

Grandfathers and Grandsons: Effects of a Male only Pension Change*

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Abstract

An exogenous male-only increase in cash transfer causes greater expenditure on food, an improvement in Weight-for-Age Z-scores in young children, and a deterioration in Height-for-Age Z-scores in very young children, as observed in the context of South Africa's 2010 state pension expansion for males. When estimated separately, these effects disappear for girls, however for boys they remain intact, at a greater significance level. In 2010 the male eligibility age for the South-African state pension was brought on a par with female eligibility age (60, previously 65). I exploit this policy change in order to estimate the effects of the male-only change in cash transfers, on growth of young children living in the same household, as well as on food expenditure. The policy change took place shortly after the completion of the first wave of South Africa's National Income Dynamics Survey and shortly before the start of the second wave, which lends itself well for a Difference-in-Differences approach on the right hand side. On the left hand side I use z-scores of the anthropometrics status of young children in the household (against WHO standards) as well as food expenditure.

1 Introduction

Conditional Cash Transfer schemes are increasingly common in developing countries, electronic systems have made it easier to administrate these at a large scale, with lower incidences of corruption. However, the efficacy of these schemes as compared in-kind benefits such as universal health care is often brought into question, especially where the recipient of the transfer is male.

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With this study I provide a close examination of the impact of cash transfers to male household members. I examine a policy change in the South African state pension that only benefits men, bringing down the eligibility age from 65 to 60, on a par with women.

I find that this policy change leads to an increased expenditure on food, improvements in weight-for-age and a deterioration in height-for-age z-scores of young children in the household. Furthermore, when estimated separately for boys and girls, the effect for girl disappears, for boys the same effects remain intact.

The debate on CCTs and anthropometric status is closely linked, malnutrition can effect physical and cognitive development, which effect future productivity and income, yet low levels of investment in Child health are often observed, despite the inefficiency of this. On a societal level this affects i.a. growth, distribution, and welfare.

Most of the literature suggests that cash transfers to women are more beneficial to children (Thomas, 1994). Duflo (2000, 2003) studies South African state pension shortly after the policy change that expanded the system to include the black and other non-white populations in 1993. That study finds that income that accrues to a woman in the household leads to improvements in anthropometric status z-scores of girls living in the same household. At the time of this study in 1993, the male eligibility age was 65 and the female age was 60, while average life expectancy in South Africa then and now is significantly lower than that, complicating the comparison.

This age discrepancy was always considered discriminatory on the basis of age. As a consequence of this, in 2010 the pension eligibility age for South African men was lowered from 65 to 60 years old, at a par with women's eligible age. I exploit this policy change by estimating a Difference-in-Differences model, quantifying the effect of the male-only increase in cash transfers in households with men aged 60 through 64.

Although Conditional Cash Transfer schemes (CCTs) are much more common, it can be more informative to study Unconditional Cash Transfer schemes (UCTs) as these suffer less from selection bias issues. State pension systems are an opportune subject of study, since they are unconditional upon reaching a certain age.

The South African pension system is of particular interest, because of the relatively high amount of the payout, upon the initial expansion to include the black population, in 1991, this was as much as twice the mean monthly income (see Tangwe and Gutura, 2013). As a result of this, although the pension system was intended as a form of poverty relief for the elderly population, it has also become that for the South-African rural population, serving as a general source

of income to many households.

The lowering of the pension eligibility age for men took place in between the first and the second wave of data collection for the South African National Income Dynamics Study (Southern Africa Labour and Development Research Unit, 2008, 2012, 2013), which took place respectively in 2008 and 2012. This household survey includes data on age, state-pension eligibility and receipts, children's anthropometric z-scores, income, food/non-food expenditure, etc. The children's z-scores are computed by comparing their anthropometrics against the WHO Child Growth Standards (de Onis, 2006).

The availability of data directly prior to and after the policy change, enables me to estimate the effect of the cash transfer to the newly eligible group of males aged 60 through 64 in their households using a Difference-in-Differences approach. I estimate effect of this change on food/non-food expenditure as well as on the anthropometric status z-scores of young children living in the same households.

I find that the transfer leads to an increase in food expenditure, but shows no significant impact on non-food expenditure. The effects on the anthropometric of children in the same households are more ambiguous. The change led to an improvement in the Weight-for-Age z-scores, as well as a regression in the Height-for-Age z-scores of younger children. When I estimate these equations separately for boys and girls, the same variables have no significant effect for girls, for boys the effects remain intact, at greater significance levels.

These results suggest that the increased expenditure in food results in improvements in the short-term Weight-for-Age indicators, but at the same time that the more long-term effect on Height-for-Age is opposite to this. A possible explanation for this is that the increase food expenditure goes towards unhealthy food, increasing weight, but not leading to any long term increases in growth. Furthermore, the separate estimations suggest that this change only affects boys.

The following section 2 discusses the National Income Dynamics Study, as well as the WHO Child Growth Standards used to compute the anthropometric z-scores. This is followed by section 3 which discusses the empirical model estimated, as well as the tools employed for this. In section 4, I present the outcome of these estimations. Finally, I interpret these results and their limitations in section 5.

2 Data

The main source of data is the South African National Income Dynamics Study (NIDS, Southern Africa Labour and Development Research Unit, 2008, 2012,

2013), which is collected by the South African Labour and Demographics Unit together with the World Bank.

