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Assessing the impact of social grants on household welfare using propensity score matching approach

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Abstract

Purpose – This study aims to investigate the impact of social grants on rural household welfare in a village located in one of the poorest provinces in South Africa – KwaZulu Natal Province. Actually, since the inception of democratic rule, the South African government has turned to social grants to address the issues of poverty, income inequality and to improve household welfare. The coverage of social grants has increased substantially with more than 17 million (about 34% of the population) South Africans being recipients of social grants. Despite having relatively well-developed social security system, poverty levels in rural parts of South Africa remains very high.

Design/methodology/approach – This study uses a cross-sectional households survey data conducted in Hlokozi village. A propensity score matching technique, which accounts for non-random selection of households, is applied.

Findings – The results reveal that social grants have a significant and positive impact on rural household welfare. Specifically, the nearest neighbour matching estimates suggest that the causal effect for social grants on household welfare is the region of about R5,830. Consistent with the nearest neighbouring method, the results obtained using the Kernel matching method show that social grants are significant in improving rural household welfare.

Originality/value – While there are a number of studies that have shed some light on how social grant reduces poverty in South Africa, there are some gaps. Firstly, only a few studies have interrogated the impact of social grants on household welfare. Secondly, most of these studies have relied on descriptive analysis, and finally, besides poverty being high in rural areas, research on the impact of social grants on rural household welfare remains thin.

Keywords PSM, Poverty, Household welfare, South Africa, Rural areas

Paper type Research paper

1. Introduction

Since the inception of democratic rule, South African government has turned to social grants to address the issues of poverty, income inequality and to improve household welfare. The coverage of social grants has increased substantially with more than 17 million (about

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34% of the population) of South Africans being recipients of social grants. Despite an increase in the coverage of social grants and well-developed social security system poverty in South Africa remains high by historical and international standards. Approximately half of South African population live in poverty (Hoogeveen and Özler, 2005; Tregenna, 2012; Biyase, 2014). Moreover, poverty is disproportionally dominant among subgroup of population that is vulnerable such as children (Streak, 2005), female headed-households (Posel and Rogan, 2011) and in rural areas (Dieden and Gustafson, 2003; Zimbalist, 2017).

A number of studies have examined the extent to which social grants have been successful in reducing poverty (Bhorat and Kanbur, 2006; Armstrong and Burger, 2009; Woolard and Leibbrandt, 2010; Satumba *et al.*, 2017) . While these studies have shed some light on poverty reducing effect of social grants:

- only a few studies have interrogated the impact of social grants on household welfare;
- most of these studies have relied on descriptive analysis (Armstrong and Burger, 2009; Satumba *et al.*, 2017); and
- besides poverty being high in rural areas, research on the impact of social grants on rural household welfare remains thin.

Thus, this paper contributes and improves upon the existing literature by using propensity score matching technique to investigate the impact of social grants – disability grant, social pension, child support grant) in a village located in one of the poorest provinces in South Africa. The propensity score matching technique reduces selection bias and account for curse of dimensionality by matching grants recipients with non-recipients who have similar pre-treatment characteristics.

The rest of the paper is structured as follows: Section 2 reviews the existing empirical literature on the effects of social grants on household welfare. Section 3 describes the empirical methodology and database used in this paper, and Section 4 presents the results. The last section provides some concluding remarks.

2. Literature review

The driving objective of social assistance grants in any country is to alleviate the negative impact of poverty and promote socio-economic development. In many countries, social grants are well targeted (as they are means tested) and have profound decreased poverty levels amongst the poor and vulnerable individuals (Leibbrandt *et al.*, 2010). The literature investigating the impact of social grants on poverty and households welfare in sub-Saharan African countries is vast (Case and Deaton, 1998; Barrientos, 2003; Booysen, 2005; Bhorat and Kanbur, 2006; Armstrong and Burger, 2009; Woolard and Leibbrandt, 2010; Levina *et al.*, 2011; The Kenya CT-OVC evaluation team, 2012; Asfaw *et al.*, 2017; Lekobane and Seleka, 2017; Woolard *et al.*, 2011; Gutura and Tanga, 2017; Zimbalist, 2017), to name just a few. Although South Africa is the most researched country due to richness of the data such as the National Income Dynamics (NIDS), there are still some gaps that exist in South African literature. We will only provide brief overview of South Africa literature, as our study is based in South Africa.

