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

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

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Abstract

We examine the multi-generational association of a nationwide social pension program in China, the New Rural Pension Scheme (NRPS). NRPS was rolled out on full scale in 2012, and rural enrollees over the age of 60 are eligible to receive an average of 102 CNY non-contributory monthly pension. We leverage age eligibility and variations in pension receipt to identify the inter-generational associations between NRPS and health among grandchildren. We find NRPS substantially increases child weight without impacting height. Overall, the child BMI z score increases by 0.87, which is largely driven by grandfathers' pension receipt raising rates of overweight and obesity among grandsons. Among the potential mechanisms, our findings are more plausibly explained by a mixture of income increase, knowledge bias of co-residing grandparents on childcare, and son preference. Potential biases from differential reporting of primary caregivers and epigenetic transmissions unlikely drive our findings.

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

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

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1 Introduction

Children living in rural areas in developing countries are more likely undernourished than their counterparts in urban areas or developed countries. 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 also become prevalent (Wells et al., 2020). Similarly, a salient gap in child nutritional status persists between rural and urban China, and existing studies document the prevalence and growth of rural child 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 of by grandparents while their parents devote more time to the labor market, it is important to understand the growing importance of grandparents in shaping child nutritional status and, more generally, human capital development.

Cash transfers offer a viable way to redistribute resources and address child nutritional disadvantages, which help improve 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 the main decision maker, therefore recipients fully internalize 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 the multi-generational association of cash transfers. It is also under-explored whether the influence of grandparents on child health shows any gendered pattern. 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 association between the world's largest social pension program that benefits hundreds of millions of rural residents, the New Rural Pension Scheme (NRPS), with 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 (e.g. Duflo (2003)). Both OAP and NRPS took a few years to roll out to all areas, but they differ in two key aspects: the size of OAP payment to beneficiaries is more than twice the median per capita income of rural South Africans, while NRPS payment accounts for about 20 percent of the median of per capita income in rural China and 1.5 times of rural elders' income; the eligibility for OAP is means tested, in contrast, all residents with rural hukou [1] are eligible to enroll in NRPS. Pension receipt is universal to all people age 60 or older with rural Hukou, not just limited to those in some disadvantaged groups through a means test.

The NRPS has covered the entire country since the end of 2012 [2]. The universal NRPS eligibility criteria (rural residents age over 60) allow us to employ a quasi-experimental design to identify the multi-generational effects of NRPS. We focus on rural children aged under 12 years (6-144 months) and compile a sample of their households. We use household age eligibility as an instrument for NRPS pension receipt, in addition to controlling for child and household characteristics, cohort effects, and 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 not reduced underweight. The correlation has not been manifested in longer-term outcomes, such as height. Moreover, we show a gendered pattern for pension recipients. Specifically, grandfathers' pension receipt has an economically and statistically significant association with grandsons' weight, while the association with granddaughters' weight is statistically insignificant. In contrast, we observe no

[1] Hukou system is an official household registration system that divides residents mainly into rural and urban types.

[2] Instead of using cross-sectional data, such as Duflo (2003) studying OAP, we use a nationally representative sample that follows up household members and their descendants in three waves, one before the full roll-out of NRPS and two afterward.

correlation between grandmothers' pension receipt and grandchildren's nutrition.

Our main findings survive a few tests on validity and misreporting. We have addressed the endogenous household eligibility due to changes in household formation and composition, using pre-determined household eligibility and eligibility of all grandparents regardless of co-residence status at any time. Child weight and height in our sample are self-reported by primary caregivers. To rule out potential biases due to concerns about caregivers' misreporting of child weight, especially the differential reporting of weight by household eligibility, we include a wave of surveys in 2010 when most areas had not implemented NRPS and employ an alternative DID-IV estimation. No significant deviations from our main findings have been detected.

We examine a number of potential mechanisms. Firstly, time allocations of parents and grandparents to childcare don't change significantly with pension receipt. While our data suggest that over time grandparents become more likely to be the main caregiver for children under age 12, and mothers have a declined rate of serving this role,[3] role of main child caregivers does not change with NRPS pension receipt. Secondly, the weight-gaining association of pension receipt is much larger for children mainly taken care of by grandparents. It is plausible that NRPS changes child weight through grandparents lacking knowledge of feeding children. Thirdly, son preference in the patrilineal society may explain the strong link between grandfathers and grandsons, and we find households with ancestor worship behaviors present a much larger association. When differentiating male-line grandparents and female-line grandparents, male-line grandfathers' pension eligibility shows the most salient correlation with grandsons' BMI. Fourthly, we discuss the channel of epigenetic transmission of health from grandfathers to grandsons, as suggested by the literature (Costa, 2023).

[3] 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.

While we rule out the unconditional epigenetic transmission in this study, the channel of inter-generational transmission conditional on grandchildren's age cannot be completely ruled out. We also rule out the potential differential reporting biases affected by grandfathers' norms on favoring a "chubby grandson". Fifthly, we test the income effects and find household income increases by more than 18% on average around NRPS eligible age. When examining the association by income sources, we show the rise in public transfers (NRPS included) as a main contributor. Finally, the inter-generational associations do not seem to be driven by changes in household composition through co-residence or migration decisions.

This study attempts to connect with four strands of literature. Firstly, it sheds light on the role of grandparents in grandchildren's human capital formation. More specifically, it is, to our knowledge, the first paper that explores the multi-generational association of NRPS with grandchildren's nutritional outcomes. Existing studies have evaluated a comprehensive set of NRPS associations, including on elderly labor supply (Ning et al., 2016; Huang and Zhang, 2021), intra-household transfers (Huang and Zhang, 2021; Chen, Eggleston and Sun, 2017; Nikolov and Adelman, 2019), senior health (Cheng et al., 2018a; Chen, Wang and Busch, 2019; Huang and Zhang, 2021), 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 associations with grandchildren except Huang and Zhang (2021) that investigate grandchildren's self-reported health. Similar evaluations have been conducted for South Africa's OAP (Case and Deaton, 1998; Case, 2001; Duflo, 2003; Maitra and Ray, 2003; Jensen, 2004), in which Duflo (2003) shows that only grandmothers' OAP receipt has a significant association with granddaughters' weight and height. Given the differences between NRPS and OAP, as well as the much higher fertility rate in South Africa than in China, their family decision-making on time and resources allocated to children may vary.

Secondly, this paper adds 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 spent more on nutrition to improve child health than are resources in the hands of men (Duflo, 2012; Duflo and Udry, 2004; Duflo, 2003; Rangel, 2006; Lundberg, 2005; Dizon-Ross and Jayachandran, 2022). This paper, instead, shows the salient impact of men's permanent income change on worsening child health. We lend further support to this idea that females' relative empowerment in the family context may promote child health in future generations. 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 an 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)). Less evidence is from developing countries. In China, co-residence with grandparents may increase grandchildren's weight, and the correlations are stronger in rural areas (He, Li and Wang, 2018).

Finally, the study has implications for understanding economic development and socioeconomic status (SES)-BMI relationship. Previous studies have found that the SES-BMI relationship is positive among low-income countries, and reverses to a negative relationship accompanied by economic development (Pampel, Denney and Krueger, 2012). In most of today's developed countries, such as the US, the gradient is negative (Ball and Crawford, 2005; Costa, 2015). Emerging countries with low income, such as India, have a positive gradient (Corsi and Subramanian, 2019).

As China's GDP per capita has increased dramatically in the past decades and has already transitioned into a middle-income country with striking disparities, the SES-BMI association is complicated and possibly divided across regions. The dramatic income increase can lead to overweight among younger generations (Costa, 2023; Luke et al., 2021). Meanwhile, studies on China tend to show that higher SES was still correlated with higher child BMI and overweight/obesity rate until the 2010s, and the gap by SES tended to expand (Gao et al., 2022; He et al., 2014), though the relationship can be largely attenuated by income Chen et al. (2017). The gradient is found to be more robust for rural residents and males (Wang et al., 2021). We complement the existing literature and find more income received by rural households, interacted with cultural norms, could have a larger association with child weight and obesity.

The rest of the paper is organized as follows. Section 2 introduces the backgrounds 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, and discusses the validity and robustness of our strategy. In Section 6 we explore potential mechanisms and other related outcomes. We conclude in Section 7.

2 Background

2.1 Social Security Expansion in Rural China

The New Rural Pension Scheme (NRPS) is a nationwide social pension program that aims to enroll the rural population in China. The NRPS pilot was launched in 320 out of 2,853 counties in 2009, and reached 838 counties by 2010 (Yang and Bazan Ruiz, 2021). The pace of NRPS roll-out in 2009-2010 was moderate, followed by more rapid expansion since 2011, which ended up covering all counties by the end of 2012. The participation rate at the individual level rose dramatically: for NRPS-eligible older adults, only 3 percent received pension by 2010, but the number increased to above 40 percent by 2012, according to our tabulation of China Family Panel Studies (CFPS) data.[4]

NRPS now consists of the most extensive social security program for the elderly in rural China. Though there are other parallel programs in rural areas, they have much lower coverage than NRPS and do not target older adults. Among these programs, dibao, the Rural Minimum Living Standard Guarantee Program, is the largest. It aims to provide cash transfers to households in poverty. Benefits and the targeted households of the dibao program are determined by the local government, with large variations subject to local fiscal constraints (Golan, Sicular and Umapathi, 2017). In general, the program application does not have an age criterion. By 2011, the dibao program had covered around 53 million individuals (Golan, Sicular and Umapathi, 2017). By the end of the same year, NRPS had covered over 326 million enrollees, and the number further increased after the nationwide roll-out.[5]

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. Specifically,

[4]At the beginning of the 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. About 15% of the counties had adopted the family binding policy, but it was not strictly enforced (Zhao et al., 2016). Nonetheless, since even the minimum annual non-contributory benefits (660 yuan) were much larger than the minimum annual premium (100 yuan) paid by children, (Chen, Hu and Sindelar, 2020) illustrated that the two generations still had the incentive to enroll and share net benefits. The binding policy was later removed.