The study collects information on a representative set of approximately ten thousand South-African households over time. Currently three ‘waves’ of data are available, these waves date from 2008, 2011, and 2013. The key variables that I use are that I use are:

- child anthropometrics status, Weight for Age & Height for Age (**zwfa**, **zhfa**);
- food expenditure (**expf**);
- child age in days (**c_age_days1**);
- sex of the child (**woman**);
- pension eligible adult (**man_60_65**; **woman_60_65**; **man_65**; **woman_65**).

In addition to these variables of interest, I include a number relevant of covariates, such as household income (**hhincome**), in the analysis.

The child anthropometric status variables, rely on the World Health Organization’s Child Growth Standards (de Onis, 2006). Children’s anthropometrics including length/height, weight, and waist, are combined with the WHO growth standards, to calculate the z-scores. In table Figure 2 and table Figure 1 the distributions of both variables for both boys and girls are presented. table Table 1 present descriptive statistics of each on the food expenditure variable.

Table 1: Food expenditure

| wave | minimum | q1 | median | mean | q3 | maximum | NA’s |
|------|---------|-----|--------|------|------|---------|------|
| 1 | 24 | 500 | 730 | 947 | 1148 | 14780 | NA |
| 2 | 33 | 560 | 841 | 1015 | 1219 | 27380 | 1456 |
| 3 | 30 | 600 | 820 | 1061 | 1216 | 30000 | 944 |

In ?? descriptive statistics of the Right-Hand Side (RHS) variable of interest are presented. Income from the state pension system is generally the same at slightly more than 1000 ZAR, which is about half of median income in the data set.

I construct a dummy variable for children living in a household with a man aged 60 until 65 (**man_60_65**). As well as dummies for a man 65 years or older (**man_65**) and these same dummies for children living with women of those ages. The interaction of this dummy variable with the event dummy **post_treatment** is the variable of interest.

In addition to the explanandum, a number of relevant covariates are included on the RHS. table Table 2 gives a description of the distribution of income as found in the NIDS dataset.

In 2006 the WHO published its standards for child growth(de Onis, 2006), superseding the previously used CDC Growth Charts of (Kuczmarski, 2000, CDC Growth Charts: United States). The WHO charts map the average growth of an ethnically varied sample of children living in households with healthy lifestyles, setting a benchmark for growth.

These z-score anthropometrics are used since they are considered to be a good representation of a child’s health.

For instance, if we measure a height x for a child of age y (in weeks/months), then we refer to the WHO tables, find the relevant ideal height and standard deviation for a child of age y . We then subtract the ideal height (μ_y) from the observed height, and divide by the standard deviation (σ_y), like so:

$$z_{xy} = \frac{x - \mu_y}{\sigma_y}$$

These ideal scores are based on a sample of children from different ethnic populations, in households which observed a healthy lifestyle. Any health issues, such as malnutrition or disease will affect these metrics, by causing the child to be shorter or lighter as compared to these ideal standards. It is however not possible to distinguish between the different causes of an observed slowed growth.

It is best practice to use only metrics for children between the ages of 6 months and 60 months.

Here we use two type of z-scores, the Height-for-Age Z-score (HAZ) and the Weight-for-Age Z-score (WAZ). Since these metrics are both age-based, they provide information about all past growth issues. Any past issues such as malnutrition and disease will have impaired growth, and these effects will still be captured by today’s height. This also applies to the WAZ, as the ideal weight is a function of the height, which is in turn a function of the age.

These are constructed on a weekly basis up to the age of 60 months, and on a monthly basis thereafter.

The NIDS uses a file and data structure which is ill suited for panel data

Table 2: Income distribution

| wave | minimum | q1 | median | mean | q3 | maximum | NA’s |
|------|---------|------|--------|------|------|---------|------|
| 1 | 0.0 | 1284 | 2165 | 4014 | 3966 | 130000 | NA |
| 2 | 100.0 | 1500 | 2583 | 4720 | 4817 | 446900 | 1089 |
| 3 | 126.2 | 1980 | 3376 | 5541 | 5933 | 300200 | 944 |

analysis. I therefore transform the data to a format which is more conducive to panel data analysis. For this I used ‘Tidy Data’ structure, as described in Wickham (2014).

3 Empirical methodology

The identification strategy in this paper is based on a policy change in the pension eligibility age for men. Until mid 2009, men became eligible for pension at the age of 65. Between mid 2009 and December 31st 2010, this was gradually lowered to 60. I combine this information with data from the South-African National Income Dynamics Study, a full-panel dataset, which contains information on households from before and after this policy change. This policy change falls between waves 1 and 2 of the NIDS, which took place in 2008 and 2012 respectively.

I study the effect of this policy change, on the anthropometric status of children in the same household as pension recipients as well as on food and non-food expenditure.

This identification strategy is operationalised by constructing a policy change or event dummy. This event dummy is called `event`, and takes the value 1 for data after the policy change (waves 2 & 3), and the value 0 otherwise (wave 1). This dummy is interacted with a dummy variable for having a man between 60 and 65 in the household (`man_60_65`), as well as with dummies for men age 65 or older and dummies for women of the same ages.

In order to identify the effect of the policy change, I employ a Difference-in-Difference estimation, using the fixed-effects estimator. I formulate two base models. One model with the `event` dummy, and an interaction term with male pension recipient (`man_60_65`). The second model has the `event` dummy and an interaction term with the eligibility dummy, as well as interaction term with the dummies for women between 60 and 65 and women and men 65 and above.

