Grandfathers and Grandsons: Social Security Expansion and Child Health in China

Jinyang Yang * Xi Chen †

October 2021

Abstract

We examine the multigenerational impacts of a nationwide social pension program in China, the New Rural Pension Scheme (NRPS). NRPS was rolled out in full scale since 2012, and enrollees age over 60 in rural areas are eligible to receive a minimum of 70 CNY non-contributory monthly pension. We leverage age eligibility and variations in pension receipt to identify the inter-generational effect of NRPS on health among grandchildren. We find NRPS substantially increases child weight without impacting height. Overall, child BMI z score increases by 1.09, which is largely driven by grandfathers' pension receipt on grandsons. Grandsons of NRPS eligible grandfathers are also more likely to be overweight or obese. Among the potential mechanisms, our findings are more plausibly explained by a mixture of income effect, son preference, and rising inter-generational cor-residence and childcare.

Keywords: Social pension, Child health, Inter-generational relationship; Intra-household allocation, Migration, Living arrangement, China

JEL Classification: H23, H31, H55, I38, J22, O15

*Jinyang Yang: Department of Agricultural and Applied Economics, Virginia Tech. 250 Drillfield Dr, Blacksburg, VA 24060. Email: yjinyang@vt.edu

†Xi Chen (Corresponding Author): Department of Health Policy and Management, Yale School of Public Health; Department of Economics, Yale University. 60 College St, New Haven, CT 06511. Email: xi.chen@yale.edu

1 Introduction

Children living in rural areas in developing countries are more likely to be undernourished than their counterparts in urban areas or developed countries. Moreover, in recent years the double burden of child malnutrition, characterized by the coexistence of nutritional insufficiency and nutritional imbalance (e.g. overweight or obesity), has become prevalent (Wells et al., 2020). In China, salient gap in child nutritional status persists between rural and urban China, and existing studies document the prevalence and growth of rural child overweight/obesity (Piernas et al., 2015; Song et al., 2015) and anemia Zhang et al. (2013). As an increasing share of children in rural China are taken care by grandparents while their parents devote more time to labor market, it is important to understand the role of grandparents in shaping child nutritional status and, more generally, how to improve child nutrition while avoiding overweight/obesity through public policy.

Cash transfers offer a viable way to redistribute resources to lower income families, which is found to address child nutritional disadvantages as well as improving their health, education, and labor market outcomes in adulthood (Duflo, 2003; Aizer et al., 2016). Cash transfers are likely more efficient when the targeted population is also a main decision maker, therefore recipients fully internalizing the returns to investment.

While a large body of literature has shed light on cash transfers to parents and child health, less is known about multi-generational impacts of cash transfers. It is also under-explored if the influence of grandparents on child health shows any gendered pattern similar to the influence of parents. The impacts imposed by parents and by grandparents may differ as their motivation, preference, and constraints in taking care of children may vary greatly. In a multi-generational setting, there are both bargaining within generations and across generations. The answer to these questions may have policy implications for China and other developing countries

where multi-generational co-residence or decision-making is common.

This paper evaluates the impacts of the world's largest social pension program that benefits hundreds of millions of rural residents, the New Rural Pension Scheme (NRPS), on grandchildren's nutrition status in China. Previous studies have leveraged another social pension program - the Old Age Pension (OAP) in South Africa - to understand the inter-generational health effects. Both OAP and NRPS took a few years to roll out to all areas, but they differ in two key characteristics: the size of OAP payment to beneficiaries is more than twice the median per capita income of rural South Africans, while NRPS pension payment accounts for about 10 percent of per capita income in China in 2012; the eligibility for OAP is mean tested, in contrast, all residents with rural hukou type are eligible to enroll in NRPS.

The NRPS started county-by-county roll-out in 2009, and by the end of 2012 all counties have been covered. The universal NRPS eligibility requirement (rural residents age over 60) allows us to employ a quasi-experimental design to identify the multi-generational effects of NRPS. We focus on rural children age under 12 years (6-144 months) and compiled a sample of their households. We use household age eligibility as an instrument for NRPS pension receipt. We also control for child and household characteristics, cohort effects, county and interview year fixed effects.

Our findings reveal that pension receipt substantially changes grandchildren's short-term nutrition status, as measured by their increased BMI z score, overweight or obesity, but no reduced underweight. It also has no effect on longer term outcomes like height. Moreover, we show gendered patterns for pension recipients. Specifically, grandfathers' pension receipt has both economically and statistically significant effect on grandsons' weight, while the impact on granddaughters are statistically insignificant. In contrast, we observe no effect of grandmothers receiving pension on grandchildren.

We examine a number of potential mechanisms. Household income increases by more than 10% on average around NRPS eligible age. When examining the impacts by income sources, we show that changes in pubic transfers (NRPS included) is the main contributor. While co-residence arrangement does not change with NRPS pension receipt, our data suggest that over time grandparents become more likely to be a main caregiver for children under age 12, and mothers have a declined rate of serving this role.[1] Moreover, adult child migration increases slightly. It is plausible that NRPS changes child weight through the channel of income expansion and nutrients intake, and grandparents allocate more time to child care though they are less knowledgeable about scientifically feeding children. When differentiating father's parents and mother's parents, father's father imposes the most salient effect on grandsons' health, suggesting that son preference may enhance the impact on boys.

This study attempts to make three main contributions to the literature. Firstly, it is to our knowledge the first paper that looks at multi-generational effects of NRPS on grandchildren's nutritional outcomes. Existing studies have evaluated a comprehensive set of NRPS impacts, including on elderly labor supply (Ning et al., 2016; Hunag and Zhang, 2016), intra-household transfers (Hunag and Zhang, 2016; Chen, Eggleston and Sun, 2017), elderly health (Cheng et al., 2018a; Chen, Wang and Busch, 2019; Hunag and Zhang, 2016), healthcare utilization (Chen, Eggleston and Sun, 2017), living arrangement with adult children (Chen, Eggleston and Sun, 2017; Eggleston, Sun and Zhan, 2018; Cheng et al., 2018b) and adult child migration (Eggleston, Sun and Zhan, 2018). However, few examine the multi-generational effects on grandchildren except Hunag and Zhang (2016) that investigate the effects of NRPS on teenage self-reported health. Similar evaluations have been conducted for South

[1]In our sample, 1444 out of 7366 children (or 19.6% of the sample) live with NRPS recipient, among whom 553 children (38.3%) report grandparents as their main daycare givers, and 478 children (33.1%) report grandparents as their main night-care givers.

Africa's OAP (Case and Deaton, 1998; Case, 2001; Duflo, 2003; Maitra and Ray, 2003; Jensen, 2004), in which Duflo (2003) evaluates the multi-generational effects of OAP. Only grandmothers' pension receipt has significant impact on granddaughters' weight and height. Given the differences between NRPS and OAP as well as much higher fertility rate in South Africa than in China, their family decision-making on time and resource allocation to children may vary.

Secondly, this paper contributes to the studies on intra-household resource allocation. Empirical studies have focused on exogenous income or wealth shocks to household members. A growing literature suggests that economic resources in the hands of women are associated with larger improvements in child health and larger shares of household spending on nutrients, health, and housing than are resources in the hands of men (Duflo, 2012; Duflo and Udry, 2004; Duflo, 2003; Rangel, 2006). This paper, instead, shows the salient impact of men's permanent income change on child health. Since families in which women own more economic resources could differ in many respects from families in which women have no access to such resources, our context of unconditional universal pension income above the age cut-off should mitigate this bias.

Thirdly, this study may relate to the literature on the unintended consequences of policies or family arrangements on child obesity. Studies in developed countries, such as the United States, find food assistance programs, originally designed to relieve hunger and under-nutrition, unintentionally increase child obesity (See the review by Cawley (2015)). Fewer evidence are from developing countries. In China, co-residence of grandparents may increase grandchildren's weight, and the effects are stronger in rural areas (He, Li and Wang, 2018).

This study distinguishes from Duflo (2003), i.e., the study closest to ours, in two main aspects. First, the income shock we leverage is universal to all rural elderly

in China above age 60, not just limited to the elderly in disadvantaged households. This universal eligibility of NRPS may eliminate the concern over household-level endogenous enrollment. While Duflo (2003) overcomes endogeneity of pension enrollment by using age eligibility as instruments, the means-tested feature of OAP in South Africa determines that unobservables correlated with pre-treated household income and health outcomes might also be correlated with demographic structure and thus the presence of eligible household member, which may invalidates the instruments. Second, instead of using cross-sectional date, we use a nationally representative sample that follows up household members and their descendants in three waves, one before the full coverage of NRPS and two afterwards. We can further compare child outcomes of eligible and ineligible households, before and after the expansion of NRPS.

The rest of the paper is organized as follows. Section 2 introduces the background of rural child care, migration and the expansion of NRPS. In Section 3 we describe our data, and in Section 4 we present the empirical strategy. Section 5 presents the estimation results of NRPS on child weight and height. In Section 6 we explore the mechanisms and other related outcomes. We conclude in Section 7.

2 Child Care, Migration, and Social Security Expansion in Rural China

The New Rural Pension Scheme (NRPS) is a nationwide social pension program that aims to enroll all eligible rural population in China. The NRPS pilot was launched in 320 rural counties in 2009 and ended up covering all counties by the end of 2012. NRPS now consists a most important safety net for Chinese rural population.

NRPS was designed to incorporate two parts, a non-contributory social pension

benefit and a voluntary defined-contribution pension savings scheme. Residents with a rural registration (hukou type) are all eligible to enroll in this program. Enrollees over age 60 are eligible to receive a non-contributory pension of a minimum 55 Chinese yuan (about 8 US dollars) per month per person in 2009, which increased to 70 Chinese yuan in 2014. The amount of social pension benefit can be raised by local government, depending on the local government revenues. Most counties maintain the lower bound of social benefit set by central government. Enrollees under 60 must contribute a minimum premium of 100 Chinese yuan annually to their defined-contribution pension account, which is matched with at least additional 30 yuan from local government.

The speed NRPS was rolled out in the first two years of nationwide pilot period is moderate. By the end of 2010, 838 out of 2,853 counties had implemented NRPS, and the enrollment rate of rural population in pilot counties was very low. Involved in annual performance evaluation of county government officials, the policy was promoted aggressively by the authorities in the following two years with more than 2,000 counties rolled out NRPS. The participation rate rose dramatically: for NRPS eligible older adults, only 3 percent received pension by 2010, but the number increased to above 40 percent by 2012 (see Figure 3). [2]

An increasingly sizable proportion of rural children live with their grandparents in China. There are 286.5 millions of rural workers in urban sectors in 2017, according to the *Rural Migrant Monitoring Report* released by National Bureau of Statistics in China. A large proportion of this population live separately from their children. [3] In

[2]At the beginning of NRPS roll-out, a family binding policy was in place requiring pension recipients to also enroll their eligible adult children to contribute premium to their personal pension account. Nonetheless, since even the minimum annual non-contributory benefits (660 yuan) was much larger than the minimum annual premium (100 yuan) paid by children, the two generations still had incentive to enroll. The binding policy was later removed.