[5]Ministry of Human Resources and Social Security of the People's Republic of China, *National Social Insurance Situation in 2011*

enrollees over age 60 are eligible to receive a non-contributory pension set by the central government (a minimum of 55 Chinese yuan, about 8 US dollars) per month per person in 2009, which increased to at least 70 Chinese yuan in 2014. While most counties adopt the lower-bound pension benefit, the size of the benefit can be raised by local government, depending on their fiscal conditions. Zhao et al. (2016)'s survey in five provinces shows that 45% of the counties had adopted a social pension amount more than the national minimum in 2011. Enrollees under 60 must contribute a minimum annual premium of 100 Chinese yuan to their individual account, which is matched with at least an additional 30 yuan from the local government.

Actual pension income received by rural elders is much higher than the national minimum. According to our CFPS survey-based calculations, the monthly average NRPS benefits received by rural elders amounted to 102 yuan in 2012, more than double the national minimum then. The amount accounted for 21% of the median of rural household income per capita in our sample. The amount was more substantial if compared with pre-NRPS elders' income. For CFPS participants, the median income per capita for elders aged over 60 living with children under 12 was 800 yuan in 2010. Their average NRPS benefits in 2012 were around 1.5 times the elders' pre-NRPS median income. In summary, NRPS benefits are non-trivial for rural households, and more substantial for rural elders as they earn less income than younger adults.

2.2 Child Care, Migration, and Patrilineal Culture

In 2020, 285.6 million rural residents worked in urban sectors.[6] A large proportion of this population live separately from their children.[7] Consequently, an increasingly

[6]National Bureau of Statistics, *Rural Migrant Monitoring Report in 2020*

[7]The lack of equal opportunities for rural migrants to access 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 million rural children under 17 lived in their original domicile without either or both parents due to parental migration. The number of left-behind children comes from United Nations Children's Fund

sizable proportion of rural children in China live with or are taken care of by their grandparents. In Chinese culture, multi-generational co-residence is esteemed as a symbol of filial piety and family harmony (*Tian Lun Zhi Le*). In 2012-2014, around 45% of the elderly at age 60 in the China Family Panel Studies (CFPS), a nationally representative longitudinal survey, co-reside with children under 12, reaching its highest level across all ages of older adults (Figure A1).

The share of grandparents taking the role as the primary caregiver for grandchildren also rises over time, at least partly due to more job opportunities for parents to migrate to work and the lack of childcare provision in rural areas. In CFPS 2012-2014, over 30 percent of rural children under 12 had grandparents as their primary daytime caregivers, and slightly below 30 percent had grandparents as primary nighttime caregivers (see Figure 1).

Given the fact that NRPS accounts for a main income source for grandparents, this public transfer aiming at the rural elderly is likely spent on grandchildren, such as through more food intake, with some unintended nutritional consequences (He, Li and Wang, 2018). Firstly, a majority of grandparents in the countryside are illiterate or semi-illiterate. Their famine experiences in early life and limited knowledge of child care may determine that securing adequate food is at the core of their child-rearing. They might possess a biased view of healthy diet and physical activities. For instance, high-starch food and high-fat meat are favored in many rural households. "Chubby Boy" (*Da Pang Xiao Zi*) is considered healthy. Secondly, the informal labor participation rate of the elderly is higher in the countryside. Unlike their urban counterparts, rural residents do not have a statutory retirement age, nor did they have pension support before NRPS was introduced. The lack of young labor in the

(UNICEF) Annual Report 2015 China. The number of rural compulsory school children left behind in 2017 is 15.5 million, according to our tabulation of the educational statistics released by the Ministry of Education. The original data can be seen for primary and secondary school children left behind http://www.moe.gov.cn/jyb_sjzl/moe_560/jytjsj_2017.

agricultural sector due to migration often requires grandparents to farm at older ages while taking care of grandchildren. Grandchildren could be left unattended during the busy season.

Thirdly, the Chinese Confucious clan culture, with its fading role in urban areas, still influences rural China and contributes to norms of son preference. A family clan is an organization of households connected by patrilineal members sharing a common ancestor. Some of them hold a genealogy or build an ancestral hall where worshipping ceremonies take place. Studies have found that clan provides public goods through informal institutions (Greif and Iyigun, 2013; Xu and Yao, 2015). There is also evidence that clan culture, often accompanied by ancestor worship behaviors, may promote the residents' human capital and protect them in adverse environments (Cao, Xu and Zhang, 2022; Tang and Zhao, 2023). Meanwhile, as part of the clan 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 are the greatest to grandson-only families in which parents are first-born sons.

3 Data and Descriptive Statistics

3.1 Data

This study compares the 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 is representative of

95 percent of China's total population. Its 2010 baseline survey constitutes 14,960 households and 42,590 individuals. Core household members and members of their newly formed families were permanently followed up in the subsequent waves. The 2012 and 2014 waves, respectively, surveyed 6,453 and 6,608 children under 12. 35,719 and 37,147 adults were surveyed in 2012 and 2014, respectively, with 9,130 and 9,934 individuals aged over 60.

The height and weight of children under 12 were all reported by their main caregivers. 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. [8] CFPS started asking adult household members regarding NRPS in 2012. Each adult was asked whether they had received NRPS and, if yes, what year and month they started to receive and the amount. In 2014, the survey continued asking about pension receipt but had dropped other questions. For the analysis in this study, household pension receipt is coded as whether any adult receives NRPS, and household eligibility is coded as whether an adult's age is over 60.

Our study focuses on children under 12 as they often demand more intensive care, and nutrition at younger ages could have a persistent effect on adulthood. They are also suffering from the double burden of malnutrition. As shown in Figure 2, while rural children of all ages under 12 are shorter than their urban counterparts, they surpass urban children in body weight. To study the role of NRPS, we compiled CFPS waves 2012-2014 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 aged 0-5 months due to concerns over measurement error; and 3) excluding children with BMI z scores or height-for-

[8]This study includes all children under 12. 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 the World Health Organization (WHO). We do not use the weight-for-height z score because WHO only has a weight-for-height growth standard for children under 5.

age z scores in the top or bottom 1 percentile. Finally, we obtained a sample of 3,898 boys and 3,468 girls. Wave 2010 is excluded from our main analyses, because by then only up to 56 out of 162 counties in CFPS were covered by NRPS, and individual-level awareness and enrollment rates were extremely low.

3.2 Descriptive Statistics

Table 1 reports summary statistics for samples classified by NRPS pension receipt among household members. Panel A shows the 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 also define stunting by height-for-age z scores below -2.

On the one hand, children in NRPS recipient households have larger BMI but shorter stature. More specifically, children in households with female pension recipients have the largest average BMI z score among all groups, as well as the highest overweight and obesity rates. However, the average child BMI z score in households with male pension recipients is similar to that in households without pension recipients, as are the overweight, obesity, and underweight rates. Children in recipient households are also more disadvantaged in height and stunting rate. Though somewhat different, the gaps in child weight and height between households with and without pension recipients are statistically insignificant in most outcomes using a two-sample t-test (see the last column of Table 1).

On the other hand, children in households with and without NRPS recipients are heterogeneous in age, gender, and household background. All of them show statistical differences as well. Firstly, the average age of children in households receiving NRPS is 6 months older than those without. Secondly, households receiving NRPS tend to have larger household size, lower income per capita, and larger chance of residing in rural areas than their non-receipt counterparts.[9] To understand whether the differences in child nutrition can be partially attributable to NRPS, we next adopt an instrumental variable approach while controlling for a rich set of child and household characteristics.

4 Estimation Strategy

In this study, we examine the association of NRPS with child health by comparing child nutritional outcomes in households with and without pension receipt. The association of receiving pension by household members with the health outcomes of grandchildren can be identified by the models below:

$$Y_{ijct} = \beta_0 + \beta_1 NRPS_{jct} + \beta_2 I_{ijct} + \beta_3 H_{jct} + \gamma_c + \eta_t + \varepsilon_{ijct} \quad (1)$$

$$Y_{ijct} = \phi_0 + \phi_1 NRPS\_male_{jct} + \phi_2 NRPS\_female_{jct} + \phi_3 I_{ijct} + \phi_4 H_{jct} + \gamma_c + \eta_t + \varepsilon_{ijct} \quad (2)$$

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 an adult receiving NRPS pension in household j, county c, and year t. When separating the correlations of NRPS by male and female pensioners, we substitute $NRPS_{jct}$ 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 j, 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 household size, farmland asset value [10], urban or rural residence,

[9] NRPS eligibility depends on the rural hukou type, rather than residence location.

[10] For rural households, farmlands constitute the most important part of household assets. In this study, we discretize farmland asset values into deciles, and include a dummy variable for missing values to retain those observations. Our results are robust to using other measures of household

father's and mother's years of education, and ages. To compare with Duflo (2003), our strategy considers children in all households regardless of their co-residence with grandparents because co-residence behavior could be an endogenous decision of the household. Instead of selecting the sample of children in multi-generational households, we control for household demographics that could be signs of the generations. In H_{jct}, we control for the number of members aged 0-5, 6-15, 16-24, 25-49, and dummy variables respectively indicating the presence of a woman aged over 50, and a man aged over 50. For robustness checks, we also control for the presence of males and females over age 70 in the household, respectively. γ_c and η_t are county and survey time fixed effects, respectively.

The decision to take up NRPS is not random. For instance, the elderly who receive less support from adult children tend to miss the opportunity to enroll in the program (Chen, Hu and Sindelar, 2020), and their grandchildren may have worse nutrition outcomes if parents live away from their home village and offer less support to child care. Fortunately, the exogenously determined eligibility at age 60 for NRPS pension receipt offers an instrument to address this endogeneity. To identify the association of pension receipt in equation (1), we use a dummy variable indicating the existence of an eligible household member as an instrument for $NRPS_{jct}$. The first-stage regression can be shown as follows.

$$NRPS_{jct} = \beta_0^1 + \beta_1^1 Eligible_{jct} + \beta_2^1 I_{ijct} + \beta_3^1 H_{jct} + \gamma_c + \eta_t + \varepsilon_{ijct}^1 \quad (3)$$

The assumptions of 2SLS require that household eligibility, $Eligible_{jct}$, is a relevant predictor for household pension receipt, and that household eligibility affects child health only through pension receipt. While the former can be tested by F-statistics of the excluded instrument in equation (3), the latter cannot be tested directly. A valid

wealth, including household total net asset value.

concern regards the household composition difference between eligible and ineligible households, which may also affect child health. Children in an eligible household, for instance, are more likely to live in a multi-generational household, and their health may be systematically different from children in an ineligible household. Therefore, we control for household members in each age category, which partially relieves our concern about household composition differences.