Each of these models is estimated with both types of z-scores, as well as food and non-food expenditure as dependent variables.

The outcome variable is y_{it} , this outcome variable takes the form of the of the z-scores, such as HAZ or WAZ or food/non-food expenditure. Here t denotes time and i the individual. The individual and time fixed effects are denoted by γ_i and λ_t respectively. Dummies for living in a household with a female or a male pension recipient are included as P_{it}^f and P_{it}^m respectively. The dummy variable T_{it} denoted the treatment status. Lastly, ϵ_{it} is the error term, which is assumed to be distributed as $\epsilon_{it} \sim N(0, \sigma)$.

$$y_{it} = \alpha_i + \lambda_t + \delta D_{it} + \beta X_{it} + \epsilon_{it} \quad (1)$$

In this, α_i represents the individual fixed effects, λ_t represent the time fixed effects, and X_{it} are the time varying covariates. The error term is ϵ_{it} . Finally the term of interest is D_{it} .

As described above, I use a total of four dependent variables, Height-for-Age (HAZ), Weight-for-Age (WAZ), and food and non-food expenditure. Each of these is used in a different estimation as the Left-Hand Side (LHS) variable. Combining these four LHSs with each of the three RHSs, gives a total of twelve estimation equations. I present the results of the estimation in section §section 4.

4 Results

In Table 6 and Table 7 I present the estimation results for the equations with anthropometric status as the dependent variables.

In Table 3, the results of the estimation using food expenditure (**expf**) as a dependent variable are presented.

The variable **man_60_65** is a dummy variable for the child living in the same household as a male aged 60 through 64.

The other rows represent the independent variables. Where **woman_60_65** represents the dummy variable for children living in a household with a state pension eligible woman aged 60 through 64. The variables **man_65** and **woman_65** represent pension eligible men and women over the age of 65 respectively. The event variable **event** is a dummy which takes the value **TRUE** (i.e. 1) for the data collected after the policy change, i.e. waves 2 and 3 and **FALSE** (i.e. 0) for data collected before then. Lastly, I include the covariate **hhincome** which represents total household income.

Table 3: Food Expenditure

```

plm(expf ~      post_treatment*man_60_65 +
              post_treatment*man_65 +
              post_treatment*woman_60_65 +
              post_treatment*woman_65 +
              hhincome +
              woman,
      data      = NIDS,
      model     = 'within')

```

| | Estimate | Std. Error | t-value | Pr(> t) |
|------------------------------------|-------------|------------|------------|-----------|
| (Intercept) | 810.8105328 | 10.8755576 | 74.5534680 | 0.0000000 |
| post_treatmentTRUE | 35.2251442 | 10.5897866 | 3.3263318 | 0.0008810 |
| man_60_65TRUE | 55.6196875 | 43.0213993 | 1.2928377 | 0.1960770 |
| man_65TRUE | 112.1835241 | 28.5781790 | 3.9254959 | 0.0000867 |
| woman_60_65TRUE | 46.8846693 | 30.9664240 | 1.5140485 | 0.1300239 |
| woman_65TRUE | -67.8984723 | 21.0318516 | -3.2283640 | 0.0012463 |
| hhincome | 0.0344025 | 0.0005493 | 62.6291630 | 0.0000000 |
| womanTRUE | -12.4862470 | 10.2886736 | -1.2135915 | 0.2249131 |
| post_treatmentTRUE:man_60_65TRUE | 103.8232181 | 49.1094384 | 2.1141194 | 0.0345132 |
| post_treatmentTRUE:man_65TRUE | 0.0905759 | 33.1925710 | 0.0027288 | 0.9978228 |
| post_treatmentTRUE:woman_60_65TRUE | 4.6874243 | 35.5632106 | 0.1318054 | 0.8951391 |
| post_treatmentTRUE:woman_65TRUE | 104.2408234 | 24.1584808 | 4.3148749 | 0.0000160 |

The key result in Table 3 is the coefficient estimate for the interaction term `eventTRUE:man_60_65TRUE`, which is positive at 97.76 with a corresponding p-value of 0.04. This represents a 97.76 Rand (ZAR) increase on food expenditure in the households which received the additional income through pension receipts of men aged between 60 and 65.

The coefficient estimates for the other independent variables take form as is to be expected. The estimate for household income is positive at 0.03 and highly significant at 0.00. The parameter estimates for the other household member dummies are all positive and generally significant. The estimate for the child being a girl (`womanTRUE`) is negative at -12.61 but not significant.