A study by Woolard and Leibbrandt (2010) investigated the impact of unconditional cash transfers on poverty using the first wave of NIDS study. They found that social grants have more impact on the income of household located at the bottom of income distribution – suggesting that social grants are well targeted to the poorest people. Moreover, they found

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that although social grants have negligible impact on poverty headcount ratio, the impact on the depth and severity of poverty was substantial.

Similar results were also obtained by Nedombeleni and Oyekale (2015), who conducted a study looking at the welfare effect of social grants among rural households in the Limpopo Dopeni village using Foster, Greer and Thorbecker (FGT) indices. Using the probit model to determine the probability of a household being poor, the authors found that remittances, non-agricultural income and social grants reduced the probability of being poor in the study area. In an unrelated study, Satumba *et al.* (2017) used 2010/2011 income and expenditure survey to assess the impact of social grants on poverty, using FGT poverty indices. They found that social grants significantly reduce poverty in provinces that have high poverty rates such as Limpopo and Eastern Cape and in rural areas. Moreover, the impact of social grants was more substantial among vulnerable groups such as Africans and female-headed households. Consistent with the findings of Woolard and Leibbrandt (2010), they argue that social grants are well targeted to the poor.

Armstrong and Burger (2009) used income and expenditure survey of 2005 to assess the impact of social grants on poverty and inequality using normalized FGT class of decomposable poverty indices and the general entropy to measure poverty and inequality respectively. Consistent with Woolard and Leibbrandt (2010) and Satumba *et al.* (2017), they found that social grants have a considerable impact on the level, depth and severity of poverty. They further found that while the impact of social grants on poverty was substantial, the impact on inequality was negligible. Other studies that found social grants to be effective in reducing poverty include Case and Deaton (1998), Barrientos (2003), Booysen (2005), Bhorat and Kanbur (2006), Woolard *et al.* (2011), Gutura and Tanga (2017), Zimbalist (2017), just to name a few.

A study by Mackett (2020) used the NIDS to investigate whether social grants were a tool for poverty reduction in South Africa. Consistent with the results of previous studies, Mackett (2020) found that individuals living in a grant household were less likely to be poor compared to those residing living in household without grant prospects. In their recent study, Nishimwe-niyimbanira *et al.* (2021) investigated the impact of social grant on income poverty in Vukuzakhe Township in South African township. Applying the 2019 South African Lower-Bound Poverty Line, the authors reported that the social grants decreased poverty by almost a quarter in the study area.

Notwithstanding a substantial number of studies conducted in South Africa, there are still some gaps in the South African literature. Firstly, most of South Africa studies have to a large extent focused on using national data to interrogating the impact of social grants on poverty; however, these surveys do not constitute full coverage which is sufficient for analytical purpose. Thus, the impact of social grants on poverty in rural areas of the country remains under-researched due to a lack of data in these areas. Secondly, empirical strategies used in most of these studies are mainly descriptive and are based on the assumption that household welfare is only influenced by social grants. Our study seeks to fill these gaps by using a cross-sectional data collected in a village located in one of the poorest province in South Africa. We use appropriate estimation techniques that are not descriptive.

3. Data and methodology

This paper uses a cross-sectional household survey data conducted in Hlokozi village to analyse the impact of social grants on household welfare. Stratified random sampling method was used in gathering data from the respondents. The respondents were classified

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on the basis of various features such as the main road and river valleys and the Hlokozi area was divided into three convenient sections. This was done primarily for reasons of convenience in numbering the homesteads – with 2,205 numbers to be assigned. A sample was drawn for each section (proportionate to its household counts) by using a random number table. A total of 282 households were surveyed for the study.

As a way of setting the scene, we first analyse the effect of social grants using a "naïve" or "morning after" simulation method (e.g. before-after comparisons). Specifically, households' welfare is calculated before and after excluding social grants from the total income. Implicit in this analysis is the unpalatable assumption that in the absence of social grants the household welfare of the recipients would have been the same as before the introduction of social grants. Moreover, the analysis assumes that changes in household welfare of recipients are not influenced by any other factors except social grants. Given the inadequacies of this basic method, we also adopt appropriate analysis of social grant impact which requires a response to the question:

Q1. What would have happened to the welfare of the recipients if they did not get the grants?