To estimate the associations of male and female pension receipt with health simultaneously in equation (2), two variables, household male and female pension eligibility statuses are used as instruments for $NRPS\_male_{jct}$ and $NRPS\_female_{jct}$, separately. The first-stage regressions can be written as two equations below.

$$\begin{aligned} NRPS\_male_{jct} = &\ \phi_0^m + \phi_1^m Eligible\_male_{jct} + \phi_2^m Eligible\_female_{jct} + \\ &\ \phi_3^m I_{ijct} + \phi_4^m H_{jct} + \gamma_c + \eta_t + \varepsilon_{ijct}^m \qquad (4) \\ NRPS\_female_{jct} = &\ \phi_0^f + \phi_1^f Eligible\_male_{jct} + \phi_2^f Eligible\_female_{jct} + \\ &\ \phi_3^f I_{ijct} + \phi_4^f H_{jct} + \gamma_c + \eta_t + \varepsilon_{ijct}^f \qquad (5) \end{aligned}$$

where $Eligible\_male_{jct}$ and $Eligible\_female_{jct}$ denote household male and female eligibility separately.

5 Results

5.1 Age Eligibility and Pension Receipt

In this section, we present the first-stage regression results of household pension receipt on age eligibility. The results will confirm whether pension age eligibility in the 2SLS estimations provides us with strong instruments. In all regression tables, we cluster standard errors at the county level unless stated otherwise. We also use

CFPS sample weights in all estimations.

Table 2 shows the full sample results. Columns 1-4 report the results without distinguishing the gender of the pension recipient. Column 3 presents results from our baseline model. 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 the 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 the gender of pension recipients. Columns 5-6 include all baseline controls as in Column 3, and Columns 7-8 follow Column 4 in additionally controlling for the presence of seniors aged 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 boys and girls.

5.2 NRPS and Child Weight

Table 3 presents the estimates on the association of NRPS with child BMI z scores. Columns 1-4 report estimates of equation (1). We first run naive OLS regressions and test whether children in households receiving pension show larger body weight after controlling for covariates. The results confirm our observation: though statistically insignificant, the coefficients on household pension receipt are around 0.2. We employ the 2SLS strategy using age eligibility as an instrument for pension receipt, and report the results in Panel B. The point estimates of NRPS pension receipt scale up by a factor of four, and the standard errors inflate by a factor of two, indicating that the marginal effects for children in complied households are statistically significant.

The association of receiving NRPS with child BMI z scores ranges from 0.72 to 1.05 standard deviations (SD) across specifications in Columns 1-4. The baseline result in Column 3 shows that NRPS increases child BMI by 0.87 SD and the estimate is statistically significant at 1% level.

Columns 5-6 report estimates of equation (2) and further distinguish the effects of NRPS by gender of pensioners. Using naive OLS, receiving pension by males in the household has a nil association with child weight. The coefficient on female pension receipt is positive but statistically insignificant. Applying 2SLS, the association of male pension receipt becomes substantial and statistically significant at 5% level. Specifically, the association between NRPS and child weight is almost entirely driven by males. With baseline controls, males receiving pension increase child BMI by 1.06 SD, about 20% larger than the baseline results without differentiating the gender of pensioners. In contrast, the coefficients on receiving pension by females are close to zero and statistically insignificant. However, it is noteworthy that we cannot reject the Wald test (P-value = 0.11) that male and female pension receipts have the same association with child BMI z score in our baseline results (Column 5, Panel B). Additionally, controlling for the presence of seniors over age 70 further magnifies the association of male pensioners, with little change in the coefficient on female pensioners (column 6, Panel B). The null hypothesis of equal association is rejected marginally at 10% level (P-value = 0.08). The differential association of male and female pensioners is unlikely driven by differences in take-up rates, because Table 2 shows eligible males and females have the same propensity to enroll in NRPS.

The size of the association in our baseline specification can be compared with those identified in previous studies. Duflo (2003) shows social pension in South Africa significantly improves girls' health outcomes, and the effect is driven by female pensioners, with a 2SLS estimate of 1.19 SD of weight-for-height. However, our study only shows male pensioners exert significant influence over child BMI, with a 2SLS estimate of 0.87 SD, about 27% smaller than Duflo's estimate.

The size of the association in China appears to be striking compared with South Africa as social pension is more generous in the latter. However, as we introduced in the background section, in almost half of the Chinese counties, the actual NRPS benefits are much higher than the national minimum level, as local government can raise the benefits according to local fiscal conditions (Zhao et al. (2016)). CFPS 2012 surveys that the average NRPS benefit accounts for 21% of median income per capita, and the size of NRPS benefit is more than 1.5 times the median income of rural elders' pre-NRPS income. Household size may also explain our sizable effect on grandchildren's health. The average household size in South Africa is 10.5 for pension-eligible households (Table 2 of Duflo 2003), but only 6.4 in our study. Given fewer children/grandchildren in China, the average spending on each grandchild after receiving a pension can be larger, even if the NRPS benefits are smaller in China.

Among studies focusing on China, Mu and de Brauw (2015) find rural parental migration in China increases child BMI by 0.11 SD, while Jo and Wang (2017) find maternal full-time work raises urban Chinese child BMI by 1.11 SD. Our identified association of NRPS receipt is larger than that of parental migration, but smaller than the effect of maternal full-time work in China or grandparents receiving social pension in South Africa.

5.3 The Distributional Effects of NRPS on Child Weight

In addition to demonstrating that NRPS shapes overall child weight, we further evaluate its potential distributional effect 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 a pension has negligible association with child underweight, while it increases the risks of child overweight and obesity. In particular, pension receipt increases the likelihood of being overweight and obese by 25% (0.081/0.313) and 32% (0.063/0.195), respectively, and both are driven by male pensioners.

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

5.4 NRPS and Child Height

In this section, we evaluate how NRPS changes children's longer-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, respectively. Again, they are imprecisely estimated.

To explore the correlations of NRPS with 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 may have little correlation with child long-term nutritional status.

While the absence of an association between pension income and height among grandchildren in rural China is at odds with Duflo (2003)'s finding that pension increases girls' height-for-age z scores by 1.2 in South Africa, it is not surprising for at least two reasons. Firstly, NRPS benefits are smaller than pension benefits in South Africa and therefore less likely to affect child height in the short term. 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. Therefore, it can be too early to identify any long-term correlation given the timing of CFPS 2012-2014.

5.5 Subsample Heterogeneity

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

Interestingly, we find a salient gender pattern in the boy subsample with male pensioners. Benefits received by male pensioners are associated with boys' larger BMI z score, and rates of overweight and obesity. However, the correlation between female pension receipt and boys' weight is small and statistically indistinguishable. Meanwhile, in the girl subsample, the estimates are imprecise, whether we examine the associations of benefits received by male or female pensioners. This is different from Duflo (2003)'s finding in South Africa that pension received by grandmothers promotes granddaughters' weight.

5.6 Validity and Robustness

Our IV strategy assumes age eligibility affects child health only through the pension receipt, which could be violated by some exceptions. The primary concern involves the policy's effect on household formation. In particular, household composition, i.e., the 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, the 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 receipt on the nutritional status of grandchildren. Controlling household members within each age category may only partially relieve the concern.

To further address the concern, we take advantage of the CFPS survey's panel structure and construct a pre-determined household eligibility variable as the instrument for a pre-determined household pension receipt. As CFPS started its first wave in 2010 when NRPS coverage was very low, CFPS followed up with those core members in 2012 and 2014 even if they left the households. We re-construct the household eligibility by whether current household members are eligible for NRPS, or whether pre-co-residing grandparents are eligible for NRPS, regardless of their co-residence status during our sample period. The pre-determined pension receipt variable is constructed in a similar way. Applying the 2SLS estimation, we report the results in Table 7. The results are qualitatively similar to our main estimates, suggesting the validity of our 2SLS estimations. The smaller marginal association of pension receipt may reflect the fact that grandparents living away from grandchildren may impose less influence over their nutritious status.

Another concern involves the sorting of grandparents into households with healthier grandchildren. If grandparents have multiple adult children and choose to live with the one who has healthier grandchildren, our estimates of pension effects will be upward biased. It is likely to happen in rural China, where the social pension system was almost absent before the 2010s. Grandparents could invest more in one of their children and expect to receive support from him/her in their elder life. Consequently, the grandchildren of this particular adult child are likely healthier as well. To test whether our findings are vulnerable to grandparents' sorting into adult children, we construct an eligibility by all grandparents' age regardless of their co-residence at any time. CFPS surveys adults in the household about their father and mother's age, regardless of their co-residence status. We take advantage of these questions and match adult children with their parents and identify whether grandparents are eligible for NRPS or not. The 2SLS estimation is inapplicable in this setting because we have no information on the pension receipts of grandparents who had never lived in the household before. Therefore, we directly use the eligibility of grandparents as the treatment and estimate the intent-to-treat (ITT) effect that compares between children with eligible grandparents with those without eligible grandparents. The results are presented in Table A2. Compared to the baseline results, the ITT estimates are downgraded but have shown the same directions as the baseline.

Our main strategy treats children present in both waves of the survey as independent, which could have unknown consequences. To address the issue, we compile a sample that drops repeated observations, letting each child present only once in the sample. If they present more than once, we keep the first/earliest wave observations. The estimates are shown in the Appendix Table A3, and our main findings hold.

5.7 Misreporting and DID-IV Estimation

Our findings on child anthropometric outcomes, especially child weight, rely on primary caregivers' self-reported values, which may be subject to misreporting. First, when child weight is reported with random error, it is less concerning as it makes our estimates less precise but still consistent. The second is when observed or unobserved characteristics of the respondents potentially affect their reported value of weight. A few reasons can be plausible, such as cognitive aging of the respondents that affects memory and cognition, or cultural norms that favor heavier grandchildren.