Table 4: Weight for Age

```

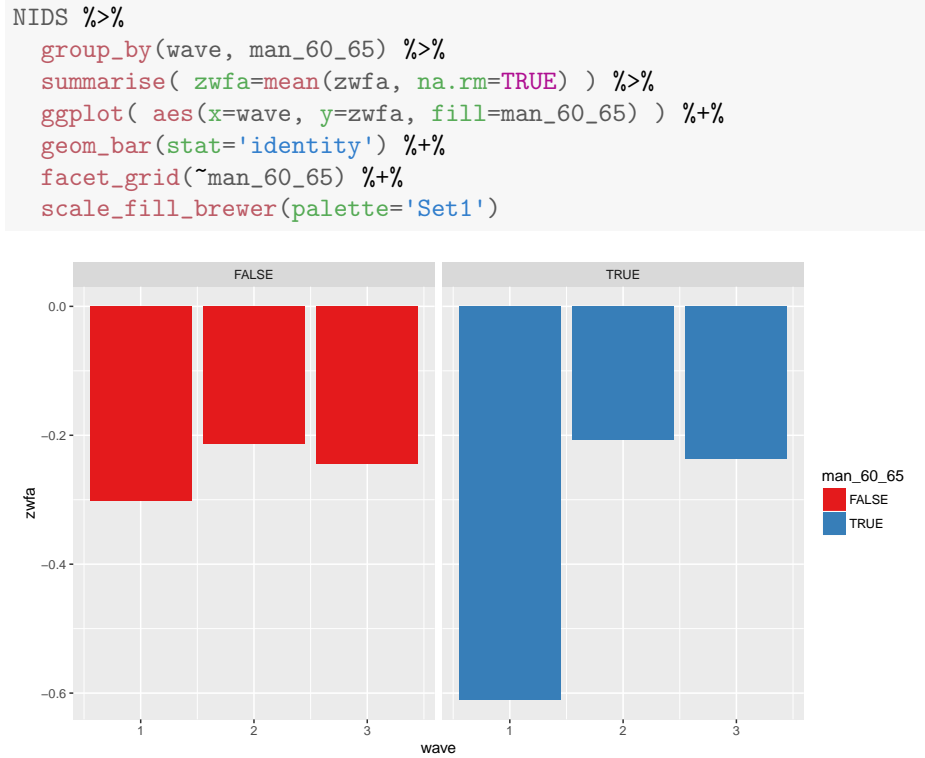
plm(zwfa ~      post_treatment*man_60_65 +
               post_treatment*man_65 +
               post_treatment*woman_60_65 +
               post_treatment*woman_65 +
               hhincome +
               woman,
      data = NIDS,
      subset = c_age_days1 > 180 & c_age_days1 < 2920,
      model='between')

```

| | Estimate | Std. Error | t-value | Pr(> t) |
|------------------------------------|------------|------------|------------|-----------|
| (Intercept) | -0.3073009 | 0.0326055 | -9.4248055 | 0.0000000 |
| post_treatmentTRUE | 0.0032539 | 0.0326791 | 0.0995698 | 0.9206876 |
| man_60_65TRUE | -0.2768796 | 0.1304236 | -2.1229253 | 0.0337810 |
| man_65TRUE | -0.0623759 | 0.0854461 | -0.7300029 | 0.4654030 |
| woman_60_65TRUE | -0.1747761 | 0.0940851 | -1.8576383 | 0.0632454 |
| woman_65TRUE | 0.0254201 | 0.0639132 | 0.3977282 | 0.6908378 |
| hhincome | 0.0000100 | 0.0000016 | 6.2361148 | 0.0000000 |
| womanTRUE | 0.0953099 | 0.0293109 | 3.2516874 | 0.0011505 |
| post_treatmentTRUE:man_60_65TRUE | 0.3300113 | 0.1479880 | 2.2299866 | 0.0257672 |
| post_treatmentTRUE:man_65TRUE | -0.0333463 | 0.1008261 | -0.3307311 | 0.7408535 |
| post_treatmentTRUE:woman_60_65TRUE | 0.1452480 | 0.1078110 | 1.3472466 | 0.1779269 |
| post_treatmentTRUE:woman_65TRUE | 0.0412345 | 0.0738919 | 0.5580384 | 0.5768288 |

When using Weight-for-Age (*zwfa*) as a dependent variable, the coefficient of interest is positive at 0.36 and significant, with a p-value of 0.026. The interaction terms of the event dummy with the other household member dummies, *man_65*, *woman_60_65*, and *woman_65*, are nowhere close to significant with p-values of 0.74, 0.18, and 0.58. These results can similarly be seen in Figure 2, which shows the average lag in *zwfa* for children living with a man between 60 and 65, before and after the policy change on the left, as compared to children who do not have such a household member on the right.

Figure 3: Weight for Age



When using Height-for-Age (*zhfa*) as a dependent variable to results is the opposite. I find a negative effect -0.52 of the treatment on the dependent variable, which is just significant at a p-value of 0.09 . None of the interaction terms with any of the other household member dummies are significant, at 0.31 , 0.24 , and 0.98 .

Table 5: Height for Age

```
plm(zhfa ~ post_treatment*man_60_65 +
        post_treatment*man_65 +
        post_treatment*woman_60_65 +
        post_treatment*woman_65 +
        hhincome +
        woman,
        data = NIDS,
        subset = best_age_yrs < 4,
        model='between')
```

| | Estimate | Std. Error | t-value | Pr(> t) |
|------------------------------------|------------|------------|-------------|-----------|
| (Intercept) | -1.3045248 | 0.0661855 | -19.7101308 | 0.0000000 |
| post_treatmentTRUE | -0.0118690 | 0.0722069 | -0.1643745 | 0.8694440 |
| man_60_65TRUE | 0.1125166 | 0.2609687 | 0.4311499 | 0.6663809 |
| man_65TRUE | 0.1873098 | 0.1780119 | 1.0522319 | 0.2927522 |
| woman_60_65TRUE | -0.3244063 | 0.1907804 | -1.7004174 | 0.0891246 |
| woman_65TRUE | 0.0430632 | 0.1312351 | 0.3281375 | 0.7428237 |
| hhincome | 0.0000211 | 0.0000043 | 4.8737618 | 0.0000011 |
| womanTRUE | 0.2245553 | 0.0563309 | 3.9863642 | 0.0000682 |
| post_treatmentTRUE:man_60_65TRUE | -0.5174950 | 0.3081696 | -1.6792542 | 0.0931751 |
| post_treatmentTRUE:man_65TRUE | -0.2266029 | 0.2252792 | -1.0058756 | 0.3145319 |
| post_treatmentTRUE:woman_60_65TRUE | 0.2697230 | 0.2306746 | 1.1692789 | 0.2423560 |
| post_treatmentTRUE:woman_65TRUE | -0.0021065 | 0.1644171 | -0.0128120 | 0.9897784 |