[3]The lack of equal opportunities for rural migrants accessing to public services, such as child schooling, unemployment supports, health care and retirement security, strongly discourages them from migrating with family (Song, 2014; Au and Henderson, 2006; Meng, 2012). In 2015, over 40.5

traditional Chinese culture, multi-generational co-residence is esteemed as a symbol of filial piety and family harmony (*Tian Lun Zhi Le*). The share of elderly living with child under 12 reaches the peak around age 60 (Figure A1). In 2012 and 2014, around 45% of elderly at age 60 in the China Family Panel Studies (CFPS), a national representative longitudinal survey, co-resided with child under 12. The number was around 37% in 2010.

The share of grandparents taking the role as the primary caregiver for grandchildren also rise over time, at least partly due to more job opportunities for parents to migrate to work and lack of public childcare in rural areas. In CFPS 2012-2014, over 30 percent of rural children under 12 had grandparents as their primary daytime caregivers (see Figure 2).

According to CFPS 2010-2014, rural children at all ages under 15 are shorter than urban children (see Figure 1a and 1b). Simultaneously, rural children under 12 have strikingly caught up, or even surpassed urban children on body weight (see Figure 1c and 1d).

Given the fact that NRPS accounts for a main income source for grandparents, this public transfer aiming at the rural elderly are likely spent on grandchildren they give care, e.g., food intake. However, children taken care by grandparents likely bear unintended nutritional consequences (He, Li and Wang, 2018). Firstly, a majority of grandparents in countryside are illiterate or semi-illiterate. Their limited knowledge on child care and famine experiences in early life may determine that securing adequate food is at the core of their child rearing. They might possess biased view of what healthy food is. For instance, high starch food like rice and high fat meat

millions of rural children under 17 live in their original domicile, but do not live together with their parents, as either one or both parents have migrated. The number of left behind children comes from United Nations Children's Fund (UNICEF) Annual Report 2017 China. The number for rural compulsory school children left behind in 2017 is 15.5 millions, according to the educational statistics released by Ministry of Education.

like pork belly are favored in many rural households. "Chubby Boy" (*Da Pang Xiao Zi*) is considered healthy. Secondly, informal labor participation rate of the elderly is higher in countryside. Unlike their urban counterparts, rural residents do not have statutory retirement age, neither do they have pension support before NRPS was introduced. The lack of young labor in agricultural sector due to migration often requires grandparents to farm in older ages while taking care of grandchildren. Grandchildren could be left unattended in busy season. Thirdly, as part of the Chinese culture, grandparents tend to spoil their grandchildren, especially grandsons. Requests made by children, such as extra pocket money for snacks, are more likely satisfied by grandparents than by parents. A recent study by Silverstein and Zhang (2020) finds financial transfers from grandparents to grandchildren often follow a male lineage, and is greatest to grandson-only families in which parents are first-born sons.

3 Data and Descriptive Statistics

3.1 Data

This study compares anthropometric status of children in households receiving NRPS to those in households without. The data were compiled from the China Family Panel Studies (CFPS), a nationwide biennial survey of Chinese households conducted by Peking University since 2010. It covers 25 provinces and 95 percent of China's total population. Its baseline survey, 2010 wave, constitutes of 14960 households and 42590 individuals. Core household members and their newly formed family members are permanently followed in the following waves. The 2012 and 2014 waves surveyed 8620 and 8617 children under 15 separately. 35719 and 37147 adults were surveyed in 2012 and 2014, with 9130 and 9934 individuals age over 60.

CFPS interviews each adult and child age over 10. Height and weight of children

under 15 are all reported by their main care givers. For each age in months, we use BMI z scores to measure short-run child nutrition and height-for-age z scores to measure long-run child nutrition. [4]

CFPS asks each adult whether they have received NRPS and what year and month they started receiving it. Household pension receipt is coded as whether there is an adult receiving NRPS, and household eligibility is coded as whether that adult ages over 60.

Our study focuses on children under 12 as nutrition in early ages could have persistent impacts on adulthood. Younger children often demand more intensive care. As shown in Figure 1, rural children under 12 are more disadvantageous in nutrition than their urban counterpart. To study the role of NRPS, we compiled CFPS waves 2012 and 2014, and matched children under 12 years (6-144 months) with characteristics of households and their members. Our sample criteria include: 1) children with rural hukou; 2) excluding children age 0-5 months due to concerns over measurement error; and 3) excluding children with BMI z scores or height-for-age z scores in the top or bottom 1 percentiles, or with BMI beyond the range 7.5-60. Finally, we obtain a sample of 3,898 boys and 3,468 girls. Wave 2010 is excluded because by then only up to 56 counties were covered by NRPS.

3.2 Descriptive Statistics

Table 1 reports summary statistics for samples classified by NRPS eligibility among household members. Panel A shows age, gender and anthropometric outcomes of children. Underweight is defined as BMI z score less than -2; overweight is defined as BMI z score greater than 2; obesity is defined as BMI z score greater than 3. We

[4]This study includes all children under 15. We measure children's BMI z score and height-for-age z score based on Child Growth Standards (0-5 years) and Growth Reference (5-19 years) developed by World Health Organization (WHO). We do not use weight-for-height z score because WHO only has weight-for-height growth standard for children under 5.

also define stunting by height-for-age z scores below -2.

On the one hand, children in NRPS eligible households have larger BMI but shorter stature. More specifically, children in households with male eligibility have the largest average BMI z score among all groups, as well as the highest overweight and obesity rates. However, average child BMI z score in female eligible households is very similar to that in non-eligible households, so are the overweight and obesity rates. Children in eligible households are also more disadvantageous in height and stunting rate.

On the other hand, children in NRPS eligible and ineligible households are heterogeneous in age, gender and household backgrounds. Firstly, children in households with NRPS eligibility are on average 10 months older than those in households with no NRPS eligibility. Secondly, children in NRPS eligible households have larger household size and lower household income per capita than their counterparts in NRPS eligible households. The households are more likely to be located in rural area.[5] Therefore, it is difficult to conclude by summary statistics whether the difference in child nutrition among eligibility statuses can be attributable to NRPS without rigorous analyses that control for child and household characteristics.

4 Estimation Strategy

The impact of receiving pension by grandparents on the health outcome of grandchildren can be identified by the models below:

$$Y_{ijct} = \alpha_0 + \beta_1 NRPS_{jct} + \beta_2 I_{ijct} + \beta_3 H_{jct} + \gamma_c + \eta_t + \epsilon_{it} \quad (1)$$

$$Y_{ijct} = \alpha_0 + \phi_1 NRPS\_male_{jct} + \phi_2 NRPS\_female_{jct} + \beta_2 I_{ijct} + \beta_3 H_{jct} + \gamma_c + \eta_t + \epsilon_{it} \quad (2)$$

[5]NRPS eligibility depends on the rural hukou type, not the household location.

where Y_{ijct} measures the health outcomes (BMI z scores or height-for-age z scores) of child i in household j county c at time t. In equation 1, $NRPS_{jct}$ is a dummy indicating whether there is a adult receiving NRPS pension in household i, county c and year t. When separating the effects of NRPS by male and female pensioners, we replace $NRPS_{jct}$ with two dummies, $NRPS\_male_{jct}$ and $NRPS\_female_{jct}$ in equation 2, which indicates whether there is a male or female pensioner in household i, county c and year t. I_{ijct} includes a set of dummies for individual characteristics such as age (in months) and gender. H_{jct} controls for household observable characteristics such as size of household, urban or rural residence, father's and mother's year of education and age, and number of members ages 0-5, 6-15, 16-24, 25-49. To control for older members who are ineligible for NRPS, H_{jct} also includes a set of dummies indicating the presence of a woman age 50-59, and a man age 50-59. γ_c and η_t are county and time fixed effects, respectively.

The decision to take up the pension is not random. For instance, the elderly who receive less support from adult children tend to miss the opportunity of enrolling in the program (Chen, Hu and Sindelar, 2020), and their grandchildren may have worse nutrition outcomes if parents live away from home village and offer less support to child care. Fortunately, the exogenously determined age eligibility for NRPS pension receipt offers us an instrument to address this endogeneity. Due to this policy, there is a discontinuity in pension receipt at age 60 (see Figure 3). In equation (1), we use a dummy variable indicating the existence of an eligible household member as an instrument for $NRPS_{jct}$. In equation (2), two instruments, male and female pension eligibility statuses are used as instruments for $NRPS\_male_{jct}$ and $NRPS\_female_{jct}$, separately.

5 Results

5.1 Effects of Age Eligibility on Pension Receipt

In this section we present the first stage regression results of household pension receipt on age eligibility. The results will inform on our design of using age eligibility as instruments in the 2SLS estimation. In all the tables of regression results, we use robust errors clustered at county level unless exception is stated. We also use CFPS sample weights in all estimations. Table 2 shows the full sample results.

Columns 1-4 report the results without distinguishing gender of the pension recipient. We incrementally control for child and household characteristics, and a set of fixed effects. The estimates on NRPS eligibility are very stable across specifications. Overall, household age eligibility significantly increases likelihood of pension receipt by 45-47 percentage points. The F-statistic for the excluded instrument demonstrates that age eligibility is a strong instrument for household pension receipt.

Specifications in columns 5-8 distinguish gender of pension recipient. Columns 5-6 included all baseline controls in column (3), and columns 7-8 follow column (4) in additionally controlling for presence of seniors age over 70. Age eligibility imposes essentially the same impact on male and female pension receipts, i.e., around 40 percentage points. Table A1 presents the results of household eligibility on NRPS pension receipt respectively for boy and girl subsamples.

5.2 Effects of NRPS on Child Weight

Table 3 reports the estimates on the impacts of NRPS on child BMI z scores. Columns 1-4 report estimates of equation (1) and columns 5-6 report estimates of equation (2). Panel A shows reduced-form estimates on pension age eligibility, and Panel B presents 2SLS estimates using age eligibility as instruments for pension receipt. Reduced-form

estimations reports sizable effects of NRPS on child weight. Specifically, average child BMI z scores in eligible households exceed those in ineligible households by 0.33-0.49 standard deviations (SD) across specifications in columns 1-4. The results are all statistically significant at 1% level. 2SLS estimates in Panel B report larger point estimates and standard errors. Impacts of receiving NRPS on child BMI z scores range from 0.74-1.09 SD. The baseline result in column 3 shows that NRPS increases child BMI by 0.91 SD for compliers. The standard error increases almost at the pace with point estimates, both nearly doubled, compared to reduced-form results.

