0.122 (0.090)
Wave dummy2	0.266*** (0.051)	0.080 (0.114)	0.174** (0.070)	0.285*** (0.050)	0.258*** (0.050)	0.316*** (0.049)	0.395*** (0.067)	0.364*** (0.049)	0.380*** (0.052)	0.423*** (0.086)
Wave dummy3	0.571*** (0.043)	0.609*** (0.101)	0.616*** (0.074)	0.656*** (0.062)	0.577*** (0.052)	0.614*** (0.047)	0.664*** (0.042)	0.585*** (0.050)	0.564*** (0.057)	0.555*** (0.080)
Wave dummy4	0.898*** (0.047)	0.924*** (0.107)	0.917*** (0.055)	0.960*** (0.055)	0.947*** (0.059)	0.983*** (0.048)	1.002*** (0.050)	0.964*** (0.063)	0.931*** (0.079)	0.899*** (0.076)
Waved ummy5	1.127*** (0.045)	1.139*** (0.091)	1.145*** (0.064)	1.184*** (0.049)	1.173*** (0.059)	1.204*** (0.055)	1.273*** (0.049)	1.180*** (0.058)	1.151*** (0.085)	1.131*** (0.064)
Mills ratio	0.415** (0.202)	0.512 (0.518)	0.575** (0.236)	0.743*** (0.177)	0.686** (0.294)	0.536** (0.239)	0.541** (0.225)	0.337 (0.205)	0.237 (0.337)	0.306 (0.271)
Constant	4.317*** (0.505)	3.457*** (1.212)	3.681*** (0.652)	3.219*** (0.472)	3.641*** (0.773)	4.277*** (0.606)	4.343*** (0.626)	4.926*** (0.514)	5.140*** (0.901)	5.291*** (0.736)
Observations	3,928	3,928	3,928	3,928	3,928	3,928	3,928	3,928	3,928	3,928
R-squared	0.514									

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1