As ?? and ?? show, the Weight-for-Age and the Height-for-Age estimations for all three Right-Hand Side variations give opposing results. For Height-for-Age z-scores as an explanandum, we find that the policy variable interaction term `post_treatmentTRUE:man_60_65TRUE` has a negative coefficient estimate. While this interaction term has a positive coefficient when using Weight-for-Age z-score as a dependent variable.

Additionally, I estimate these equation separately for boys and girls.

Table 6: Girls Height for Age

```

plm(zhfa ~      post_treatment*man_60_65 +
                post_treatment*man_65 +
                post_treatment*woman_60_65 +
                post_treatment*woman_65 +
                hhincome,
      data = NIDS,
      subset = best_age_yrs < 4 &
      woman == TRUE,
      model='between')

```

| | Estimate | Std. Error | t-value | Pr(> t) |
|---------------------------|------------|------------|-------------|-----------|
| (Intercept) | -1.0827829 | 0.0853476 | -12.6867426 | 0.0000000 |
| eventTRUE | -0.0292989 | 0.1014385 | -0.2888346 | 0.7727352 |
| man_60_65TRUE | -0.0656365 | 0.3501531 | -0.1874508 | 0.8513245 |
| man_65TRUE | 0.4217243 | 0.2468947 | 1.7081136 | 0.0877565 |
| woman_60_65TRUE | -0.3987542 | 0.2798468 | -1.4249014 | 0.1543277 |
| woman_65TRUE | -0.0273289 | 0.1885614 | -0.1449338 | 0.8847765 |
| hhincome | 0.0000250 | 0.0000058 | 4.3324668 | 0.0000154 |
| eventTRUE:man_60_65TRUE | -0.2353016 | 0.4120205 | -0.5710920 | 0.5679957 |
| eventTRUE:man_65TRUE | -0.3603559 | 0.3146522 | -1.1452513 | 0.2522298 |
| eventTRUE:woman_60_65TRUE | 0.0214524 | 0.3339310 | 0.0642420 | 0.9487834 |
| eventTRUE:woman_65TRUE | 0.1394328 | 0.2329406 | 0.5985769 | 0.5495168 |

Table 7: Boys Height for Age

```
plm(zhfa ~ post_treatment*man_60_65 +
        post_treatment*man_65 +
        post_treatment*woman_60_65 +
        post_treatment*woman_65 +
        hhincome,
        data = NIDS,
        subset = best_age_yrs < 4 &
        woman == FALSE,
        model='between')
```

| | Estimate | Std. Error | t-value | Pr(> t) |
|---------------------------|------------|------------|-------------|-----------|
| (Intercept) | -1.2998129 | 0.0848152 | -15.3252272 | 0.0000000 |
| eventTRUE | 0.0103725 | 0.1028205 | 0.1008795 | 0.9196557 |
| man_60_65TRUE | 0.3491800 | 0.3913368 | 0.8922751 | 0.3723477 |
| man_65TRUE | -0.0665181 | 0.2569582 | -0.2588674 | 0.7957629 |
| woman_60_65TRUE | -0.2599733 | 0.2609596 | -0.9962203 | 0.3192579 |
| woman_65TRUE | 0.1223980 | 0.1829573 | 0.6689976 | 0.5035705 |
| hhincome | 0.0000156 | 0.0000065 | 2.3876923 | 0.0170425 |
| eventTRUE:man_60_65TRUE | -0.9431906 | 0.4647851 | -2.0293047 | 0.0425532 |
| eventTRUE:man_65TRUE | -0.0319730 | 0.3231811 | -0.0989320 | 0.9212017 |
| eventTRUE:woman_60_65TRUE | 0.5501036 | 0.3207639 | 1.7149798 | 0.0864965 |
| eventTRUE:woman_65TRUE | -0.1619634 | 0.2326134 | -0.6962771 | 0.4863324 |

5 Conclusions and limitations

The estimation results present three key results. Firstly, I find that there is a significant and consistent positive effect of the interaction term (`post_treatmentTRUE:man_60_65TRUE`) on food expenditure. Secondly, there is a significant and consistent positive effect of the interaction term (`post_treatmentTRUE:man_60_65TRUE`) on the Weight-for-Age Z-score. Thirdly, we find a consistent and negative effect of the interaction term on the Height-for-Age Z-scores. Both of these effects are consistent across the different specifications used in our estimations.

The impetus for this paper is to gain a greater understanding of the effects of Male/Female bargaining power in households, for instance to improve designs of Conditional Cash Transfer schemes (CCTs).