Columns 5-6 further distinguish the impacts of NRPS by gender of pensioners. Interestingly, similar to the reduced-form estimates, the effects of NRPS on child weight is almost entirely driven by grandfathers. With baseline controls, grandfathers receiving pension increases child BMI by 1.09 SD, about 20% larger than the baseline results without differentiating gender of pensioner. In contrast, the effects of receiving pension by grandmothers is close to zero and statistically insignificant. Additionally controlling for the presence of seniors further magnifies the impact of male pensioners, but changes no effect for female pensioners. The differential impacts of male and female pensioners are unlikely driven by differences in take-up rate, because Table 2 shows eligible males and females have the same propensity to enroll NRPS.

Our baseline effect size can be compared with those identified in previous studies. Duflo (2003)'s reduced-form estimates show social pension in South Africa increases girls' BMI by 0.34 SD, relative to 0.41 SD in our baseline results (Table 3, Panel A, column (3)). Moreover, Duflo (2003) finds that the effect is driven by female pensioners, with a 2SLS estimate of 1.19 SD. While in our study only male pensioners show significant influence over child BMI, with a 2SLS estimate of 1.09 SD. Mu and de Brauw (2015) finds rural parental migration in China increases child BMI by 0.11 SD, while Jo and Wang (2017) finds maternal full-time work raise urban Chinese

child BMI by 1.11 SD. Therefore, our identified effect of NRPS receipt is larger than that of parental migration, but similar to the effects of maternal full-time work or grandparents receiving social pension in South Africa.

5.3 The Distributional Effects of NRPS on Child Weight

While NRPS shifts overall child weight, we further evaluate its potential distributional effects on child weight. We replace the dependent variable in equations (1) and (2) with underweight, overweight and obesity, and report the linear probability model results in Table 4. All the columns report the 2SLS estimation results using baseline controls.

We show that receiving pension does not seem to reduce rate of underweight among disadvantaged children, while it increases the risks of child overweight and obesity. The impact of pension receipt on child underweight is negligible. However, NPRS has substantial impacts on child overweight and obesity. In particular, pension receipt increases rates of overweight and obesity by 27% (0.085/0.313) and 33% (0.064/0.195), respectively, and both are driven by male pensioners.

Overall, Tables 3 - 4 suggest that NRPS imposes significant impact on child short-term nutritional outcomes. Grandfathers play a more important role than grandmothers do.

5.4 Effects of NRPS on Child Height

In this section, we evaluate how NRPS changes child long-term health outcomes as measured by height-for-age z scores. We replace the outcomes in equations (1)- (2) by child height-for-age z scores and report the results in Panel A, Table 5. All columns report 2SLS estimates with baseline controls.

Columns 1-2 report full sample results respectively using equations 1 and 2. In

both specifications the 2SLS estimates are imprecise to draw any statistical conclusion. Columns 3-4 and columns 5-6 further present the 2SLS estimates in boys and girls subsamples, respectively. Again, they are imprecisely estimated.

To explore the effects of NRPS on child stunting, an important measure of long-term impaired growth and development deficits, we repeat the exercise in Panel A upon replacing the outcome with a dummy variable indicating stunting. The results are reported in Panel B, Table 5. Again, none of the estimates are statistically significant. Results in Panel A and B, Table 5 both suggest NRPS have little effects on child long-term nutritional status.

While our undetected impact of pension income on height among grandchildren in rural China is different from Duflo (2003)'s finding that pension increases girls' height-for-age z scores by 1.2, it is not surprising for at least two reasons. Firstly, social pension benefits only account for 10% of rural household income in China, too small to have any impact on child height. This is in stark contrast with South Africa in which pension benefits amount to more than twice the average rural income. Secondly, NRPS only completed its roll-out to all Chinese counties by the end of 2012, and by then a large proportion of households in each county had not enrolled in. Therefore, our survey waves might be too early to identify any long-term effect.

5.5 Subsample Heterogeneity

We have presented so far that NRPS has substantial effects on child weight, but not on child height. The impacts are mostly driven by male pensioners. To explore potential gender pattern in these identified effects, we divide the sample by child gender. In both subsamples we use baseline controls in estimations and differentiate gender of pensioners. The results are reported in Table 6.

Interestingly, we find salient gender pattern in boys' subsample and among male

pensioners. Benefits received by male pensioners is associated with boys' larger BMI z score, rates of overweight and obesity. However, the effect of female pension receipt on boys' weight are small and statistically insignificant. Meanwhile, in girls' subsample, the estimates are imprecise, whether we examine the effects of benefits received by male or female pensioners. This is different from Duflo (2003)'s finding in South Africa that pension received by grandmothers is associated with granddaughters' higher weight.

5.6 Robustness

The 2SLS estimates compare compliers in treatment group with those in control group, which may not be generalized to the group of non-compliers. To evaluate the average effect between compliers and non-compliers, intent-to-treat (ITT) estimates are presented in Table A2 that compare between children in eligible households with those in ineligible households before and after NRPS expansion. [6] CFPS collected first wave of data in 2010, when NRPS coverage was very low (see Figure 3). [7] Our DD estimates of the effects of NPRS on child weight are reported in Table A2. The results are consistent with our findings in Table 3.

Finally, The presence of NRPS pensioner in a household may be endogenous. In particular, household composition, i.e. living arrangement of grandparents with their grandchildren, may also change with pension roll-out, which undermines the exogeneity of the presence of NRPS eligible household members. In other words,

[6] CFPS longitudinal survey covers the gradual roll-out of NRPS, which enables us to leverage policy dynamics in a standard Difference-in-Difference (DD) analysis. In contrast to the cross-sectional setting in Duflo (2003)'s evaluation of social pension in South Africa, our DD analysis does not rely on individual-level NRPS take-up decisions. Instead, the DD design makes use of county-level roll-out timing.Yang and Bazan Ruiz (2021) finds while the variation of county roll-out timing is partially driven by local economic and political forces, most of the variation remains unexplained, which supports the use of county roll-out timing as an instrument.

[7] In comparison to our main 2SLS estimations, our DD analysis enables further inclusion of CFPS 2010 survey, prior to NRPS roll-out in a majority of CFPS counties.

endogenous household composition could create a correlation between unobserved household characteristics and the presence of an eligible member, which may invalidate our proposed identification strategy of pension income on nutritional status of grandchildren. Following Duflo (2003)'s proposed solution, we re-construct household pension age eligibility that includes all extended family members, regardless of their cor-residence status. Results, shown in Table A3, are qualitatively similar to our main estimates, suggesting the validity of our 2SLS estimations. The smaller marginal effect of pension receipt may reflect the fact that grandparents living away from grandchildren may impose less influence over their nutritious status.

6 Mechanisms and Other Outcomes

In a household bargaining framework, children are considered public good. Pension benefits to grandparents may shape health outcomes among grandchildren in two main channels, goods and time allocated to grandchildren. In this section, we examine these plausible mechanisms.

6.1 Income Effect

While we are unable to directly test how NRPS changes child consumption as CFPS does not survey on individual consumption, we first test whether NRPS increases household income. The exact estimation strategy introduced by equation (1) and (2) is modified to account for the fact that age eligibility is both correlated with NRPS pension receipt and household income. We use narrow time window around age 60 to identify any discontinuous in main sources of income.

We extract the adult sample from CFPS waves 2012-2014, centering at 60 and coding their age in 0.5 years. We match the adults observations age 50-70 with their

household income data. Adults exactly age 60 are dropped. In total 10254 adults are in our sample. Figure 4a displays the NRPS taking-up rate by age. There is an immediate discontinuity at age 60, where the taking-up rate increases dramatically. We use a RD design and local linear regression to estimate the impacts of NRPS (see Imbens and Lemieux (2008)). Triangular kernel is used in the estimation. In all RD estimation, adult gender, marital status and educational level are controlled.

RD estimates show that NRPS increases annual household income per capita by more than 750 CNY, which accounts for above 10 % of our sample average income and above 15% of the median income in our sample. [8] The impacts is similar to Chinese official statistics that NRPS pension income accounts for about 10% of annual average rural household income per capita in 2012. To confirm the sources of rising income, we further decompose household income into five categories: public transfer, wage, capital income, household business income and other income. [9] The results are shown in Figure A2a - A2e. NRPS increases public transfer to households by 219 CNY on average, and it also increases household capital income by 24 CNY. The capital income increase may due to the increase of household savings after receiving NRPS. The impacts of NRPS on other sources of income are statistically insignificant, which may be viewed as placebo tests. Instead of household income, Figure A2f displays the impacts of NRPS on individual income.[10] We find NRPS increases individual income by more than 415 CNY. The impact is smaller but consistent with our findings on household income.

[8]Household income per capita is calculated by household gross income divided by number of household members.

[9]Household public transfer includes all pension, subsidies and compensations as well as income from public donation. Household wage includes all the wage from each household member. Household captial income includes all gains from financial investment and rental income from real estate properties, land, and machineries. Household business income includes all net income from family agricultural work (including in-kind income), and net profit from family-owned businesses. Household other income includes all monetary support from friends and relatives.

[10]Individual income consists of income from internships, full-time work, pension, fellowship, and assistantship.

Despite the findings above, we cannot infer from the data that NRPS increases child food consumption or nutritional in-take. If intra-household bargaining is efficient, income expansion will increase household consumption allocated to child, who is considered as public good in theory.

6.2 Time allocation

Time allocated to child care may also be affected by NRPS. For instance, grandparents may reduce labor supply or even quit labor market after receiving pension, and instead spend more time with children, which frees up parents' time in housework and may increase their labor supply. If this is the case, we may not necessarily observe substantial increase in household total wage income, other than increase in grandparents' time allocated to grandchildren and their nutritional outcomes. Unfortunately, household time allocation is not observed in CFPS. However, as analysed above, two outcomes, i.e., co-residence of grandparents with grandchildren and adult child migration, may be correlated with grandparents' time allocation to grandchildren.

Figure 5 displays the RD estimates of NRPS on multi-generational co-residence and adult child migration. Multi-generational co-residence is defined as grandparents living with children under 12. Adult child migration is defined based on adult children of older adults leaving the home county for 3 months and more. The impact of NRPS on co-residence of grandparents with grandchildren is small and statistically insignificant. However, there is a marginal increase in adult child migration following pension receipt. The result is consistent with Eggleston, Sun and Zhan (2018)'s study, where they find a much larger impact of NRPS on adult child migration in more developed areas in China. Our finding implies that the burden of child care may shift from parents to grandparents after parental migration. However, this effect is modest that it is unlikely to drive the identified substantial effect on child weight

and the gender difference.