To learn to what extent misreporting may affect our analysis of child weight, we compare the self-reported weight of children in our sample with the objectively measured weight of children in the China Household Nutrition Survey (CHNS), a national survey that examines the nutritional status of all respondents, including children. We are particularly interested in the lumping points in the self-reported distribution compared with CHNS, which can be a signal of extensive misreporting. We select two waves of the CHNS survey that are closest to our sample period, 2009 and 2011, and apply the same criterion as we do in the CFPS sample, keeping children aged under 12 with rural hukou type. However, children aged under 6 months are not dropped from the CHNS sample because the age of children is rounded to years in the publicly available dataset.

Distributions of child weight from the two samples are plotted in Figure A2. The CFPS sample is more concentrated in the 10-20 kg range of weight than the CHNS sample. However, no obvious lumping point of weight is observed in the CFPS sample. Overall, the distribution of weight in the two samples share a great deal of overlapping area. Average weights are 21.19 kg and 21.56 kg in CFPS and CHNS, respectively, and the t-test of difference is statistically insignificant. As the survey designs and sampling frames of the two surveys are different, and CFPS includes many more provinces than CHNS, their overall similarity in average weight and no clear lumping points likely indicate that most of the caregivers have a fair knowledge of child weight.

We further test whether differential reporting drives our findings on child weight, especially boys' weight. Assuming cultural norms on weight and differential reporting attached to the norms are fixed for households but correlated with caregivers' age, comparing child weight in eligible households before and after NRPS coverage, with ineligible households, may difference out the differential reporting bias. Such a difference-in-difference (DID) strategy needs to incorporate the pre-treatment period of the NRPS national pilot. CFPS started its first wave in 2010 when NRPS rolled out in a small set of counties with low enrollment rates. While CFPS 2010 does not collect information on NRPS, we utilize the survey questions in CFPS 2012 that ask the year when a respondent started receiving NRPS benefits to construct the pension receipt status of the same household in 2010. County roll-out is constructed by whether any household with local rural hukou receives NRPS by survey year.

To be more comparable with our main analysis, we adopt the DID-IV strategy following (Duflo, 2003), in which we use household eligibility times county NRPS roll-out as the instrument for household pension receipt interacted with county NRPS roll-out.

$$\begin{aligned} Y_{ijct} = {} & \beta_0 + \beta_1(NRPS_{jct} \times After\_NRPS_{ct}) + \beta_2 Eligible_{jct} + \\ & \beta_3 After\_NRPS_{ct} + \beta_4 I_{ijct} + \beta_5 H_{jct} + \gamma_c + \eta_t + \varepsilon_{ijct} \end{aligned} \tag{6}$$

$$\begin{aligned} Y_{ijct} = {} & \phi_0 + \phi_1(NRPS\_male_{jct} \times After\_NRPS_{ct}) + \\ & \phi_2(NRPS\_female_{jct} \times After\_NRPS_{ct}) + \phi_3 Eligible\_male_{jct} + \\ & \phi_4 Eligible\_female_{jct} + \phi_5 After\_NRPS_{ct} + \phi_6 I_{ijct} + \\ & \phi_7 H_{jct} + \gamma_c + \eta_t + \varepsilon_{ijct} \end{aligned} \tag{7}$$

where $After\_NRPS_{ct}$ denotes whether county c at time t has rolled-out NRPS. β_1 in equation (6) captures the parameter of interest in our DID-IV estimation, and ϕ_1 and ϕ_2 in equation (7) capture the association by gender of pension receipt. In equation (6) the interaction of pension receipt with county rollout is instrumented with household eligibility interacted with county rollout status ($Eligible_{jct} \times After\_NRPS_{ct}$). In equation (7), we use ($Eligible\_male_{jct} \times After\_NRPS_{ct}$) and ($Eligible\_female_{jct} \times After\_NRPS_{ct}$) as the instruments for male and female pension receipt interacted with county rollout separately.

Table 8 reports the DID-IV estimates on child BMI z score using the pooled sample of children surveyed during 2010-2014. All the parameters of interest resemble our main findings, in the full sample and subsamples by child gender. In the full sample, the coefficient on NRPS receipt interacted with county rollout is 22% larger than the baseline (Column 3 of Panel B in Table 3), and that on male NRPS receipt are indiscernibly different from the baseline (Column 5 of Panel B in Table 3). For the boys, only male pension receipt presents a significant association with BMI z score. For the girls, neither gender of pension receipt is significantly associated with BMI z score. In all samples, the association of female pension receipt is muted. While most of the estimates on NRPS pension receipt and male pension receipt maintain statistical significance at 5% or 1% level, standard errors obtained by DID-IV estimation are much larger than their IV counterparts. Our main findings are robust to DID-IV estimations.

We proceed with two more exercises in the appendix to test the specifications of the DID-IV strategy. First, we apply individual fixed effects instead of county fixed effects in equation (7), as it takes full advantage of the panel structure of the survey and rules out unobserved time-invariant characteristics of children and their households. The strategy tends to drop younger and older children in the sample, as they are more likely to present only once in the sample. To address the sample attrition issue, we adopt the CFPS family panel weights in the regressions and report the results in Table A4. On the one hand, the findings in Table A4 are very similar to their counterparts of DID-IV estimates with county fixed effects shown in Table 8. On the other hand, the number of observations drops substantially by 2940 in Table A4 as compared to Table 8. The standard errors increase substantially as well, indicating that the coefficients in Table A4 are much more imprecisely estimated.

The second exercise involves the weights we apply in our main results. We apply the weights to achieve consistent estimates with national representativeness. According to User's Manual[11], CFPS weights are constructed to address the non-response rate and sample attrition in follow-up surveys. Details of constructing the weights can been seen in the CFPS Technical Report on Weight Calculation[12].

Two reasons motivate our use of CFPS weights. First, according to CFPS User's Manual, the sampling frame in 2010 was designed to oversample five regions, Shanghai, Liaoning, Henan, Gansu, and Guangdong, which amount to nearly half of the total households in the sample. Solon, Haider and Wooldridge (2015) argue that if the sample simply overrepresents some regions and the model includes regional fixed effects, and additionally, if the model is correctly specified, unweighted regression is consistent and efficient (see the 4th paragraph on Page 310 and the 1st paragraph on Page 311). However, CFPS is a longitudinal survey, and core household members are tracked in the follow-up waves, regardless of their location. Due to endogenous migration choices and sample attrition, regional fixed effects can hardly fully address the oversampling issue. Second, due to the large regional disparities in China, variation in response rate across regions, ranging from 60-90%, is likely endogenous. Specifically, if the response rate is correlated with child outcomes, the sampling weights are endogenous. This could be true, for instance, if households with parents absent are more likely to decline surveys, children in these households tend to be in disadvantageous

[11]Click the link here for the CFPS User's Manual.

[12]See the link here for the CFPS Technical Report on Weight Calculation. It only has a Chinese version.

nutritional status.

Solon, Haider and Wooldridge (2015) suggest that if the model is correctly specified, the weighted estimate is always consistent but may be less efficient than the unweighted estimate if sampling is exogenous. We follow their guide and compare weighed vs. unweighted estimates as tests for model specifications and endogeneity of the sampling process. In Table A5, we show the estimates that do not apply sample weights. There is only a slight difference between weighted and unweighted results, and the major patterns found in Table A5 are robust and similar to Table 8.

6 Mechanisms and Other Outcomes

In a household decision-making framework, children are public goods. Pension benefits to grandparents may shape health outcomes among grandchildren in two main channels, goods and time allocated to grandchildren. Beyond resource allocations, other mechanisms may also explain our main findings on child weight and male-line association, such as biased knowledge of childcare, social norms, and their interactions with epigenetic transmission or differential reporting. In this section, we examine these plausible mechanisms.

6.1 Time allocation

Parents' and grandparents' time allocation to child care may be heterogeneous in producing their health outcomes, and time allocated to child care may be affected by NRPS. For instance, grandparents may reduce their labor supply after receiving a pension, and instead spend more time with grandchildren, which frees up parents' time in housework and may increase their labor supply. While household time allocation is not directly observed in CFPS, other indirect measures, e.g., main caregivers for grandchildren, may indicate grandparents' time allocation to grandchildren.

CFPS surveys include a question regarding main caregivers during daytime and at night for children under 12. In Table 9, we re-estimate equation (2) by replacing the outcome with whether the child is mainly taken care of by grandparents. The results are largely insignificant in both boys and girls, with the only exception being that grandmothers' pension marginally increases their serving as the main caregivers for granddaughters in the daytime. Overall, our empirical evidence suggests that the shift of caregiving responsibility from parents to grandparents may not be large enough to explain our main findings on the gendered pattern in nutritional outcomes among grandchildren.

6.2 Knowledge Bias

Even though NRPS may not change the main caregivers of children, it may affect child health outcomes through an "intensive margin" due to the biased knowledge of grand-parenting. To test the mechanism, we focus on children mainly taken care of by grandparents because they are more intensively exposed to NRPS, and we expect amplified associations for these subsamples.

The first three columns of Table 10 report the 2SLS results of NRPS on child BMI z score for children co-residing with grandparents, mainly taken care of by grandparents in the daytime, and at night, respectively. All controls are the same as the baseline model. We find NRPS has the largest association with children having grandparents as their main caregivers at night. Specifically, the association of the grandfather's pension receipt is almost twice as large as that in baseline results. This is in line with our expectations as night caregivers are most likely to be the primary guardians of children. Among those children mainly taken care of by grandparents at night, 44% have their mother absent in the household, compared with around 7% for the rest of the children. However, children having grandparents as their main caregivers in the daytime present a similar association to those in the full sample baseline result. It's plausible their parents, especially mothers, still have a strong influence on household decision-making regarding childcare. Overall, conditional on the child's co-residence with grandparents, the correlation of the grandfather's pension receipt with the child's BMI z score is 49% larger than the baseline relationship (see the first column in Table 10).