To answer this question we perform propensity score matching which pairs households that receive social grants with other similar households, except for social grants. We estimate the probability of receiving social grants as a function of individual and household characteristics, rank recipient and non-recipient households by their propensity score, pair individual members of recipient households, and non-recipients with similar propensity scores, and calculate the average difference in welfare across them.

Specifically, we adopt a three-step estimation procedure to investigate the effect of social grants on household welfare. In the first step, we estimate a logit model comprising the explanatory variables of receiving social grants. Guided by existing studies in this field we chose the most commonly used variables in this field such as age of the head of the household (measured in years); gender of the head of the household (male = 1 while female = 2); marital status married = M, widowed = W, divorced = D, single or never married = S, living together but not formally married = P. We then generated a dummy variable of marital status where 1 = married, and 0 = otherwise. Social grants variable in the Hlokozi survey was measured using a question "indicate which member of your household receives the following grants or payments at present": disability grant, social pension and child support grant. The respondent is then asked to indicate the total sum per household per month. Food security variable was measured by asking "how many meals a day are usually eaten by the people who live in this household". A follow-up question says "does it ever happen that there is not enough food available for everybody to have 3 meals on that day?" (1 = yes or 2 = no). To help identify migrants, Hlokozi survey asks the following question: "how frequently and regularly . . .stayed here (in this homestead) during the last 6 months?" (1 = most nights here, 2 = most nights away but returns here regularly and fairly frequently e.g. weekends, fortnightly, month ends, 3 = most nights away but returns fairly regularly, though less frequently than every month, 4 = most nights away and no regular pattern of frequent returns).

In the second step, the estimates of the logit model are used to compute the propensity score, understood as the probability of receiving social grants. In the third step, the propensity score derived from the logit model is used to match the receiving households with non-receiving households. The propensity score index is defined as the probability of receiving treatment conditional on observed covariates X:

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$$P(X) = Pr(D = 1|X) \quad (1)$$

where P (X) is the abbreviation for propensity score, Pr is a probability, D = 1 indicates exposure to the treatment, the "|" symbol stands for conditional on, and X is a set of observed covariates.

PSM analysis requires fulfilment of various assumptions such as the conditional independence assumption (CIA) or the assumption of selection on observables (Rosenbaum and Rubin, 1983; Heckman and Robb, 1985). This assumption implies that conditional observable characteristics of potential participants and potential outcomes are not dependent on the participation status. The CIA can be expressed as follows:

$$Y^0, Y^1 \perp D|X \quad (2)$$

where $\perp$ denotes independence and, D = 1 indicates exposure to the treatment, the "|" stands for conditional on, X is a set of observed covariates and Y^0 and Y^1 are potential outcomes.

Because estimates are sometimes sensitive to the choice of matching technique, we implement two frequently used approaches. We consider nearest neighbour matching (NNM) and kernel-based matching (KBM). With NNM, each member of the treatment group is matched to a non-treated unit using the closest propensity score. Whilst the KBM the propensity score of each treated unit is matched with the kernel weighted average outcome of all non-treated units.

4. Findings

4.1 "Morning after" simulation: before and after comparison

We first present results based on "Morning after" simulation which provide us with a first impression on how social grants might affect household welfare (in Figures 1–5). Figure 1 shows the level of poverty (P0) before and after social grants. The level of poverty, defined for income net of social grants is 73% and it goes down to 54% for income defined inclusive of social grants. Thus, social grants seem to be effective in reducing the level of poverty. These results are consistent with most studies in the literature (Maitra and Ray, 2003; Hoogeven and Ozler, 2005; Armstrong and Burger, 2009; Van der berg *et al.*, 2010). The table also shows poverty level by gender. Interestingly, poverty incidence declines from 61% to 59% for males and from 70% to 49% for females. Social grants have a considerable impact in reducing poverty among females.

Following a number of studies in this field (Maitra and Ray, 2003; Posel, 2016; Biyase *et al.*, 2017), we assess the impact of social grants – disability grant, social pension, child support grant, on the distribution of households' income by estimating the kernel density of a log of income with and without social grants for males and females separately. The most striking feature of the two figures is that while social grants slightly shift the entire distribution of income for the males (Figure 2), the impact on the distribution of income for the females (Figure 3) is more noticeable.