CFPS surveys on an obscure question, asking children under 12 who are their main care givers during daytime and night. In Table 7, we estimate equation (2) by replacing the outcome with whether the child is mainly taken care by grandparents. The results turn out to be trivial and statistically insignificant in both boys and girls subsamples. One exception is that we find receiving pension by grandmothers increases the likelihood that grandparents become main caregivers during daytime in girls subsample. However, the impact is only significant at 10% level, which is difficult to draw solid conclusion. Overall, our empirical evidence suggests that the shift of care-giving responsibility from parents to grandparents could happen modestly, but not large enough to explain our main finding on gendered pattern in nutritional outcomes among grandchildren.

6.3 Son Preference

Our findings of the link between grandfathers and grandsons suggest son preference prevails in rural China, and grandfathers may possess stronger norms of son preference than grandmothers. A potential way to test son preference is to differentiate the gender of parents, i.e. father's father and mother's father. We predict pension receipt by father's father has stronger impacts on grandson's weight than mother's father, because the family name is carried on only through males. Table 8 reports the reduced-form OLS estimates by differentiating the gender of intermediate generation. As expected, results show that the effect through father's father on boys weight are relatively more salient. The effects of pension receipt by father's father on boys overweight/obesity are statistically significant at 10% level. The effects through mother's father are also positive but imprecisely estimated.

7 Conclusion

In this paper, we present novel evidence on the multi-generational health effects of the largest social pension policy in the world. We take advantage of the discontinuity in age eligibility for pension receipt, and find robust results that NRPS has substantial impacts on child short-term nutrition outcomes. The effect seems driven by grandfathers on grandsons. We discuss the potential mechanisms and show it most plausible that NRPS increases child consumption of food and nutrition, especially exacerbated via son/grandson preference, followed by some modest increase in grandparents' time allocation to child care.

Our findings are not as promising as it seems, as we show NRPS increases children's chance of overweight and obesity, but does not reduces the underweight rate. In the meantime, NRPS does not seem to improve children's long-term nutritional outcomes. Therefore, our findings lend support to the ever-increasing concern over double burden of under-and over-nutrition, especially in less developed areas where grandparents spend more time on child care with very limited knowledge on healthy diet for children. In order to improve the heath outcomes of rural children, relying on public transfer alone may not be sufficient.

References

Aizer, Anna, Shari Eli, Joseph Ferrie, and Adriana Lleras-Muney. 2016. "The Long Term Impact of Cash Transfers to Poor Families." *American Econmic Review*, 106(4): 935–971.

Au, Chun-Chung, and J Vernon Henderson. 2006. "Are Chinese Cities too Small?." *Review of Economic Studies*, 73(3): 549–576.

Case, Anne. 2001. "Does Money Protect Health Status? Evidence from South African Pensions." *NBER working paper*, No. 8495.

Case, Anne, and Angus Deaton. 1998. "Large Cash Transfers to the Elderly in South Africa." *The Economic Journal*, 108(450): 1330–1361.

Cawley, John. 2015. "An Economy of Scales: A Selective Review of Obesity's Economic Causes, Consequences, and Solutions." *Journal of Health Economics*, 43 244–268.

Chen, Xi, Karen Eggleston, and Ang Sun. 2017. "The impact of social pensions on intergenerational relationships: Comparative evidence from China." *Journal of the Economics of Ageing*, 12 225–235.

Chen, Xi, Lipeng Hu, and Jody L. Sindelar. 2020. "Leaving money on the table? Suboptimal enrollment in the new social pension program in China." *The Journal of the Economics of Ageing*, 15, p. 100233.

Chen, Xi, Tianyu Wang, and Susan H Busch. 2019. "Does Money Relieve Depression? Evidence from Social Pension Expansions in China." *Social Science & Medicine*, 220 411–420.

Cheng, Lingguo, Hong Liu, Ye Zhang, and Zhong Zhao. 2018a. "The Health Implications of Social Pensions: Evidence from China's New Rural Pension Scheme." *Journal of Comparative Economics*, 46(1): 20–34.

Cheng, Lingguo, Hong Liu, Ye Zhang, and Zhong Zhao. 2018b. "The Heterogeneous Impact of Pension Income on Elderly Living Arrangements: Evidence from China's New Rural Pension Scheme." *Journal of Population Economics*, 31(1): 155–192.

Duflo, Esther. 2003. "Grandmothers and Granddaughters: Old-Age Pensions and Intrahousehold Allocation in South Africa." *World Bank Economic Review*, 17(1): 1–25.

Duflo, Esther. 2012. "Women Empowerment and Economic Development." *Journal of Economic Literature*, 50(4): 1051–1079.

Duflo, Esther, and Christopher Udry. 2004. "Intrahousehold Resource Allocation in Cˆote D'Ivoire: Social Norms, Separate Accounts and Consumption Choices." *NBER working paper*, No. 10498.

Eggleston, Karen, Ang Sun, and Zhaoguo Zhan. 2018. "The impact of rural pensions in China on labor migration." *World Bank Economic Review*, 32(1): 64–84.

He, Qinying, Xun Li, and Rui Wang. 2018. "Childhood obesity in China: Does grandparents' coresidence matter?." *Economics & Human Biology*, 29 56–63.

Hunag, Wei;, and Chuanchuan Zhang. 2016. "The Power of Social Pensions." *IZA discussion paper*, No. 10425.

Imbens, Guido W., and Thomas Lemieux. 2008. "Regression discontinuity designs: A guide to practice." *Journal of Econometrics*, 142(2): 615–635.

Jensen, Robert T. 2004. "Do Private Transfers 'Displace' the Benefits of Public Transfers? Evidence from South Africa." *Journal of Public Economics*, 88(1-2): 89–112.

Jo, Young, and Qing Wang. 2017. "The impact of maternal employment on children's adiposity: Evidence from China's labor policy reform." *Health Economics*, 26(12): e236–e255.

Maitra, Pushkar, and Ranjan Ray. 2003. "The Effect of Transfers on Household Expenditure Patterns and Poverty in South Africa." *Journal of Development Economics*, 71(1): 23–49.

Meng, Xin. 2012. "Labor Market Outcomes and Reforms in China." *Journal of Economic Perspectives*, 26(4): 75–102.

Mu, Ren, and Alan de Brauw. 2015. "Migration and Young Child Nutrition: Evidence from Rural China." *Journal of Population Economics*, 28(3): 631–657.

Ning, Manxiu, Jinquan Gong, Xuhui Zheng, and Jun Zhuang. 2016. "Does New Rural Pension Scheme Decrease Elderly Labor Supply? Evidence from CHARLS." *China Economic Review*, 41 315–330.

Piernas, C., D. Wang, S. Du, B. Zhang, Z. Wang, C. Su, and B. M. Popkin. 2015. "The Double Burden of Under- and Overnutrition and Nutrient Adequacy among Chinese Preschool and School-aged Children in 2009-2011." *European Journal of Clinical Nutrition*, 69(12): 1323–1329.

Rangel, Marcos A. 2006. "Alimony Rights and Intrahousehold Allocation of Resources: Evidence from Brazil." *Economic Journal*, 116(513): 627–658.

Silverstein, Merril, and Wencheng Zhang. 2020. "Grandparents' Financial Contributions to Grandchildren in Rural China: The Role of Remittances, Household Structure, and Patrilineal Culture." *The Journals of Gerontology: Series B*, 75(5): 1042–1052.

Song, Yang. 2014. "What Should Economists Know about the Current Chinese Hukou System?." *China Economic Review*, 29 200–212.

Song, Yi, Jun Ma, Hai Jun Wang, Zhiqiang Wang, Peijin Hu, Bing Zhang, and Anette Agard. 2015. "Secular Trends of Obesity Prevalence in Chinese Children from 1985 to 2010: Urban-Rural Disparity." *Obesity*, 23(2): 448–453.

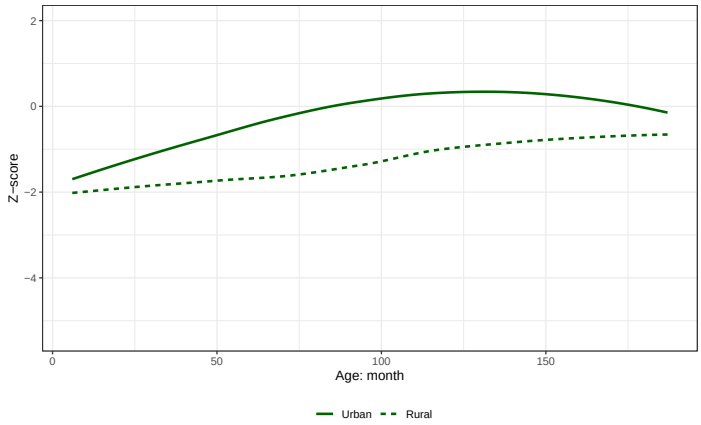
Wells, Jonathan C, Ana Lydia Sawaya, Rasmus Wibaek, Martha Mwangome, Marios S Poullas, Chittaranjan S Yajnik, and Alessandro Demaio. 2020. "The double burden of malnutrition: aetiological pathways and consequences for health." *The Lancet*, 395(10217): 75–88.

Yang, Jinyang, and Muchin I.A Bazan Ruiz. 2021. "Are pilot experiments random? Social connections and policy expansion in China." *The Journal of the Economics of Ageing*, 18, p. 100305.

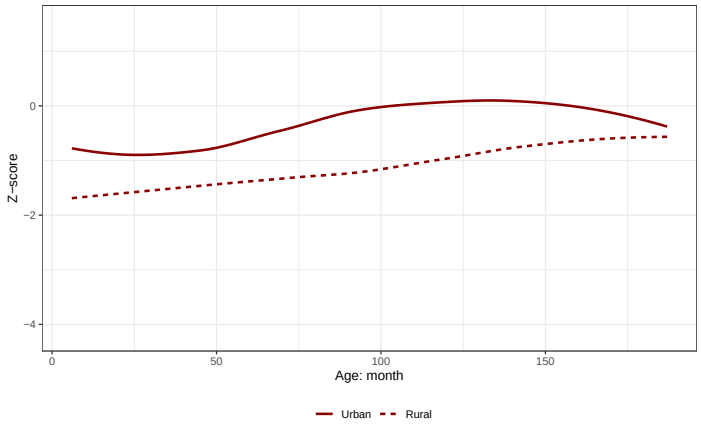
Zhang, Linxiu, Max Kleiman-Weiner, Renfu Luo, Yaojiang Shi, Reynaldo Martorell, Alexis Medina, and Scott Rozelle. 2013. "Multiple Micronutrient Supplementation Reduces Anemia and Anxiety in Rural China's Elementary School Children." *The Journal of Nutrition*, 143(5): 640–647.