6.3 Son Preference and Patrilineal Norms

Our findings of the link between grandfathers' pension receipt and grandsons' health outcomes may indicate the prevailing son preference in rural China, and grandfathers may possess stronger norms of son preference than grandmothers in a traditional patrilineal society. The patrilineal norms may be measured by traditional family ancestor worship behaviors. In the CFPS household questionnaire, household heads are asked whether the household has participated in activities such as family ancestor worship or tomb-sweeping during the last 12 months. We hypothesize that pension receipt may have a larger influence on boys in households with such behaviors.

In our sample, 4267 out of 7366 children live in households that have ancestor worship or tomb-sweeping behaviors, accounting for 57.9% of our total sample size. For the subsample reporting strong adherence to patrilineal norms, the average maximum years of education of their grandparents is 5.53, which is only slightly more than the subsample of children reporting no strong adherence to patrilineal norms (5.46) (see Table A6). The two-sample t-test shows that the difference is not statistically significant (p-value = 0.608). Similarly, parents of the former subsample also receive more education (7.92 years for fathers and 6.90 years for mothers) than parents of the latter subsample (7.61 years for fathers and 6.36 years for mothers). For both fathers' and mothers' levels of education, the two-sample t-tests reject at the 1% level that they are not statistically different. In the boys, we find the same pattern that ancestor-worship households tend to have higher educational levels for grandparents and parents.

We divide the boys by household ancestor worship behaviors and employ the 2SLS estimations as before to examine the association between NRPS and child weight. The results are summarized in the last two columns in Table 10. For boys in households with ancestor worship behaviors, the association of grandfathers receiving a pension is much more prominent, 45% larger than the baseline effect size. Conversely, for boys in households with no such behaviors, the association of grandfathers receiving a pension is imprecisely estimated.

We further test son preference by differentiating the gender of the intermediate generation. We hypothesize that the father's father (or the male-line grandfather) receiving a pension may have a stronger association with the grandson's weight than that of the mother's father, given the patrilineal society. Table 11 reports the reduced-form OLS estimates by differentiating the gender of the intermediate generation. As expected, results show that the correlation of the father's father pension receipt with boys' weight is relatively more salient, significantly increasing boys' risk of overweight / obesity at the 10% level. Though positive, the associations through the mother's father are imprecisely estimated.

6.4 Epigenetic Transmission and Cultural Norms

The findings on the male-line relationship between NRPS pension receipt and child weight coincide with the literature on epigenetic transmission of health between grandparents and grandchildren. Studies have found that both positive and negative exposures of grandfathers can be linked to male-line grandsons' health outcomes. (Costa, 2021; Vågerö, Cederström and van den Berg, 2022; Vågerö et al., 2018; van den Berg and Pinger, 2016). A most recent study by Costa (2023) shows that grandfathers' exposure to starvation during the US Civil War (1861-5) increases male-line, not female-line, grandsons' BMI, and the likelihood of being overweight.

In China's context, famines tend to affect rural residents more than their urban counterparts. CFPS enables us to directly control for famine exposures. In CFPS 2010 respondents born before 1977 were asked whether they had experienced persistent hunger for over a week, and that piece of information was linked to CFPS waves 2012 and 2014. We control for three variables related to grandparents' famine experience—whether the male-line grandfather experienced famine, whether the non-male-line grandfather experienced famine, and whether any grandmother experienced famine—in addition to the baseline specifications, and report the 2SLS results in Table 12. All results are very similar to our main findings. The last column reports the results for boys after restricting to ancestor-worship households. The association is unattenuated when controlling for grandparents' famine experience, suggesting that epigenetic transmission may not be the main driver of our results.

In Table 13, we further address the concern about potential mechanisms, in particular, if epigenetic imprint may play a salient role. Specifically, our falsification test includes children aged between 6-144 months and their households from the 2010 wave of CFPS. We examine if the same households eligible for NRPS in 2012/2014 had had higher child weight prior to the NRPS roll-out. False eligibility and pension receipt in 2010 are respectively constructed as whether the same household was eligible and received the pension in 2012/2014. We proceed with the 2SLS estimates that use false household eligibility in 2010 as the instrument for false pension receipt. Reassuringly, the results in all columns are statistically indistinguishable. The same sample of children, however, demonstrates higher weight and obesity risk in the years

2012/2014 after NRPS pension receipt. While these falsification tests may not fully address the epigenetic-income channel, they help isolate the effect of pension benefits from that of epigenetic transmission.

To test the intermingle of potential male-line epigenetic transmission with cultural-income channels, we restrict to the boy subsample in households with ancestor-worship behaviors or any grandparent experienced famine, and pre-NRPS wave (2010) only. We also continue to control for grandparents' famine experience and report the results in Table A7. Results suggest that the sub-sample of rural Chinese who were scarred but survived earlier famines (Columns 3 and 4) do not seem to carry the epigenetic imprint alongside the cultural affection to transmit health from grandfathers to grandsons prior to NRPS roll-out in 2010. It is worth noting, however, that conditional on famine exposure, the sample size substantially drops. Table A7 also shows no stronger effect among ancestor-worship grandfathers prior to the NRPS roll-out in 2010 (Columns 1 and 2).

The epigenetic transmission may be conditional on the grandchildren's age, as existing studies have linked adult grandchildren's health to grandparents' exposures Costa (2023). Pension-eligible grandparents likely have older grandchildren and, therefore, more epigenetic transmission, which violates our assumption that NRPS eligibility only affects child weight through pension receipt. The violation is unlikely to be ruled out even with a DID strategy because the age of children changes with household eligibility. While not being able to completely address the endogeneity of conditional epigenetic transmission, we may indirectly test whether this is the main mechanism that drives our findings. We restrict our sample to children aged 8 and below when they are mostly before puberty. Our findings can be weakened if the epigenetic transmission is conditional on older children. Table A8 shows the results. We find the associations between NRPS and child BMI z-score robust across all specifications, including in the boys and ancestor-worship households, though less precisely estimated.

6.5 Differential Reporting and Cultural Norms

Our results on the association between male pension receipt and boys' weight in ancestor-worship households may raise concerns about the interaction of differential reporting with cultural norms. The association can be an artifact of strategic reporting of ancestor-worship grandparents who process the strongest norms on "chubby grandson" and over-report grandsons' weight. Though we have discussed differential reporting by age and generation in Section 5.7, the correlation between cultural norms and differential reporting needs further discussion.

We test whether grandparents' characteristics are correlated with differential reporting. In Table A9 the evidence is mixed, i.e., 'wild guesses' of the 1% excluded sample are more commonly among less educated but not ancestor-worship grandparents. Specifically, for the excluded sample with extreme values (highest/lowest 1% z-score), the average maximum years of education for grandparents is 5.00, about 0.5 years lower than our analytical sample. The t-test of the cross-group difference rejects the null at 10% level. However, the excluded sample shows no statistical difference from the analytical sample in ancestor worshipping.

6.6 Other Outcomes

6.6.1 Income and Food Expenditure

While we are unable to directly test how NRPS changes child consumption as CFPS does not survey individual consumption or, specifically, nutritional intake, we first test whether NRPS discontinuously increases sources of household income around age 60. As food consumption is considered a normal good, income expansion to grandparents has the potential to increase food consumption allocated to grandchildren.

To examine the correlation of NRPS with income, we extract the adult sample from CFPS waves 2012-2014, and match those age 50-70 with their household income data. Households with income per capita ranking in the top 1% are dropped. Our sample includes 10,663 adults in total. We employ the same 2SLS strategy, using eligibility as an instrument for pension receipt. Additional controls include their age, age squared, gender, marital status, educational levels, and county and year fixed effects. Standard errors are clustered at the county level, and we use the survey weights in regressions.

The first column of Table 14 reports the first stage results. Similar to results in Table 2, the likelihood of receiving NRPS pension substantially increases by more than 40% after being eligible. F statistics of the excluded instrument is larger than 284. Column 2 presents the 2SLS estimate of pension receipt on household income. [13] It shows that NRPS increases annual household income per capita by more than 1,611 CNY, which accounts for above 18% of our sample average income and above 23% of the median income in our sample. To uncover the sources of rising income, we further decompose household income into five categories: public transfers, wage income, capital income, household business income, and other income.[14] The results are shown in Table A10. Not surprisingly, NRPS increases public transfers to households most prominently by 618 CNY on average, and it also increases household capital income by 36 CNY. The rising capital income may be due to the increase in household savings after receiving NRPS. The association of NRPS with other sources of income

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

[14]Household public transfers includes all pension, subsidies and compensations as well as income from public donation. Household wage income includes all wages from household members. Household capital 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.

is statistically insignificant. However, it is noteworthy that household wage income increases by 638 CNY with a large standard error. It may imply household members increase their off-farm labor supply after the older person receives a pension.

While CFPS does not provide direct information on child nutritional intake, the closest approximation is probably household food expenditure, including expenditure on food at home and food away from home. In the second column of Table 14, we examine whether receiving NRPS benefits increases household food expenditure. The result is intuitive: receiving a social pension increases annual food expenditure by around 568 CNY per capita. It's plausible that children may be allocated more nutritional intake from the rising household food expenditure. However, we are unable to further disentangle children's food consumption and nutritional intake from others within the same household.

6.6.2 Household Structure

Household structure can be influenced by migration and co-residence decisions, which in turn affect child health outcomes through compound channels, including goods and time allocations, and knowledge about child care. In CFPS 2012-2014, around 45% of older adults at age 60 co-reside with grandchildren under 12, a significant jump from around 37% in 2010. In this section, we examine the correlation of NRPS pension receipt with household structure change, with a focus on adult migration and intergenerational co-residence.

Again, the older adult sample is used to examine the potential household structure change. The third column in Table 14 displays the 2SLS estimates on NRPS receipt and adult child migration. Adult child migration is defined based on adult children of older adults leaving the home county for 3 months and more in a year.

We show little change in adult child migration following an older adult's pension receipt. The result is different from Eggleston, Sun and Zhan (2018)'s study, where they find a moderate impact of NRPS on adult-child migration, especially in less developed areas in China. The null effect in our study could be explained by CFPS's inclusion of rural counties in both more developed and less developed areas. Nevertheless, the off-farm labor supply may still increase conditional on migration status, though we are unable to test due to data limitations.