Lastly, we assess the impact of social grants on gender inequality by graphing the Lorenz curves when income is exclusive (Figure 4) and inclusive (Figure 5) of social grants. Lorenz curve plots cumulative distribution of the population on the horizontal axis against cumulative distribution of income share in the vertical axis. The further Lorenz curve lies below the diagonal line, the higher is the level of inequality. Comparison of two figures shows some interesting results. Firstly, female Lorenz curves lies below male curves in both

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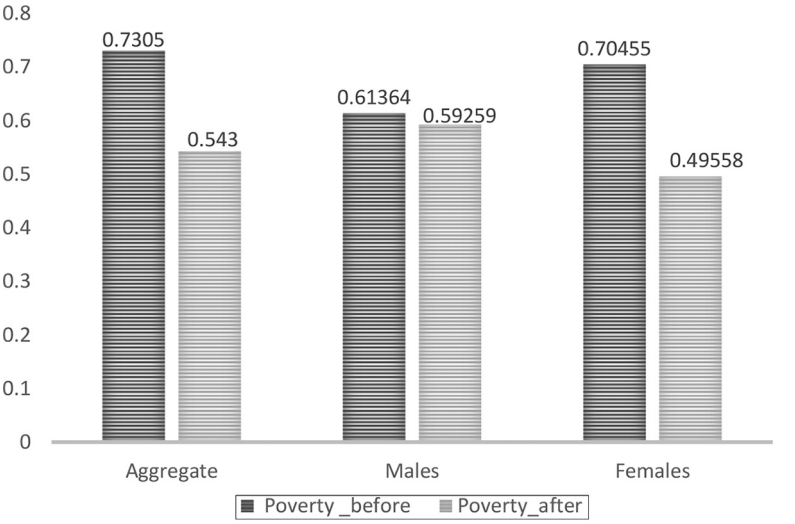

Figure 1.
Level of poverty before and after social grants

Source: Own calculation based on survey data

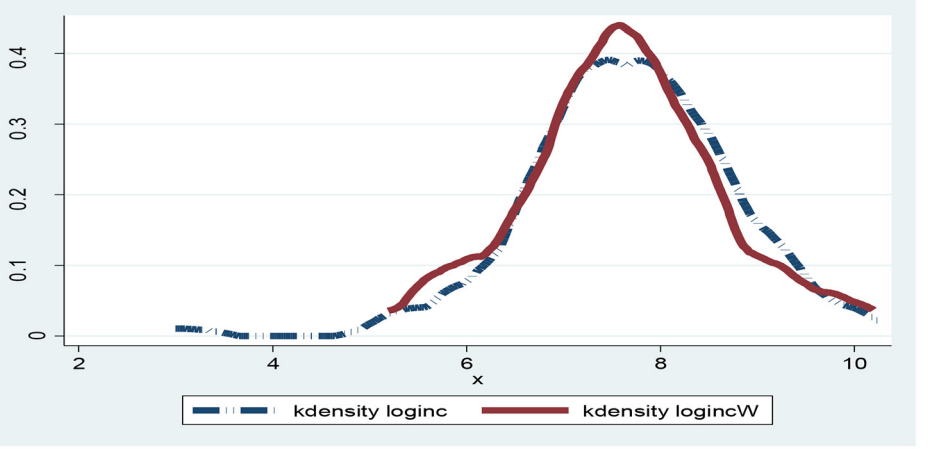

Figure 2.
Kernel density of income with and without grants for males

Source: Own calculation based on survey data

graphs, implying that female inequality is higher than male inequality. Secondly, gender inequality is higher when income is defined net of social grants (Figure 4) compared to when income is inclusive of social grants. Thus, social grants are effective in reducing gender inequality. Lastly, although not showed in one graph, social grants reduce the overall inequality for both females and males.

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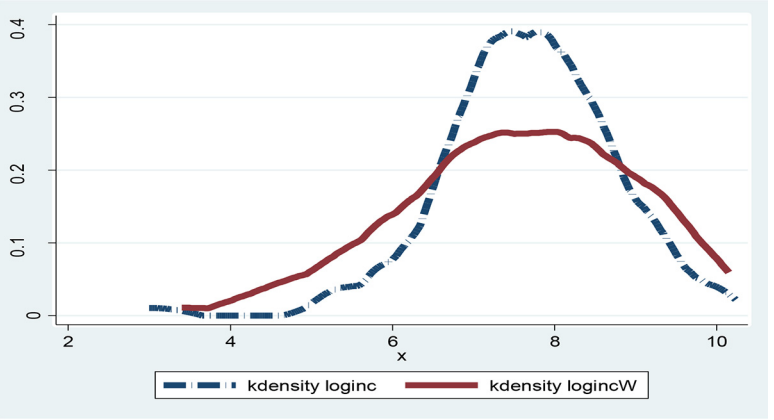