Figures and Tables

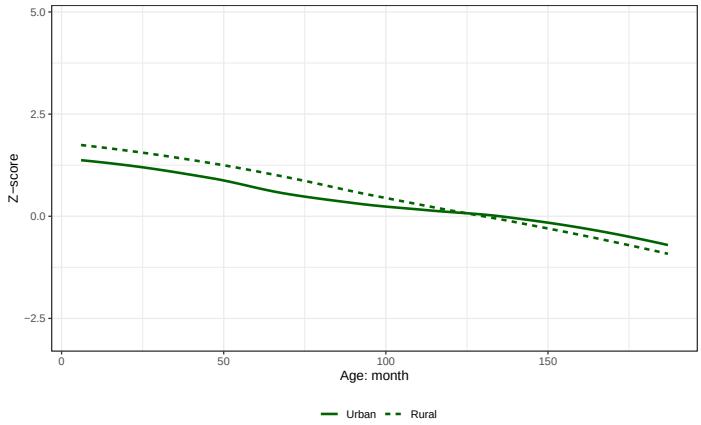
Figure 1: Nutritional Status of Rural and Urban Children under 15



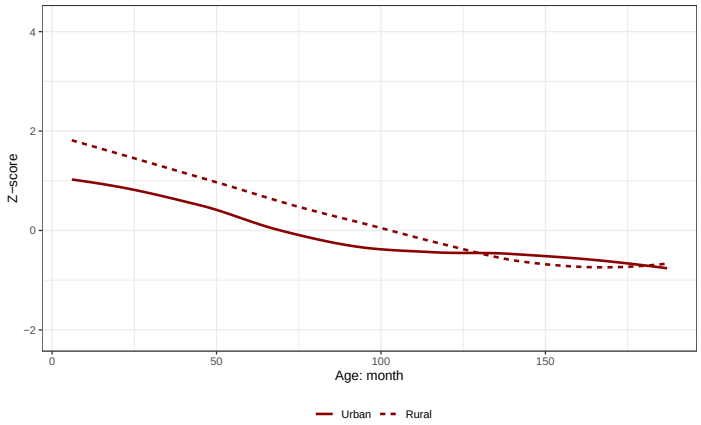
(a) Height-for-Age Z Scores of Boys under 15



(b) Height-for-Age Z Scores of Girls under 15



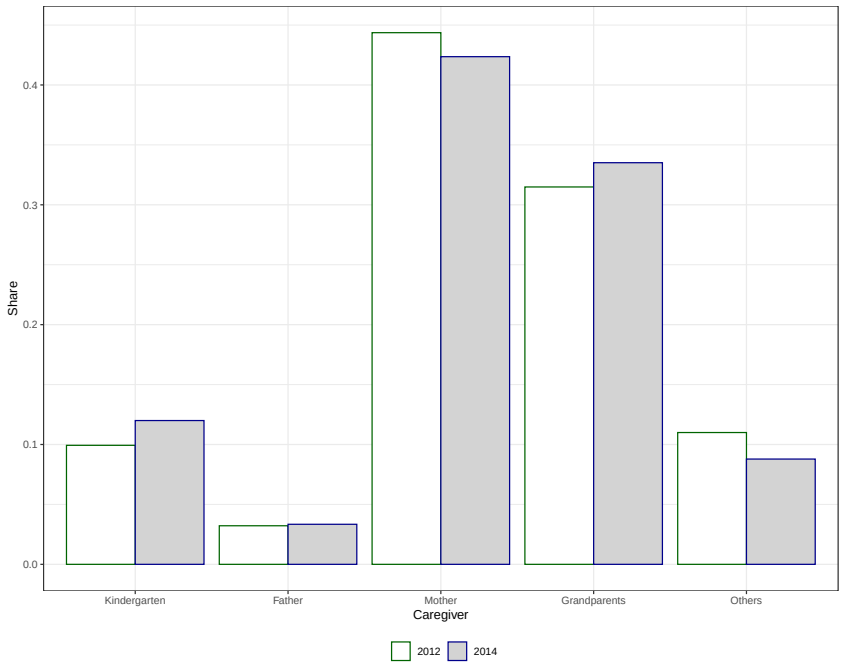
(c) BMI Z scores of Boys under 15



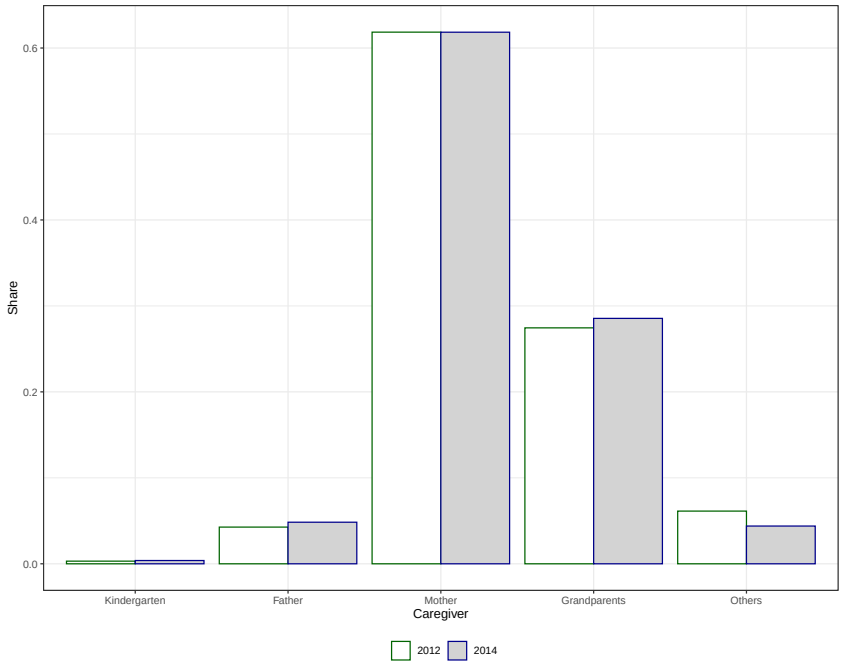
(d) BMI Z scores of Gilrs under 15

*Note:*Authors' tabulations of China Family Panel Studies wave 2010, 2012 and 2014 data. This figure present local regression of height-for-age z score and BMI z score on child age (months). Height-for-age z scores and BMI z scores are calculated based on Child Growth Standards (0-5 years) and Growth Reference (5-19 years) developed by World Health Organization (WHO). Children age less than 6 months are dropped.

Figure 2: Share of Primary Childcare Givers for Children under 12



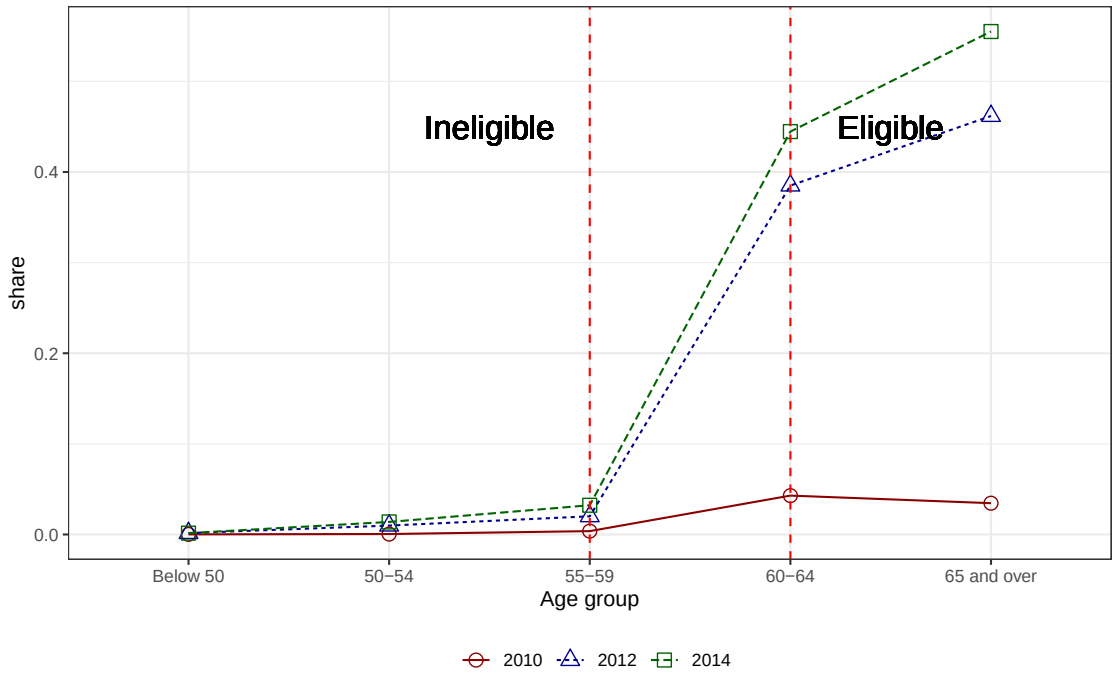
(a) Daytime Care Giver



(b) Night Care Giver

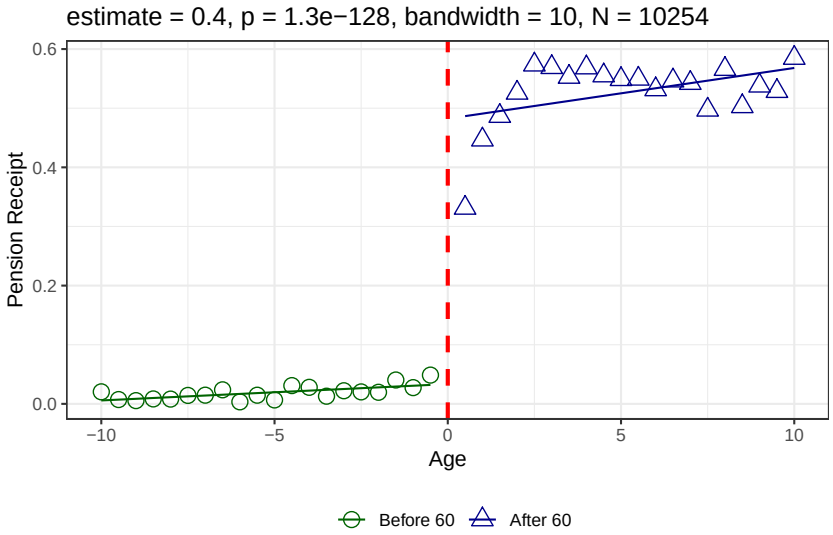
Note: Authors' tabulations of China Family Panel Studies wave 2012 and 2014 data. Daytime childcare giver is defined by CFPS question "who is usually the main care giver of the child during the daytime?" Night childcare giver is defined by CFPS question "who is usually the main care giver of the child during the night?" Wave 2010 is not included because the survey question in wave 2010 is different from that in wave 2012 and 2014. It only asks who mainly take care of the children, regardless of daytime and night.