I do this by evaluating the z-scores of anthropometrics of children between the ages of six and sixty months old, living in the same household as recipients of the South-African old-age state pension system. I then compare the z-scores for children living with male pension recipients, with the z-scores of children living with female pension recipients. This method employed here is similar to Duflo (2000, 2003).

I analyse data around a policy change, which lowers the pension eligibility age for men from 65 to 60, which brings it at par with women's pension eligibility age. There are two main reasons for further analysis of outcomes surrounding this policy change.

Firstly, this overcomes major issues with attrition and the associated selection bias of the discrepancy in pension eligibility age, especially since average life expectancy is well below pension eligibility age.

Secondly, analysing data around the policy change allows me to employ a Difference-in-Differences estimation (DiD). Which enables me to draw a causal inference from the treatment effect.

I use the South-African National Income Dynamics Survey data (Southern Africa Labour and Development Research Unit, 2008, 2012, 2013, jointly with The World Bank). This full-panel dataset provides observations from 2008, 2012, and 2013. The treatment, a policy change which lowers the pension eligibility age for men from 65 to 60, takes place in 2009 and 2010.

In my estimations I use the Difference-in-Differences method, which is operationalised as a fixed-effects panel model. I construct two models on the Right-Hand Side. The first is a random-effects model with an interaction between the event dummy and a dummy for having a male aged 60 through 64 in the same household (`man_60_65`). The second model is a random-effects estimation with the same interaction, as well as an interaction terms with other dummies: `woman_60_65`, `man_65`, and `woman_65`.

On the Left-Hand Side (LHS) I use two different anthropometric z-scores, Height-for-Age (HAZ) and Weight-for-Age as well as food en non-food expenditure.

Combining the three RHS models with the four LHS z-scores gives us twelve estimation equations. When I estimate of these equations, I find three effects key effects.

Firstly, the greater male bargaining power, *ceteris paribus*, leads to an increase in food expenditure. Secondly, I observe a positive effect of the Weight-for-Age z-scores. Thirdly, I find a deterioration in the Height-for-Age z-scores.

These effects seem to suggest that the male income resulted in greater food expenditure, but possibly also a change in the nature of the expenditure on food, helping improve the Weight-for-Age, but not improving the Height-for-Age, with the later being a more long term health indicator.

When I subset to a dataset which only includes girls, no significant effects are found. However, using a dataset of only boys give the same results and at greater significance levels. This makes it unlikely that the surprising deterioration in Height-for-Age can be attributed to another factor such as the 2008 global financial crisis, since this would in all likelihood also have affected girls

as it did boys.

More central to this study, it suggest that the cash transfer only affected boys living with a new recipient. As shown in table Figure 1, the boys in the dataset scored slightly worse in the Weight-for-Height z-scores. One possible explanation for the improvement in Weight-for-Age in boys could be that they benefitted more in terms of this metric because they were behind more. However, this is at odds with the deterioration in Height-for-Age, since also here, boys scored worse even in wave 1 of the dataset. Should a greater lag have been the cause of the effect in the improvement in Weight-for-Height then we would expect a similar improvement in Height-for-Age.

An alternative explanation could be that if the cash transfer was used to purchase unhealthy food, which increases weight but is not nutritious in terms of promoting growth, than this was only spent on boys in the household. If there is merit to this last explanation, then this result mirrors the result found in Duflo (2000, 2003), where the central result is an improvement in girls anthropometric status when they live with a female pension recipient.

The first key outcome of this research is that food expenditure is some way too ambiguous a variable. The results of the increased food expenditure are not altogether positive, leading to a deterioration in Height-for-Age. In context such as these, the increased food expenditure would generally be thought of as a positive development. By further analysing the types of food purchased, it might be possible to better understand the deterioration in Height-for-Age.

The second key outcome of this research is that both the positive and negative consequence of the male-only cash transfer seem to only effect boys. This could suggest that, similarly to Duflo (2000, 2003) the grandparent seems to spend only on grandchildren of the same sex.

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A Additional Estimates

Table 8: Standard Error Correction

```
library(lmtest) # standard error correction
library(broom) # output formatting

# standard error correction
tidy( coeftest(expf1, vcov=vcovHC(expf1,
                                type="HC0",
                                cluster="group"))) )
```

| term | estimate | std.error | statistic | p.value |
|----------------------------------|------------|------------|-----------|-----------|
| (Intercept) | 797.973137 | 20.4834004 | 38.957064 | 0.0000000 |
| post_treatmentTRUE | 54.598225 | 9.4195865 | 5.796244 | 0.0000000 |
| man_60_65TRUE | 60.992207 | 30.8335999 | 1.978109 | 0.0479254 |
| man_65TRUE | 112.135045 | 19.9611804 | 5.617656 | 0.0000000 |
| woman_60_65TRUE | 47.634524 | 15.3353771 | 3.106185 | 0.0018969 |
| woman_65TRUE | 3.158883 | 12.1322850 | 0.260370 | 0.7945802 |
| hhincome | 0.034387 | 0.0047316 | 7.267585 | 0.0000000 |
| womanTRUE | -12.610512 | 10.1037207 | -1.248106 | 0.2120019 |
| post_treatmentTRUE:man_60_65TRUE | 97.758973 | 39.4529129 | 2.477864 | 0.0132225 |