Figure 3.
Kernel density of income with and without grants for males

Source: Own calculation based on survey data

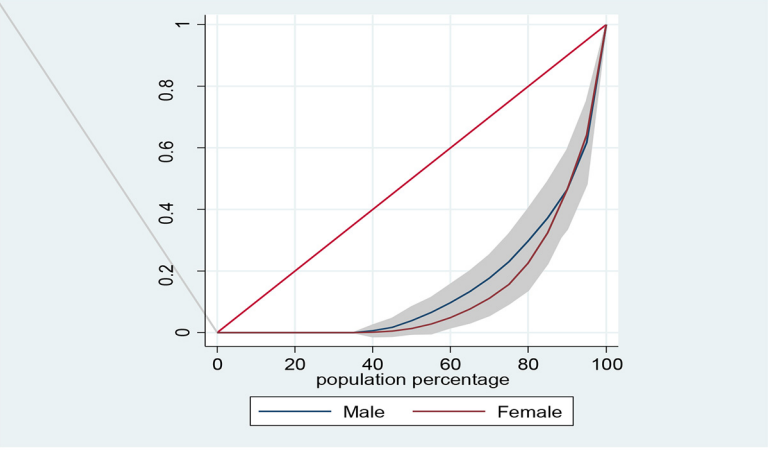

Figure 4.
Lorenz curve for pre-transfer income

Source: Own calculation based on survey data

4.2 Propensity-score matching estimates

4.2.1 Factors influencing social grants. Having reported the estimates from the naive approach, we now turn to the results of propensity-score matching. The first step in the analysis is to estimate the probability of receiving social grants as a function of household characteristics. The estimated coefficients of the probit model, along with the levels of significance, are presented in Table A1. The results suggest that households asset (measured by land), government assistance [1] (whether household has received some assistance from a state initiatives), food security, number of migrants in household, marital status of the household head, age and gender of the household are not important in explaining the likelihood of receiving social grants. While these variables were found to be insignificant determinants of social grants, they were included in the analysis because they

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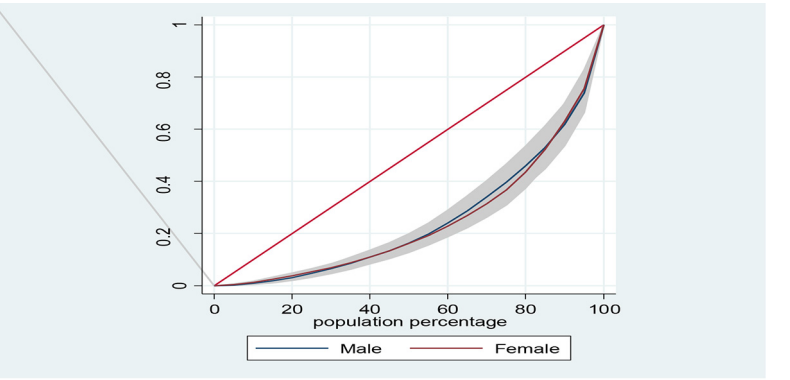

Figure 5.
Lorenz curve for post-transfer income

Source: Own calculation based on survey data

constitute important factors in explaining household welfare (Malik, 1996; Serumaga-Zake and Naude, 2002; Mukherjee and Benson, 2003; Geda *et al.*, 2005; Datt and Jolliffe, 2005; Mok *et al.*, 2007; Julie *et al.*, 2008; Litchfield and McGregor, 2008; Akere and Adewuyi, 2011; Gounder, 2013; Edoumiekomu *et al.*, 2013; Lekobane and Seleka, 2017; Biyase and Zwane, 2018).