Figure 3: Share of Adults Receiving NRPS by Age and Year

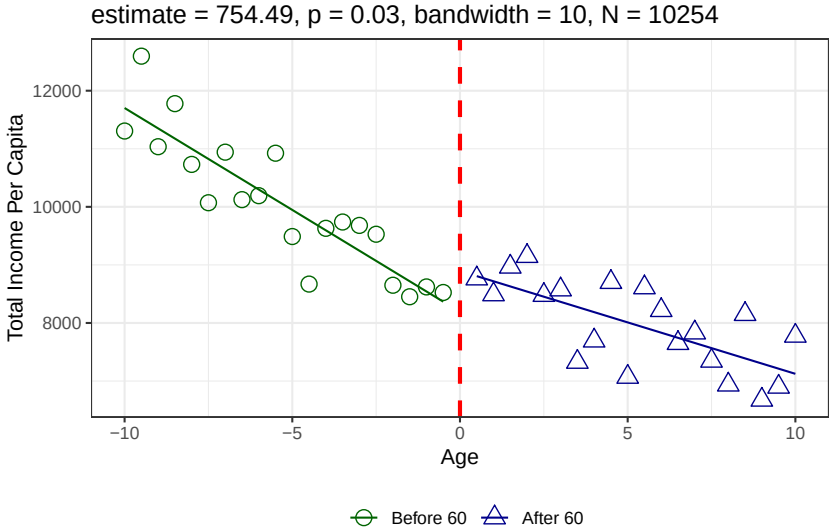


Notes: Authors' tabulations of China Family Panel Studies wave 2010, 2012 and 2014 data.

Figure 4: Effects of NRPS on Household Income



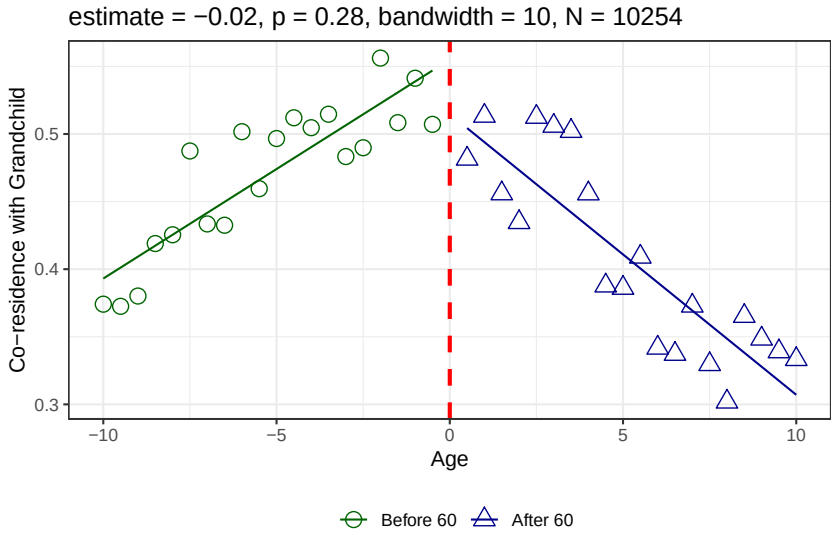
(a) Pension Receipt



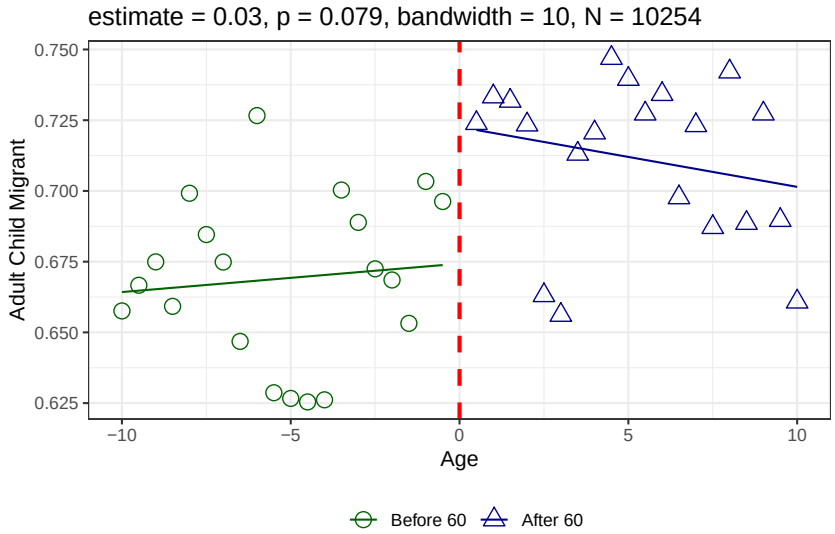
(b) Houisehold Total Income

Note: The data comes from CFPS wave 2012 and 2014. Panel (a) shows the change of pension receipt rate by adult's age (in 0.5 years). Panels (b) displays the average household income per capita at ages (in 0.5 years) 50-70. Ages are centered at 60. Household total income per capita is calcuated by household gross income divided by number of household members. The solid lines show the fitted lines before and after 60 years old. The RD estimation results are displayed in each panel using adult observations.

Figure 5: Effects of NRPS on Multi-generational Co-residence and Adult Child Migration



(a) Co-residence of Grandparents with Grandchild



(b) Adult Child Migration

Note: The data comes from CFPS wave 2012 and 2014. Ages are centered at 60. Panel (a) shows the change of the grandparents' co-residence rate with child under 12 by grandparent's age (in 0.5 years). Panel (b) shows the change of the grandparents' adult child migration rate by grandparents' age (in 0.5 years). The solid lines show the fitted lines before and after 60 years old. The RD estimation results are displayed in each panel using adult observations.

Table 1: Summary Statistics

		Eligibility for pension		
	Full sample	Male	Female	None
Panel A: Children				
Gender (boy=1)	0.535	0.536	0.509	0.541
	(0.499)	(0.499)	(0.500)	(0.498)
Age (month)	70.108	75.410	77.480	66.785
	(40.262)	(39.585)	(40.525)	(40.127)
BMI z score	1.332	1.442	1.368	1.266
	(3.606)	(3.869)	(3.793)	(3.469)
Obese (yes=1)	0.195	0.209	0.197	0.190
	(0.396)	(0.406)	(0.397)	(0.392)
Overweight (yes=1)	0.313	0.337	0.316	0.304
	(0.464)	(0.473)	(0.465)	(0.460)
Underweight (yes=1)	0.114	0.134	0.124	0.108
	(0.318)	(0.341)	(0.329)	(0.310)
Height-for-age z score	-1.711	-1.851	-1.927	-1.585
	(2.943)	(3.070)	(3.055)	(2.858)
Stunting (yes=1)	0.374	0.402	0.397	0.356
	(0.484)	(0.490)	(0.489)	(0.479)
Panel B: Household				
Inc per capita (1000 yuan)	7.312	6.699	6.410	7.795
	(6.707)	(6.013)	(5.802)	(7.114)
Household size	5.487	6.274	6.332	5.037
	(1.848)	(1.706)	(1.797)	(1.784)
Father's age (year)	34.064	35.023	35.495	33.429
	(6.290)	(5.361)	(5.645)	(6.631)
Mother's age (year)	32.158	32.752	33.085	31.823
	(6.174)	(5.575)	(5.775)	(6.461)
Father's edu (year)	8.130	8.211	7.953	8.208
	(3.388)	(3.301)	(3.485)	(3.378)
Mother's edu (year)	7.266	7.229	6.802	7.451
	(3.807)	(3.769)	(3.910)	(3.763)
Urban (yes=1)	0.342	0.289	0.321	0.358
	(0.474)	(0.453)	(0.467)	(0.479)
# of members in age group:				
<5	0.902	0.813	0.825	0.944
	(0.837)	(0.779)	(0.843)	(0.848)
6-15	0.999	1.176	1.243	0.886
	(0.908)	(0.950)	(0.934)	(0.864)
16-24	0.353	0.277	0.319	0.386
	(0.664)	(0.584)	(0.628)	(0.696)
25-49	2.131	2.071	2.119	2.152
	(0.876)	(0.900)	(0.949)	(0.862)
Presence of household member:				
Male age over 50 (yes=1)	0.506	1.000	0.691	0.334
	(0.500)	(0.000)	(0.462)	(0.472)
Female age over 50 (yes=1)	0.539	0.837	1.000	0.318
	(0.498)	(0.369)	(0.000)	(0.466)
Male age over 70 (yes=1)	0.070	0.263	0.163	0.000
	(0.255)	(0.440)	(0.369)	(0.000)
Female age over 70 (yes=1)	0.096	0.127	0.343	0.000
	(0.294)	(0.333)	(0.475)	(0.000)
Male pensioner (yes=1)	0.117	0.424	0.260	0.005
	(0.322)	(0.494)	(0.438)	(0.069)
Female pensioner (yes=1)	0.133	0.285	0.453	0.008
	(0.339)	(0.452)	(0.498)	(0.086)
Observations	7366	2140	2158	4355

Notes: This sample comes from CFPS wave 2012 and 2014. Male eligibility status includes households that have male or both gender eligibility. Female eligibility status includes households that have female or both gender eligibility. Standard deviations are in parentheses.

Table 2: First Stage Regressions: Full Sample Results

	Either gender receipt				Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
NRPS eligibility	0.473***	0.448***	0.454***	0.455***				
	(0.027)	(0.029)	(0.029)	(0.029)				
Male eligibility					0.400***	0.050**	0.402***	0.039*
					(0.031)	(0.020)	(0.032)	(0.021)
Female eligibility					0.038*	0.404***	0.047**	0.412***
					(0.020)	(0.026)	(0.023)	(0.027)
Age and gender	Y	Y	Y	Y	Y	Y	Y	Y
Household covariates		Y	Y	Y	Y	Y	Y	Y
County FEs			Y	Y	Y	Y	Y	Y
Year FEs	Y	Y	Y	Y	Y	Y	Y	Y
Older seniors				Y			Y	Y
F statistics	5376.41	238.65	245.08	246.17	166.49	241.44	157.82	232.84
R^2	0.361	0.365	0.436	0.436	0.400	0.428	0.401	0.429
Observations	7366	7366	7366	7366	7366	7366	7366	7366

The sample comes from the 2012 and 2014 CFPS and includes children age between 6-144 months and their households. Children observed in year 2012 and 2014 are pooled together. "Age and gender" includes dummies of child age (in months) and dummy of child gender. Household covariates include household size, household location (rural or urban), father's and mother's education years and age, and the number of household members in the age categories 0-5, 6-15, 16-24, 25-49, a set of dummies indicating whether there is a women age over 50 and a man age over 50 within the household. "Older seniors" denotes the presence of males and females age over 70 within household separately. Robust standard errors are clustered at county level and presented in parenthesis. CFPS national sample weights in each year are used in the regression.
$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Table 3: Effects of NRPS on Child BMI Z Score: Full Sample Results