We next explore the potential association of NRPS with multi-generational co-residence decisions and show the results in the last column of Table 14. Multi-generational co-residence is defined as an older adult living with children under 12. The 2SLS estimates using the older adult sample show that the association between NRPS and the co-residence of grandparents with grandchildren is small in size and statistically insignificant. Overall, our exercise in this section implicates that the dramatic rural household structure change in recent years is unlikely to be driven by social security reform alone.

7 Conclusion

In this paper, we present novel evidence on the multi-generational health associations of the largest social pension policy in the world, i.e., China's NRPS. We leverage the policy design in age eligibility for pension receipt, and find robust results that NRPS has a substantial relationship with grandchildren's short-term nutritional outcomes. The relationship seems driven by grandfathers on grandsons.

While we discuss some of the potential mechanisms that the correlation can be plausibly explained by NRPS increasing child food consumption, exacerbated via son preference and biased knowledge about childcare, we leave the definitive explanations unexplored. For instance, our findings could not distinguish if the differential associations by gender of grandchildren emerge from grandparents' preferences or from perceived differences in the returns to inputs. If the former dominates, future work needs to understand the exact cause(s) of differential preferences. Moreover, we cannot completely rule out the channel that grandparents' exposures to adverse environments may affect grandchildren's health conditional on children's age. Further studies using measured anthropometrics could improve the precision of estimates.

Our findings alarmingly show NRPS increases children's chance of overweight and obesity, but does not reduces their 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 the double burden of under- and over-nutrition, especially in less developed areas where grandparents spend more time on childcare with very limited knowledge about healthy diets and physical activities for children. In order to improve the health outcomes of rural children, relying on public transfers without addressing the key issue of family decision-making on child rearing may not be sufficient.

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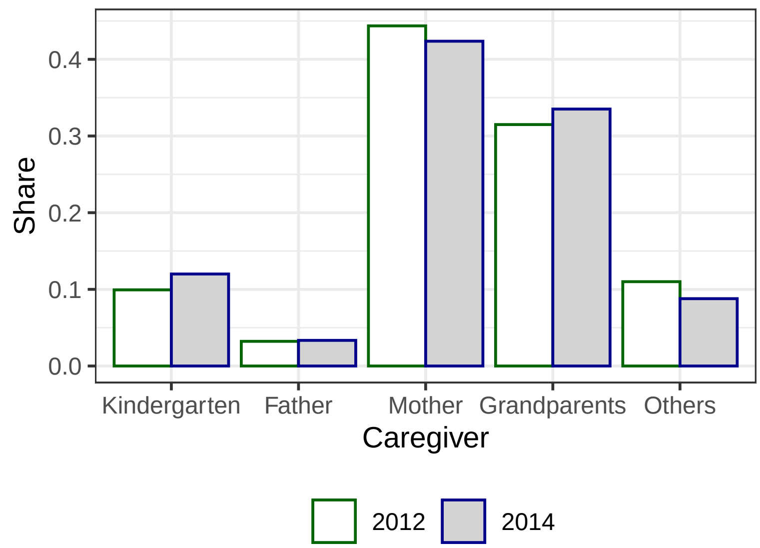
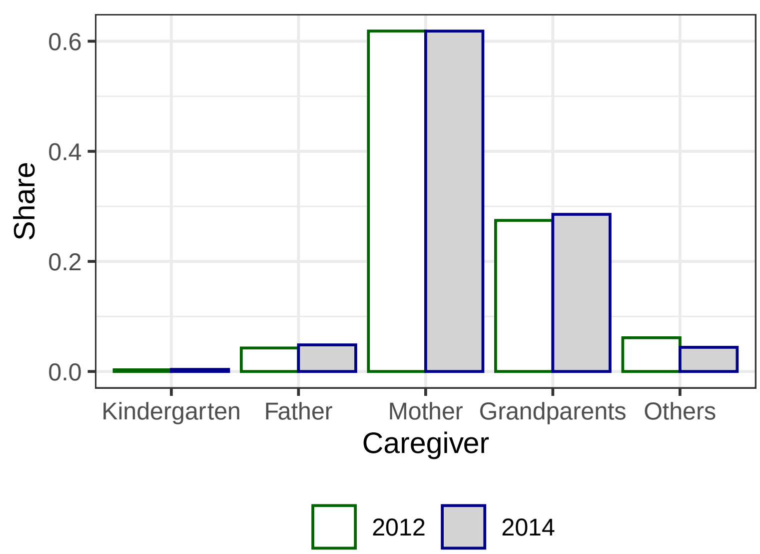
Figures and Tables

Figure 1: Share of Primary Caregivers for Children under Age 12



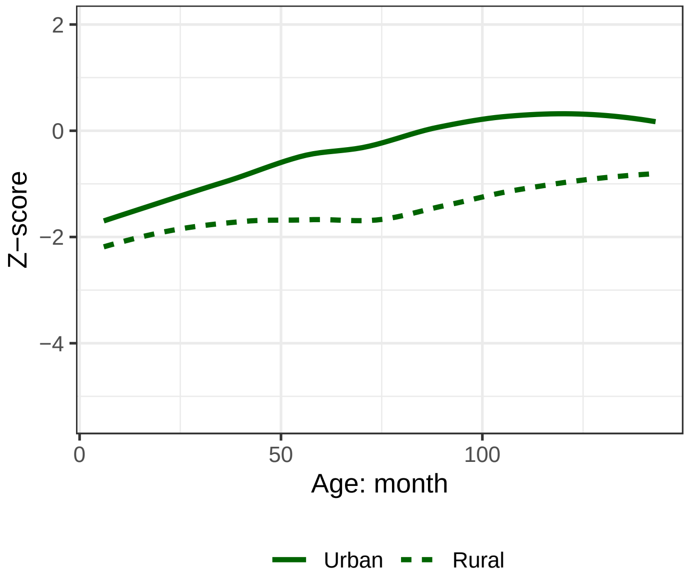
(a) Daytime Care Giver



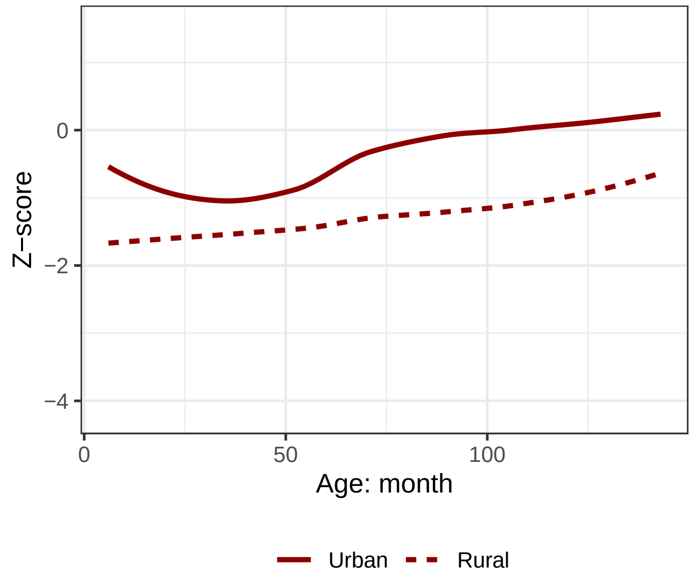
(b) Night Care Giver

Note: Authors' tabulations of China Family Panel Studies wave 2012 and 2014 data. Daytime childcare giver is defined by the CFPS question, "Who is usually the main caregiver of the child during the daytime?" Night childcare giver is defined by the CFPS question, "Who is usually the main caregiver of the child during the night?"

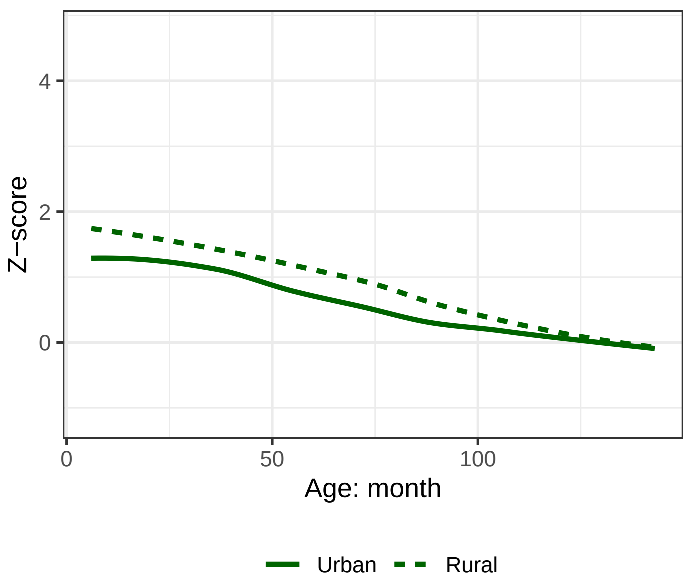
Figure 2: Nutritional Status of Rural and Urban Children under Age 12



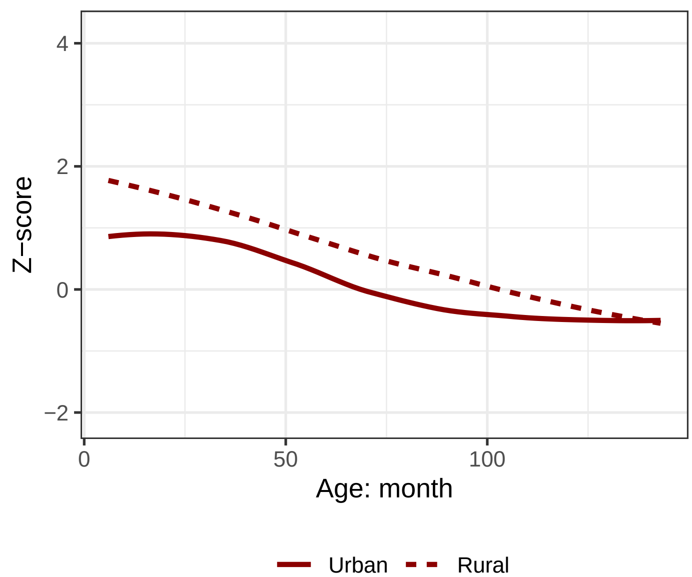
(a) Height-for-Age Z Scores of Boys under 12



(b) Height-for-Age Z Scores of Girls under 12



(c) BMI Z scores of Boys under 12



(d) BMI Z scores of Girls under 12

*Note:*Authors' tabulations of China Family Panel Studies wave 2012 and 2014 data. This figure presents 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 the World Health Organization (WHO). Children aged less than 6 months are dropped.