Among all the explanatory variables considered, education and remit dummy significantly influenced the probability of receiving social grants. For example, the likelihood of receiving remittances is positive and significant, implying that remittances significantly increase the likelihood of receiving social grants. This is possible given the fact that remittances by and large tend to complement government cash transfer programs (Ambrosius, 2016). There are a number of empirical studies to support this claim (Garcia Zamora, 2005; Aparicio and Mesequer, 2012; Mesequer and Aparicio, 2012; Duquette-Rury, 2014; Iskander, 2015; Simpser *et al.*, 2016). They found that:

> Migrants use collective remittances by Home-Town-Associations (HTA) as leverage in order to obtain additional spending by municipal, state and federal governments for the financing of public works in their communities. (Mesequer and Aparicio, 2012)

4.2.2 Impact of social grants on household welfare. The effect of social grants on household welfare is estimated with the NNM and KBM algorithms. The results of the propensity score matching on the impact of social grants on household welfare are given in Tables 1 and 2. The results in Table 1 show that social grants exerts a positive and significant impact on the household welfare (measured by per capita income) in Hlokozi village. Specifically, the NNM estimates suggest that the causal effect for social grants on household welfare is about R5,830 in Hlokozi.

Table 1.
Average treatment effect of grants on household welfare nearest neighbour matching

Variable	Sample	Treated	Controls	Difference	SE	T-stat
HH_income	Unmatched	7,018.056	4,769.048	2,249.008	[1,667.183]	1.35
	ATT	7,678.696	1,847.826	5,830.87	[1,917.244]	3.04

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With regard to kernel-based matching algorithm, (each participant is matched with a weighted average of all non-participants with weights that are inversely proportional to the distance between the propensity score of the participants and non-participants), the effect of social grants on household welfare shows an increase of R8,535 [2]. This finding is collaborated by Kyophilavong (2011) who found that cash transfers to poor households with children could reduce poverty and improve income distribution in both urban and rural areas and that poor rural families with children rather than the urban poor, seem to benefit more in terms of poverty reduction, from this cash transfer program. Thus, these authors recommend that the Lao Government should consider establishing a comprehensive social support program aimed at reducing poverty in Laos.

Our finding also confirmed the conclusions of other previous studies which have shown that conditional cash transfers (Banarjee *et al.*, 2010; Brune *et al.*, 2011; Bandiera *et al.*, 2013), and unconditional cash transfers (Cunha *et al.*, 2011; Haushofer and Shapiro, 2013; Blattman *et al.*, 2013) have positive effects on consumption, income, and other welfare indicators.

The density distribution of the propensity scores for recipients and non-recipients is shown in (Figure 6) below. The bottom half of the graph shows the propensity score distribution for the non-treated or non-recipients, while the upper-half refers to the treated or recipients individuals. Visual analysis of the density distribution of the propensity scores suggests that there is a high chance of getting good matches.

Table 2.
Average treatment effect of grants on household welfare kernel estimator

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
HH_income	Unmatched	7,018.056	4,769.048	2,249.008	[1,667.183]	1.35
	ATT	10,155.38	1,619.523	8,535.862	[2,861.943]	2.98

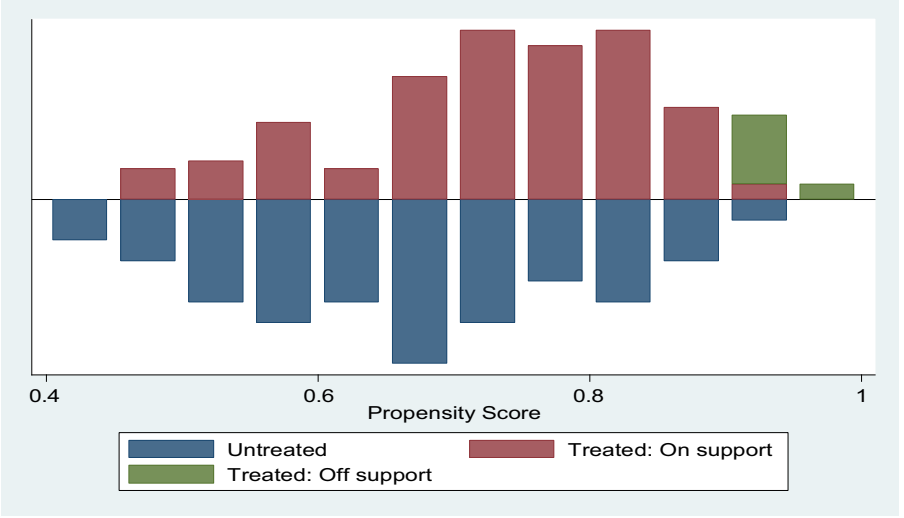

Figure 6.
Distribution of the Propensity Scores in Common Support Area

Source: Own calculation based on survey data

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We also plot the distributions of the propensity scores for the receiving households with non-receiving households to visually check the overlap condition and to see if the matching is able to make the distributions more similar. The distributions of the propensity scores, before and after the matching, are plotted in Figure 7. Graphical assessment suggests that the densities of the propensity scores are more similar after matching. The plot also reveals a clear overlapping of the distributions.