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Reduced-form results					
NRPS eligibility	0.395***	0.334**	0.412***	0.496***		
	(0.126)	(0.150)	(0.138)	(0.156)		
Male eligibility					0.436***	0.522***
					(0.150)	(0.163)
Female eligibility					0.038	0.055
					(0.156)	(0.169)
	Panel B: 2SLS results					
NRPS pensioner	0.834***	0.745**	0.906***	1.088***		
	(0.267)	(0.337)	(0.307)	(0.356)		
Male pensioner					1.092**	1.301***
					(0.427)	(0.447)
Female pensioner					−0.008	−0.016
					(0.404)	(0.437)
Age and gender	Y	Y	Y	Y	Y	Y
Household covariates		Y	Y	Y	Y	Y
County FEs			Y	Y	Y	Y
Year FEs	Y	Y	Y	Y	Y	Y
Older seniors				Y		Y
Observations	7366	7366	7366	7366	7366	7366

The sample comes from the 2012 and 2014 CFPS and includes children age between 6-144 months and their households. Children observed in year 2012 and 2014 are pooled together. "Age and gender" includes dummies of child age (in months) and dummy of child gender. Household covariates include household size, household location (rural or urban), father's and mother's education years and age, and the number of household members in the age categories 0-5, 6-15, 16-24, 25-49, a set of dummies indicating whether there is a women age over 50 and a man age over 50 within the household. "Older seniors" denotes the presence of males and females age over 70 within household separately. Robust standard errors are clustered at county level and presented in parenthesis. CFPS national sample weights in each year are used in the regression.
$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Table 4: Effects of NRPS on Underweight, Overweight and Obesity: Full Sample

	Underweight		Overweight		Obesity	
	(1)	(2)	(3)	(4)	(5)	(6)
NRPS pensioner	0.002		0.085**		0.064**	
	(0.034)		(0.041)		(0.031)	
Male pensioner		0.023		0.135**		0.110***
		(0.045)		(0.059)		(0.042)
Female pensioner		0.005		−0.011		−0.014
		(0.038)		(0.058)		(0.046)
Age and gender	Y	Y	Y	Y	Y	Y
Household covariates	Y	Y	Y	Y	Y	Y
County FEs	Y	Y	Y	Y	Y	Y
Year FEs	Y	Y	Y	Y	Y	Y
Observations	7366	7366	7366	7366	7366	7366

The sample comes from the 2012 and 2014 CFPS and includes children age between 6-144 months and their households. Children observed in year 2012 and 2014 are pooled together. "Age and gender" includes dummies of child age (in months) and dummy of child gender. Household covariates include household size, household location (rural or urban), father's and mother's education years and age, and the number of household members in the age categories 0-5, 6-15, 16-24, 25-49, a set of dummies indicating whether there is a women age over 50 and a man age over 50 within the household. "Older seniors" denotes the presence of males and females age over 70 within household separately. Robust standard errors are clustered at county level and presented in parenthesis. CFPS national sample weights in each year are used in the regression.

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Table 5: Effects of NRPS on Child Height

	Full sample		Boys		Girls	
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Height-for-age z-score					
NRPS pensioner	−0.308		−0.439		−0.410	
	(0.226)		(0.346)		(0.324)	
Male pensioner		−0.205		−0.262		−0.089
		(0.333)		(0.492)		(0.461)
Female pensioner		−0.135		−0.412		−0.167
		(0.355)		(0.528)		(0.485)
	Panel B: Stunting					
NRPS pensioner	0.032		0.028		0.041	
	(0.038)		(0.061)		(0.049)	
Male pensioner		0.039		0.093		−0.050
		(0.058)		(0.077)		(0.083)
Female pensioner		−0.024		−0.047		0.050
		(0.061)		(0.096)		(0.077)
Age and gender	Y	Y	Y	Y	Y	Y
Household covariates	Y	Y	Y	Y	Y	Y
County FEs	Y	Y	Y	Y	Y	Y
Year FEs	Y	Y	Y	Y	Y	Y
Observations	7366	7366	3898	3898	3468	3468

The sample comes from the 2012 and 2014 CFPS and includes children age between 6-144 months and their households. Children observed in year 2012 and 2014 are pooled together. "Age and gender" includes dummies of child age (in months) and dummy of child gender. Household covariates include household size, household location (rural or urban), father's and mother's education years and age, and the number of household members in the age categories 0-5, 6-15, 16-24, 25-49, a set of dummies indicating whether there is a women age over 50 and a man age over 50 within the household. Robust standard errors are clustered at county level and presented in parenthesis. CFPS national sample weights in each year are used in the regression.

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Table 6: Effects of NRPS on Child Weight: Subsample Results by Child Gender

	Boys subsample			Girls subsample		
	BMI z	Overweight	Obese	BMI z	Overweight	Obese
Male pensioner	1.148**	0.154**	0.142**	1.098	0.072	0.069
	(0.563)	(0.077)	(0.067)	(0.709)	(0.077)	(0.059)
Female pensioner	0.637	0.025	0.027	−0.510	−0.011	−0.012
	(0.557)	(0.085)	(0.065)	(0.622)	(0.072)	(0.061)
Age and gender	Y	Y	Y	Y	Y	Y
Household covariates	Y	Y	Y	Y	Y	Y
County FEs	Y	Y	Y	Y	Y	Y
Year FEs	Y	Y	Y	Y	Y	Y
Observations	3898	3898	3898	3468	3468	3468

The sample comes from the 2012 and 2014 CFPS and includes children age between 6-144 months and their households. Children observed in year 2012 and 2014 are pooled together. "Age and gender" includes dummies of child age (in months) and dummy of child gender. Household covariates include household size, household location (rural or urban), father's and mother's education years and age, and the number of household members in the age categories 0-5, 6-15, 16-24, 25-49, a set of dummies indicating whether there is a women age over 50 and a man age over 50 within the household. Robust standard errors are clustered at county level and presented in parenthesis. CFPS national sample weights in each year are used in the regression.
$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Table 7: Effects of NRPS on Primary Childcare by Grandparents

	Full sample		Boys		Girls	
	Daytime	Night	Daytime	Night	Daytime	Night
Male pensioner	0.044	−0.039	0.090	−0.015	0.013	−0.006
	(0.068)	(0.065)	(0.088)	(0.097)	(0.091)	(0.082)
Female pensioner	0.031	−0.053	−0.048	−0.104	0.184*	0.016
	(0.068)	(0.062)	(0.076)	(0.081)	(0.101)	(0.098)
Age and gender	Y	Y	Y	Y	Y	Y
Household covariates	Y	Y	Y	Y	Y	Y
County FEs	Y	Y	Y	Y	Y	Y
Year FEs	Y	Y	Y	Y	Y	Y
Observations	7365	7365	3897	3897	3468	3468

Daytime childcare giver is defined by CFPS question "who is usually the main care giver of the child during the daytime?" Night childcare giver is defined by CFPS question "who is usually the main care giver of the child during the night?" The sample comes from the 2012 and 2014 CFPS and includes children age between 6-144 months and their households. Children observed in year 2012 and 2014 are pooled together. "Age and gender" includes dummies of child age (in months) and dummy of child gender. Household covariates include household size, household location (rural or urban), father's and mother's education years and age, and the number of household members in the age categories 0-5, 6-15, 16-24, 25-49, a set of dummies indicating whether there is a women age over 50 and a man age over 50 within the household. Robust standard errors are clustered at county level and presented in parenthesis. CFPS national sample weights in each year are used in the regression.
$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Table 8: Effects of NRPS on Child Weight by Gender of Intermediate Generation

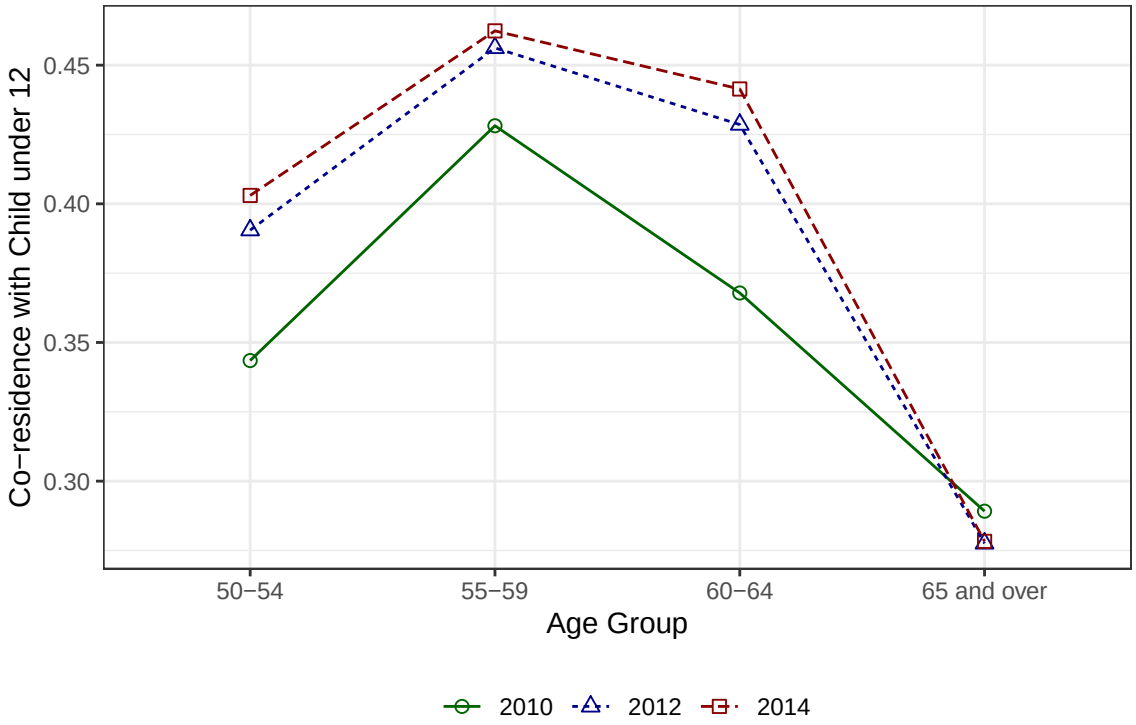
	Full sample			Boys			Girls		
	BMI z	Overweight	Obese	BMI z	Overweight	Obese	BMI z	Overweight	Obese
Farther's father eligible	0.501**	0.054**	0.052**	0.453	0.066*	0.057*	0.441	0.011	0.041
	(0.218)	(0.026)	(0.022)	(0.330)	(0.033)	(0.034)	(0.281)	(0.035)	(0.029)
Farther's mother eligible	0.051	0.005	0.004	0.365	0.026	0.030	−0.060	0.006	−0.004
	(0.180)	(0.027)	(0.020)	(0.317)	(0.043)	(0.033)	(0.227)	(0.033)	(0.025)
Mother's father eligible	0.501	0.039	0.025	0.826	0.057	0.096	0.406	0.041	0.031
	(0.487)	(0.067)	(0.071)	(0.623)	(0.087)	(0.097)	(0.625)	(0.108)	(0.086)
Mother's mother eligible	0.417	0.114	0.030	0.595	0.045	0.079	0.685	0.172	−0.019
	(0.683)	(0.083)	(0.089)	(0.983)	(0.124)	(0.130)	(0.792)	(0.119)	(0.102)
Age and gender	Y	Y	Y	Y	Y	Y	Y	Y	Y
Household covariates	Y	Y	Y	Y	Y	Y	Y	Y	Y
County FEs	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FEs	Y	Y	Y	Y	Y	Y	Y	Y	Y
R^2	0.218	0.188	0.186	0.227	0.213	0.212	0.297	0.268	0.267
Observations	7366	7366	7366	3898	3898	3898	3468	3468	3468

The sample comes from the 2012 and 2014 CFPS and includes children age between 6-144 months and their households. Children observed in year 2012 and 2014 are pooled together. "Age and gender" includes dummies of child age (in months) and dummy of child gender. Household covariates include household size, household location (rural or urban), father's and mother's education years and age, and the number of household members in the age categories 0-5, 6-15, 16-24, 25-49, a set of dummies indicating whether there is a women age over 50 and a man age over 50 within the household. Robust standard errors are clustered at county level and presented in parenthesis. CFPS national sample weights in each year are used in the regression.