Table 1: Summary Statistics by Gender of Pension Recipient

	Either	Male	Female	None	T-test p-values
Panel A: Children					
Gender (boy=1)	0.513	0.518	0.511	0.540	0.075
	(0.500)	(0.500)	(0.500)	(0.498)	
Age (month)	75.040	75.643	76.878	68.921	0.000
	(40.352)	(39.924)	(40.890)	(40.150)	
BMI z score	1.454	1.269	1.491	1.303	0.164
	(3.730)	(3.491)	(3.760)	(3.575)	
Obese (yes=1)	0.196	0.170	0.204	0.195	0.923
	(0.397)	(0.376)	(0.403)	(0.396)	
Overweight (yes=1)	0.330	0.308	0.331	0.309	0.130
	(0.470)	(0.462)	(0.471)	(0.462)	
Underweight (yes=1)	0.105	0.103	0.101	0.116	0.248
	(0.307)	(0.303)	(0.301)	(0.320)	
Height-for-age z score	-1.843	-1.598	-1.956	-1.679	0.067
	(3.080)	(2.878)	(3.134)	(2.909)	
Stunting (yes=1)	0.403	0.383	0.404	0.367	0.012
	(0.490)	(0.486)	(0.491)	(0.482)	
Panel B: Household					
Inc per capita (1000 yuan)	6.770	6.770	6.539	7.447	0.000
	(5.805)	(5.752)	(5.486)	(6.907)	
Farmland asset (1000 yuan)	31.697	34.505	31.464	35.373	0.028
	(47.237)	(45.246)	(49.785)	(77.322)	
Household size	6.319	6.294	6.489	5.287	0.000
	(1.857)	(1.662)	(1.992)	(1.789)	
Father's age (year)	35.051	34.817	35.490	33.827	0.000
	(5.414)	(5.153)	(5.517)	(6.460)	
Mother's age (year)	32.804	32.623	33.168	32.002	0.000
	(5.591)	(5.381)	(5.683)	(6.296)	
Father's edu (year)	8.129	8.196	7.990	8.131	0.983
	(3.183)	(3.062)	(3.291)	(3.436)	
Mother's edu (year)	7.059	7.243	6.932	7.316	0.018
	(3.688)	(3.627)	(3.704)	(3.834)	
Urban (yes=1)	0.294	0.252	0.296	0.353	0.000
	(0.455)	(0.434)	(0.457)	(0.478)	
# of members in age group:					
¡5	0.855	0.800	0.832	0.913	0.021
	(0.864)	(0.768)	(0.906)	(0.830)	
6-15	1.201	1.203	1.267	0.950	0.000
	(1.013)	(1.025)	(1.012)	(0.873)	
16-24	0.301	0.267	0.348	0.365	0.000
	(0.600)	(0.555)	(0.644)	(0.678)	
25-49	2.152	2.078	2.224	2.126	0.340
	(0.951)	(0.911)	(1.015)	(0.857)	
Presence of household member:					
Male age over 50 (yes=1)	0.784	0.997	0.685	0.439	0.000
	(0.411)	(0.054)	(0.465)	(0.496)	
Female age over 50 (yes=1)	0.901	0.847	0.988	0.453	0.000
	(0.299)	(0.360)	(0.110)	(0.498)	
Male age over 60 (yes=1)	0.695	0.962	0.571	0.162	0.000
	(0.460)	(0.192)	(0.495)	(0.368)	
Female age over 60 (yes=1)	0.75	0.619	0.952	0.166	0.000
	(0.433)	(0.486)	(0.214)	(0.372)	
Observations	1445	889	990	5921	

Notes: This sample comes from CFPS waves 2012 and 2014. "Either" includes households that have male or female pension receipt. "Male" pension receipt status includes households that have male or both genders' receipts. "Female" pension receipt status includes households that have female or both genders' receipts. The last column reports t-test p-values of households with and without pension receipt. 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***	0.447***	0.453***	0.454***				
	(0.027)	(0.029)	(0.029)	(0.029)				
Male eligibility					0.401***	0.048**	0.403***	0.037*
					(0.031)	(0.020)	(0.032)	(0.022)
Female eligibility					0.039**	0.404***	0.048**	0.412***
					(0.019)	(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	296.49	235.38	243.41	248.64	107.60	130.69	98.56	126.70
Observations	7366	7366	7366	7366	7366	7366	7366	7366

The sample comes from the 2012 and 2014 CFPS and includes children aged between 6-144 months and their households. Children observed in the years 2012 and 2014 are pooled together. "Age and gender" includes dummies of child age (in months) and the dummy of child gender. "Household covariates" include household size, household location (rural or urban), farmland asset, 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 woman aged over 50 and a man aged over 50 within the household. "Older seniors" denotes the presence of males and females aged over 70 within the household separately. Robust standard errors are clustered at the county level and presented in parenthesis. CFPS national sample weights in each year are used in the regressions.

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

Table 3: NRPS and Child BMI Z Score: Full Sample Results

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: OLS results					
NRPS pensioner	0.326*	0.199	0.145	0.162		
	(0.193)	(0.214)	(0.194)	(0.192)		
Male pensioner					−0.130	−0.126
					(0.211)	(0.213)
Female pensioner					0.221	0.242
					(0.243)	(0.237)
	Panel B: 2SLS results					
NRPS pensioner	0.835***	0.722**	0.875***	1.059***		
	(0.267)	(0.328)	(0.299)	(0.348)		
Male pensioner					1.065**	1.263***
					(0.423)	(0.441)
Female pensioner					−0.035	−0.033
					(0.407)	(0.441)
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 aged between 6-144 months and their households. Children observed in the years 2012 and 2014 are pooled together. "Age and gender" includes dummies of child age (in months) and the dummy of child gender. "Household covariates" include household size, household location (rural or urban), farmland asset, 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 woman aged over 50 and a man aged over 50 within the household. "Older seniors" denotes the presence of males and females aged over 70 within the household separately. Robust standard errors are clustered at the county level and presented in parenthesis. CFPS national sample weights in each year are used in the regressions.

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

Table 4: NRPS and Child Underweight, Overweight and Obesity: Full Sample Results

	Underweight		Overweight		Obesity	
	(1)	(2)	(3)	(4)	(5)	(6)
NRPS pensioner	0.004		0.081**		0.063**	
	(0.034)		(0.040)		(0.032)	
Male pensioner		0.028		0.133**		0.109**
		(0.044)		(0.057)		(0.042)
Female pensioner		0.002		−0.013		−0.016
		(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

This table presents the 2SLS estimates of NRPS on child weight outcomes. The sample comes from the 2012 and 2014 CFPS and includes children aged between 6-144 months and their households. Children observed in both years are pooled together. "Age and gender" includes dummies of child age (in months) and the dummy of child gender. "Household covariates" include household size, household location (rural or urban), farmland asset, 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 woman aged over 50 and a man aged over 50 within the household. Robust standard errors are clustered at the county level and presented in parenthesis. CFPS national sample weights in each year are used in the regressions.

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

Table 5: NRPS and Child Height

	Full sample		Boys		Girls	
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Height-for-age z-score					
NRPS pensioner	−0.333		−0.438		−0.289	
	(0.227)		(0.331)		(0.334)	
Male pensioner		−0.187		−0.232		−0.013
		(0.333)		(0.479)		(0.451)
Female pensioner		−0.132		−0.472		−0.122
		(0.360)		(0.520)		(0.509)
	Panel B: Stunting					
NRPS pensioner	0.031		0.030		0.024	
	(0.038)		(0.060)		(0.051)	
Male pensioner		0.037		0.093		−0.054
		(0.058)		(0.075)		(0.081)
Female pensioner		−0.023		−0.040		0.041
		(0.061)		(0.095)		(0.079)
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

This table presents the 2SLS estimates of NRPS on child height outcomes. The sample comes from the 2012 and 2014 CFPS and includes children aged between 6-144 months and their households. Children observed in the years 2012 and 2014 are pooled together. "Age and gender" includes dummies of child age (in months) and the dummy of child gender. "Household covariates" include household size, household location (rural or urban), farmland asset, 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 woman aged over 50 and a man aged over 50 within the household. Robust standard errors are clustered at the county level and presented in parenthesis. CFPS national sample weights in each year are used in the regressions.
$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Table 6: NRPS and Child Weight: Subsample Results by Child Gender

	Boys			Girls		
	BMI z	Overweight	Obese	BMI z	Overweight	Obese
Male pensioner	1.088**	0.148**	0.139**	0.981	0.061	0.061
	(0.546)	(0.073)	(0.064)	(0.704)	(0.075)	(0.059)
Female pensioner	0.677	0.031	0.031	−0.538	−0.016	−0.018
	(0.550)	(0.085)	(0.065)	(0.635)	(0.071)	(0.062)
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

This table presents the 2SLS estimates of NRPS on child weight outcomes. The sample comes from the 2012 and 2014 CFPS and includes children aged between 6-144 months and their households. Children observed in both years are pooled together. "Age and gender" includes dummies of child age (in months) and the dummy of child gender. "Household covariates" include household size, household location (rural or urban), farmland asset, 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 woman aged over 50 and a man aged over 50 within the household. Robust standard errors are clustered at the county level and presented in parenthesis. CFPS national sample weights in each year are used in the regressions.