5. Conclusion

This paper use both naïve approach ("morning after" simulation) and appropriate econometric technique (propensity score matching) to investigate the impact of social grants on household welfare in Hlokosi village, a village located in one of the poorest province in South Africa. Using "morning after" simulation analysis, we found that social grants are effective in improving household welfare. Perhaps interestingly, we found that the effect of social grants on the welfare of female is considerably higher compared to males. The results of the propensity score matching on the impact of social grants on household welfare show that social grants exerts a positive and significant impact on the household welfare (measured by per capita income) in Hlokozi village. Specifically, the NNM estimates suggest that the causal effect for social grants on household welfare is about R5,830 in Hlokozi.

With respect to kernel matching technique, individuals are matched with a weighted average of all controls with weights that are inversely proportional to the distance between

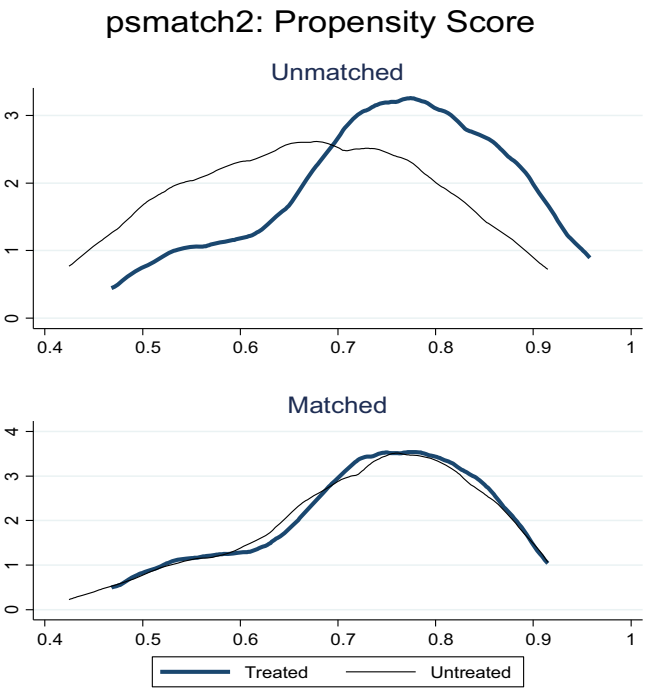

Figure 7.
Distributions of the propensity scores

Source: Own calculation based on survey data

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the propensity scores of treated and controls, the effect of social grants on household welfare shows an increase of R8,535 [3]. This finding is collaborated by Kyophilavong (2011) who found that cash transfers to poor households with children could reduce poverty and improve income distribution in both urban and rural areas and that poor rural families with children rather than the urban poor, seem to benefit more in terms of poverty reduction, from this cash transfer program.

The policy implication of the findings is that social grants should continue to be used as a tool to alleviate poverty and reduce inequality in rural areas. Moreover, the coverage of social grants among females should be increased to reduce high level of female poverty and income inequality.

Notes

1. Initiatives taken to improve the standard of living of communities in non-urban areas.
2. As can be seen in the results all the matching techniques produce consistent estimates of the effect of social grants on household welfare.
3. As can be seen in the results all the matching techniques produce consistent estimates of the effect of social grants on household welfare.

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Appendix

Table A1. Estimation of the propensity scores, logit model estimating the probability of receiving

Variables	Coef.	Std. err.	T-stats
Educ	0.916919	[0.423364]	**
Educ_SQ	−0.10524	[0.044474]	**
Migrant	0.289689	[0.411652]	
remit_dummy	4.506556	[1.803807]	**
Asset	−2.17482	[1.561949]	
Govt_assist	0.161962	[0.95197]	
Food_sec	−0.44847	[0.880984]	
Number of migrants in HH	0.269735	[0.523994]	
HHH_married	1.131275	[1.062169]	
Head_age	0.040736	[0.043255]	
Age_SQ	−0.00076	[0.000556]	
HH_gender_1	−0.4971	[1.012819]	
Cons	−4.41057	[2.800051]	**

Notes: Standard errors in parentheses. *Significant at 10%; **Significant at 5%; ***Significant at 1%

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