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

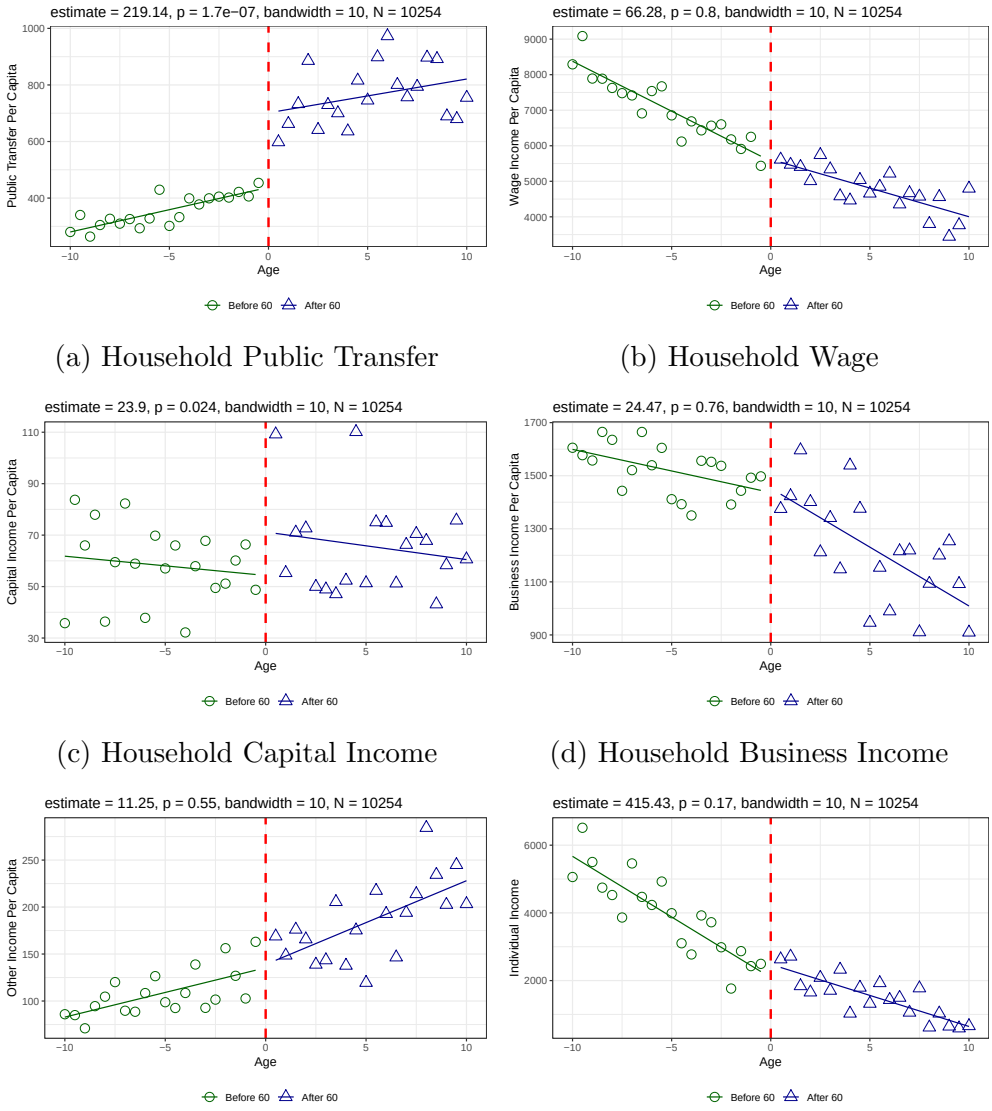
Appendix Figures and Tables

Figure A1: Share of Elderly Co-residing with Child under 12



Source: Authors' tabulations of China Family Panel Studies waves 2010, 2012 and 2014.

Figure A2: Effects of NRPS on Household Income: by Income Sources



(a) Household Public Transfer

(b) Household Wage

(c) Household Capital Income

(d) Household Business Income

(e) Household Other Income

(f) Individual Income

Note: The data comes from CFPS wave 2012 and 2014. Ages are centered at 60. Panels (a)-(e) displays the average household income per capita by income sources at ages (in 0.5 years) 50-70. Household income per capita is divided by five incomes sources. Household public transfer includes all pension, subsidies and compensations as well as income from public donation. Household wage includes all the wage from each household member. Household captial income includes all gains from financial investment and rental income from real estate properties, land, and machineries. Household business income includes all net income from family agricultural work (including in-kind income), and net profit from family-owned businesses. Household other income includes all monetary support from friends and relatives. Panel (f) displays the average adult individual income at ages (in half years) 50-70. For each adult, individual income consists of income from internships, full-time work, pension, fellowship, and assistantship. The solid lines show the fitted lines before and after 60 years old. The RD estimation results are displayed in each panel using adult observations.

Table A1: Effects of Age Eligibility on Household Pension Receipt: Sub-sample Results by Gender of Children

	Either gender		Male		Female	
	Boys	Girls	Boys	Girls	Boys	Girls
	(1)	(2)	(3)	(4)	(5)	(6)
NRPS eligibility	0.448***	0.465***				
	(0.035)	(0.030)				
Male eligibility			0.386***	0.417***	0.046**	0.064**
			(0.038)	(0.033)	(0.023)	(0.024)
Female eligibility			0.025	0.049**	0.413***	0.396***
			(0.023)	(0.024)	(0.031)	(0.029)
Age and gender	Y	Y	Y	Y	Y	Y
Household covariates	Y	Y	Y	Y	Y	Y
County FEs	Y	Y	Y	Y	Y	Y
Year FEs	Y	Y	Y	Y	Y	Y
F statistics	163.84	240.25	103.18	159.68	177.49	186.46
R^2	0.459	0.466	0.421	0.452	0.464	0.447
Observations	3898	3468	3898	3468	3898	3468

The sample comes from the 2012 and 2014 CFPS and includes children age between 6-144 months and their households. Children observed in year 2012 and 2014 are pooled together. "Age and gender" includes dummies of child age (in months) and dummy of child gender. Household covariates include household size, household location (rural or urban), father's and mother's education years and age, and the number of household members in the age categories 0-5, 6-15, 16-24, 25-49, a set of dummies indicating whether there is a women age over 50 and a man age over 50 within the household. "Older seniors" denotes the presence of males and females age over 70 within household separately. Robust standard errors are clustered at county level and presented in parenthesis. CFPS national sample weights in each year are used in the regression.
$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Table A2: Effects of NRPS on Child BMI Z Score: Difference-in-Difference Estimation

	Full	Full	Boys	Girls
Eligible household × After county rollout	0.456**			
	(0.228)			
Eligible household	−0.050			
	(0.232)			
Eligible male members × After county rollout		0.338	0.632*	0.023
		(0.282)	(0.359)	(0.375)
Eligible female members × After county rollout		0.238	−0.045	0.420
		(0.329)	(0.520)	(0.356)
Eligible male members		−0.072	−0.330	0.157
		(0.278)	(0.343)	(0.400)
Eligible female members		−0.046	0.443	−0.402
		(0.309)	(0.491)	(0.363)
Age and gender	Y	Y	Y	Y
Household covariates	Y	Y	Y	Y
County FEs	Y	Y	Y	Y
Year FEs	Y	Y	Y	Y
R^2	0.200	0.200	0.199	0.268
Observations	11051	11051	5892	5159

The sample comes from the CFPS 2010, 2012 and 2014, and it includes children age between 6-144 months and their households. Children observed in all years are pooled together. "After country rollout" indicate whether the county a household located in has rolled-out NRPS in the survey year or not. The county NRPS rollout year is constructed using the 5th percentile of household NRPS participation years within the county. "Age and gender" includes dummies of child age (in months) and dummy of child gender. Household covariates include household size, household location (rural or urban), father's and mother's education years and age, and the number of household members in the age categories 0-5, 6-15, 16-24, 25-49, a set of dummies indicating whether there is a women age over 50 and a man age over 50 within the household. "Older seniors" denotes the presence of males and females age over 70 within household separately. Robust standard errors are clustered at county level and presented in parenthesis. CFPS national sample weights in each year are used in the regression.
$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Table A3: Robustness of Effects of NRPS on BMI Z Scores

	Full	Full	Boys	Girls
NRPS pensioner	0.793**			
	(0.327)			
Male pensioner		0.926*	0.962*	1.002
		(0.473)	(0.570)	(0.852)
Female pensioner		0.090	0.898	−0.545
		(0.436)	(0.572)	(0.717)
Age and gender	Y	Y	Y	Y
Household covariates	Y	Y	Y	Y
County FEs	Y	Y	Y	Y
Year FEs	Y	Y	Y	Y
R^2	0.211	0.208	0.212	0.284
Observations	7366	7366	3898	3468

The sample comes from the CFPS 2012 and 2014, and it includes children age between 6-144 months and their households. Children observed in all years are pooled together. Household eligibility is constructed by whether children's extended family members in the sample, regardless of thier cor-residence status, are eligible to receive NRPS. "Age and gender" includes dummies of child age (in months) and dummy of child gender. Household covariates include household size, household location (rural or urban), father's and mother's education years and age, and the number of household members in the age categories 0-5, 6-15, 16-24, 25-49, a set of dummies indicating whether there is a women age over 50 and a man age over 50 within the household. "Older seniors" denotes the presence of males and females age over 70 within household separately. Robust standard errors are clustered at county level and presented in parenthesis. CFPS national sample weights in each year are used in the regression.

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$