Table 9: Non-food expenditure

```
NIDS %>%
  group_by(wave) %>%
  do(tidy(summary(.$expnf)))
```

| wave | minimum | q1 | median | mean | q3 | maximum | NA's |
|------|---------|-------|--------|------|------|---------|------|
| 1 | 4.000 | 220.0 | 552.4 | 1789 | 1425 | 120300 | NA |
| 2 | 1.000 | 285.1 | 588.1 | 1678 | 1300 | 361000 | 1456 |
| 3 | 4.429 | 336.0 | 755.0 | 1870 | 1735 | 112000 | 944 |

Table 10: Non-Food Expenditure

```
plm(expnf ~ post_treatment*post_treatment +
      man_65 +
      wopost_treatment +
      woman_65 +
      hhincome +
      woman,
  data = NIDS,
  model = 'random')
```

| | Estimate | Std. Error | t-value | Pr(> t) |
|----------------------------------|--------------|------------|------------|-----------|
| (Intercept) | 1052.4112911 | 56.710077 | 18.5577476 | 0.0000000 |
| post_treatmentTRUE | -229.1189649 | 53.971673 | -4.2451707 | 0.0000219 |
| man_60_65TRUE | -12.9406582 | 245.515119 | -0.0527082 | 0.9579648 |
| man_65TRUE | -345.7800113 | 96.666790 | -3.5770300 | 0.0003481 |
| woman_60_65TRUE | -385.0294955 | 93.983693 | -4.0967692 | 0.0000420 |
| woman_65TRUE | -617.4061057 | 70.636448 | -8.7406166 | 0.0000000 |
| hhincome | 0.2310988 | 0.003067 | 75.3510870 | 0.0000000 |
| womanTRUE | -52.8786218 | 54.028761 | -0.9787125 | 0.3277298 |
| post_treatmentTRUE:man_60_65TRUE | -231.9316003 | 281.149594 | -0.8249402 | 0.4094120 |

Table 11: Food Expenditure Interact All

```
plm(expf ~ post_treatment*post_treatment +
      post_treatment*man_65 +
      post_treatment*wopost_treatment +
      post_treatment*woman_65 +
      hhincome +
      woman,
  data = NIDS,
  model = 'within')
```

| | Estimate | Std. Error | t-value | Pr(> t) |
|------------------------------------|-------------|------------|------------|-----------|
| (Intercept) | 810.8105328 | 10.8755576 | 74.5534680 | 0.0000000 |
| post_treatmentTRUE | 35.2251442 | 10.5897866 | 3.3263318 | 0.0008810 |
| man_60_65TRUE | 55.6196875 | 43.0213993 | 1.2928377 | 0.1960770 |
| man_65TRUE | 112.1835241 | 28.5781790 | 3.9254959 | 0.0000867 |
| woman_60_65TRUE | 46.8846693 | 30.9664240 | 1.5140485 | 0.1300239 |
| woman_65TRUE | -67.8984723 | 21.0318516 | -3.2283640 | 0.0012463 |
| hhincome | 0.0344025 | 0.0005493 | 62.6291630 | 0.0000000 |
| womanTRUE | -12.4862470 | 10.2886736 | -1.2135915 | 0.2249131 |
| post_treatmentTRUE:man_60_65TRUE | 103.8232181 | 49.1094384 | 2.1141194 | 0.0345132 |
| post_treatmentTRUE:man_65TRUE | 0.0905759 | 33.1925710 | 0.0027288 | 0.9978228 |
| post_treatmentTRUE:woman_60_65TRUE | 4.6874243 | 35.5632106 | 0.1318054 | 0.8951391 |
| post_treatmentTRUE:woman_65TRUE | 104.2408234 | 24.1584808 | 4.3148749 | 0.0000160 |

Table 12: Non-Food Expenditure Interact All

```
plm(expnf ~      post_treatment*post_treatment +
               post_treatment*man_65 +
               post_treatment*wopost_treatment +
               post_treatment*woman_65 +
               hhincome +
               woman,
      data      = NIDS,
      model     = 'within')
```

| | Estimate | Std. Error | t-value | Pr(> t) |
|----------------------------------|--------------|------------|------------|-----------|
| (Intercept) | 1052.4112911 | 56.710077 | 18.5577476 | 0.0000000 |
| post_treatmentTRUE | -229.1189649 | 53.971673 | -4.2451707 | 0.0000219 |
| man_60_65TRUE | -12.9406582 | 245.515119 | -0.0527082 | 0.9579648 |
| man_65TRUE | -345.7800113 | 96.666790 | -3.5770300 | 0.0003481 |
| woman_60_65TRUE | -385.0294955 | 93.983693 | -4.0967692 | 0.0000420 |
| woman_65TRUE | -617.4061057 | 70.636448 | -8.7406166 | 0.0000000 |
| hhincome | 0.2310988 | 0.003067 | 75.3510870 | 0.0000000 |
| womanTRUE | -52.8786218 | 54.028761 | -0.9787125 | 0.3277298 |
| post_treatmentTRUE:man_60_65TRUE | -231.9316003 | 281.149594 | -0.8249402 | 0.4094120 |

Figure 4: Children living with a man 65 or over

```
NIDS %>%
  group_by(wave, man_65) %>%
  summarise( zwfa=mean(zwfa, na.rm=TRUE) ) %>%
  ggplot( aes(x=wave, y=zwfa, colour=man_65) ) %+%
  geom_line() %+%
  scale_colour_brewer(palette='Set1')
```

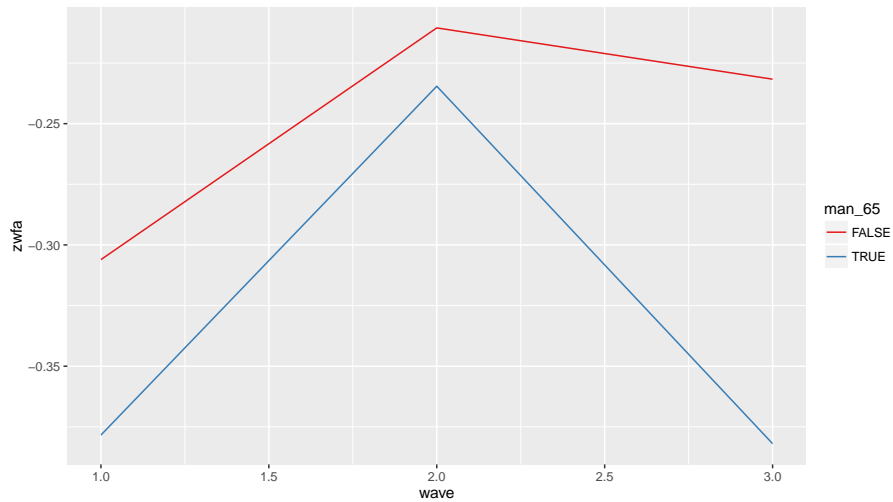


Table 13: Hausmann

```

model_exp2 <- expnf ~ post_treatment*man_60_65 +
post_treatment*man_65 +
woman_60_65*post_treatment +
post_treatment*woman_65 +
hhincome +
woman

fe_exp2 <- plm(model_exp2, data=NIDS, model='within')

## series fwag, cwag, swag, chld, fost, spen_flg, ppen_flg, uif, remt are NA and have been
## series spen, ppen are constants and have been removed

re_exp2 <- plm(model_exp2, data=NIDS, model='random')

## series fwag, cwag, swag, chld, fost, spen_flg, ppen_flg, uif, remt are NA and have been
## series spen, ppen are constants and have been removed

phtest(fe_exp2, re_exp2)

##
## Hausman Test
##
## data: model_exp2
## chisq = 857.92, df = 10, p-value < 2.2e-16
## alternative hypothesis: one model is inconsistent

```

B Software

The computation estimation of these models is performed using R (R Core Team, 2016), with the implementation of the panel data structure and models using the `plm` package (Croissant and Millo, 2008). All changes are logged using the version control system Git (`git`) and publicly available on GitHub at <https://github.com/bquast/MaleFemale-Bargaining-Power-Child-Growth>¹.

In order to merge data and compute of these statistics, I make use of the `dplyr` and `tidyr` R packages Wickham (2016); Wickham and Francois (2015). After having combined the various data.frames within each wave, the three waves can be combined by simply joining the rows using base R's `rbind()` function (R Core Team, 2016).

¹The repository can be cloned to a local computer by entering in following command in a terminal (with Git installed):
`git clone https://github.com/bquast/MaleFemale-Bargaining-Power-Child-Growth.git`

Figure 1: Weight-for-Age z-score distributions

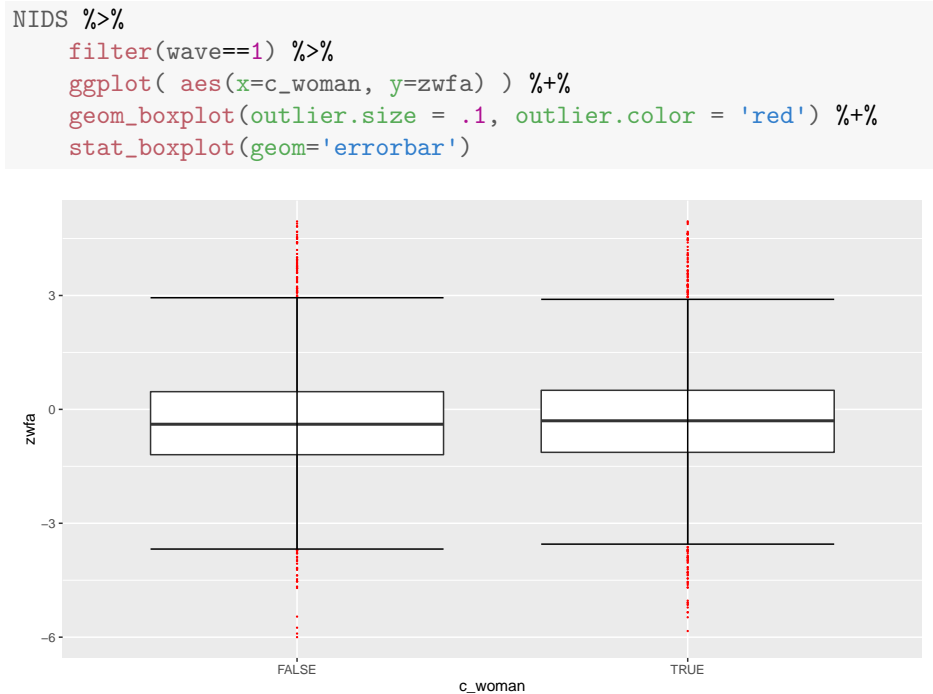


Figure 2: Height-for-Age z-score distributions