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

Table 7: NRPS and Child BMI Z Scores, 2SLS Estimates Using Pre-Determined Household Members' Eligibility and Pension Receipt

	Full	Full	Boys	Girls
NRPS pensioner	0.719**			
	(0.278)			
Male pensioner		0.957**	0.839*	0.871
		(0.393)	(0.448)	(0.697)
Female pensioner		−0.127	0.553	−0.574
		(0.385)	(0.541)	(0.632)
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
Observations	7366	7366	3898	3468

This table presents the 2SLS estimates of NRPS on child BMI z score. The sample comes from the CFPS 2012 and 2014, and it includes children aged between 6-144 months and their households. Children observed in both years are pooled together. Household eligibility is constructed by whether children's pre-determined co-residing household members in 2010, regardless of their co-residence status in our sample, are eligible to receive NRPS. "Age and gender" includes dummies of child age (in months) and the dummy of child gender. "Household covariates" include household size, household location (rural or urban), farmland asset, 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 woman aged over 50 and a man aged over 50 within the household. Robust standard errors are clustered at the county level and presented in parenthesis. CFPS national sample weights in each year are used in the regressions.

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

Table 8: DID-IV Estimates of NRPS on Child BMI Z Score

	Full	Full	Boys	Girls
NRPS pensioner × After county rollout	1.068***			
	(0.407)			
Male pensioner × After county rollout		1.050*	1.570**	0.583
		(0.549)	(0.745)	(0.746)
Female pensioner × After county rollout		0.186	-0.349	0.643
		(0.544)	(0.749)	(0.689)
After county rollout	-0.471	-0.474	-1.082**	0.071
	(0.356)	(0.360)	(0.439)	(0.240)
NRPS eligibility	-0.048			
	(0.172)			
Male eligibility		-0.116	-0.256	-0.029
		(0.192)	(0.227)	(0.290)
Female eligibility		0.019	0.471*	-0.343
		(0.197)	(0.278)	(0.242)
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
Observations	10,559	10,559	5,647	4,912

This table presents the DID-2SLS estimates of NRPS on child BMI z score. The sample comes from the 2010, 2012 and 2014 CFPS and includes children aged between 6-144 months and their households. Columns (1) and (3) use the interaction of household eligibility with county NRPS rollout status–the DID treatment variable–as the instrument for household pension receipt interacted with county NRPS rollout, and report the 2SLS estimates. Columns (2) and (4) employ the same strategy but differentiate the gender of pension recipients. County rollout status is defined as whether at least one household within the county has received the pension by survey time. "Age and gender" includes dummies of child age (in months) and the dummy of child gender. "Household covariates" include household size, household location (rural or urban), farmland asset, 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 woman aged over 50 and a man aged over 50 within the household. Robust standard errors are clustered at the county level and presented in parenthesis. CFPS national sample weights in each year are used in the regressions.

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

Table 9: Associations Between NRPS and Grandparents being the Primary Child Caregivers

	Full sample		Boys		Girls	
	Daytime	Night	Daytime	Night	Daytime	Night
Male pensioner	0.046	−0.041	0.082	−0.022	0.010	−0.004
	(0.068)	(0.065)	(0.086)	(0.096)	(0.091)	(0.081)
Female pensioner	0.027	−0.054	−0.044	−0.102	0.182*	0.005
	(0.069)	(0.061)	(0.076)	(0.081)	(0.103)	(0.095)
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

This table presents the 2SLS estimates of NRPS on child care-giving arrangements. Daytime child caregiver is defined by the CFPS question, "Who is usually the main caregiver of the child during the daytime?" Night child caregiver is defined by the CFPS question, "Who is usually the main caregiver of the child during the night?" The sample comes from the 2012 and 2014 CFPS and includes children aged between 6-144 months and their households. Children observed in the years 2012 and 2014 are pooled together. "Age and gender" includes dummies of child age (in months) and the dummy of child gender. "Household covariates" include household size, household location (rural or urban), farmland asset, 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 woman aged over 50 and a man aged over 50 within the household. Robust standard errors are clustered at the county level and presented in parenthesis. CFPS national sample weights in each year are used in the regressions.
$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Table 10: NRPS and Child BMI Z Scores: Conditional on Inter-Generational Co-residence, Child Caregiver, and Household Ancestor Worship Behavior

	Full Sample Conditional on			Boys Ancestor Worship	
	Co-residence	Daytime	Night	Yes	No
Male pensioner	1.331**	0.681	1.730**	1.544**	−0.487
	(0.531)	(0.719)	(0.721)	(0.639)	(1.627)
Female pensioner	−0.238	−0.199	0.432	0.368	1.697
	(0.463)	(0.817)	(0.839)	(0.669)	(1.530)
Age and gender	Y	Y	Y	Y	Y
Household covariates	Y	Y	Y	Y	Y
County FEs	Y	Y	Y	Y	Y
Year FEs	Y	Y	Y	Y	Y
Observations	4827	2202	1934	2266	1273

This table presents the 2SLS estimates of NRPS on child BMI z score. The sample comes from the 2012 and 2014 CFPS and includes children aged between 6-144 months and their households. Children observed in both years are pooled together. The first three columns present the results conditional on inter-generational co-residence, grandparents as main daytime caregivers, and grandparents as main night caregivers, separately. The main daytime caregiver is defined by the CFPS question, "Who is usually the main caregiver of the child during the daytime?" The main night caregiver is defined by the CFPS question, "Who is usually the main caregiver of the child during the night?" The last two columns present the results of boys conditional on households with and without ancestor worship behaviors separately. Ancestor worship is defined by the CFPS question "whether the household has participated in activities such as family ancestor worship or grave sweeping during the last 12 months". "Age and gender" includes dummies of child age (in months) and the dummy of child gender. "Household covariates" include household size, household location (rural or urban), farmland asset, 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 woman aged over 50 and a man aged over 50 within the household. Robust standard errors are clustered at the county level and presented in parenthesis. CFPS national sample weights in each year are used in the regressions.
$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Table 11: NRPS and 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	0.488**	0.052**	0.052**	0.425	0.061*	0.056*	0.370	0.003	0.035
	(0.215)	(0.025)	(0.022)	(0.319)	(0.032)	(0.033)	(0.280)	(0.034)	(0.029)
Farther's mother eligible	0.042	0.004	0.003	0.391	0.031	0.032	−0.076	0.005	−0.006
	(0.179)	(0.027)	(0.020)	(0.315)	(0.042)	(0.033)	(0.229)	(0.032)	(0.025)
Mother's father eligible	0.429	0.033	0.021	0.822	0.059	0.099	0.296	0.026	0.025
	(0.487)	(0.066)	(0.071)	(0.633)	(0.087)	(0.097)	(0.654)	(0.103)	(0.081)
Mother's mother eligible	0.463	0.117	0.034	0.568	0.035	0.074	0.781	0.185	−0.011
	(0.675)	(0.083)	(0.088)	(0.999)	(0.125)	(0.132)	(0.794)	(0.114)	(0.098)
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
Observations	7366	7366	7366	3898	3898	3898	3468	3468	3468

This table presents the OLS estimates of NRPS eligibility on child weight outcomes by differentiating the father's parents and the mother's parents. The sample comes from the 2012 and 2014 CFPS and includes children aged between 6-144 months and their households. Children observed in both years are pooled together. "Age and gender" includes dummies of child age (in months) and the dummy of child gender. "Household covariates" include household size, household location (rural or urban), farmland asset, 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 woman aged over 50 and a man aged over 50 within the household. Robust standard errors are clustered at the county level and presented in parenthesis. CFPS national sample weights in each year are used in the regressions.

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

Table 12: NRPS and Child BMI Z Scores: Controlling Grandparents Famine Experience

					Ancestor Worship
	Full	Full	Boys	Boys	Boys
NRPS pensioner	0.946***		1.189***		
	(0.298)		(0.392)		
Male pensioner		1.179***		1.296**	1.782***
		(0.443)		(0.562)	(0.662)
Female pensioner		−0.045		0.648	0.293
		(0.410)		(0.555)	(0.680)
Age and gender	Y	Y	Y	Y	Y
Household covariates	Y	Y	Y	Y	Y
County FEs	Y	Y	Y	Y	Y
Year FEs	Y	Y	Y	Y	Y
Observations	7366	7366	3898	3898	2266

This table presents the 2SLS estimates of NRPS on child BMI z score. The sample comes from the 2012 and 2014 CFPS and includes children aged between 6-144 months and their households. Children observed in both years are pooled together. All columns adopt the baseline specifications, additionally controlling for grandparents' famine experiences, including whether the male-line grandfather experienced famine, whether the non-male-line grandfather experienced famine, and whether any grandmother experienced famine. Dummies for missing values are created for each famine experience variable. The famine variable is defined by the CFPS question of whether the adult (born before 1977) had experienced persistent hunger for at least one week. The last column presents the results of boys conditional on households with ancestor worship behaviors. Ancestor worship is defined by the CFPS question "whether the household has participated in activities such as family ancestor worship or grave sweeping during the last 12 months". "Age and gender" includes dummies of child age (in months) and the dummy of child gender. "Household covariates" include household size, household location (rural or urban), farmland asset, 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 woman aged over 50 and a man aged over 50 within the household. Robust standard errors are clustered at the county level and presented in parenthesis. CFPS national sample weights in each year are used in the regressions.

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

Table 13: Falsification Test of NRPS and Child BMI Z Score

	Full	Full	Boys	Boys
NRPS pensioner	−0.461		−0.483	
	(0.454)		(0.605)	
Male pensioner		0.398		0.382
		(0.532)		(0.860)
Female pensioner		−0.783		−0.702
		(0.634)		(0.875)
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
Observations	3199	3199	1690	1690

The sample comes from the CFPS 2010, and it includes children aged between 6-144 months and their households. All columns report the 2SLS estimates that use false household eligibility as the instrument for false household pension receipt. False eligibility and pension receipt in 2010 are constructed as whether the same household has the eligibility or has received the pension in 2012 or 2014. "Age and gender" includes dummies of child age (in months) and the dummy of child gender. "Household covariates" include household size, household location (rural or urban), farmland asset, 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 woman aged over 50 and a man aged over 50 within the household. Robust standard errors are clustered at the county level and presented in parenthesis. CFPS national sample weights in each year are used in the regressions. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Table 14: Associations between NRPS and Household Income, Food Expenditure, and Household Composition

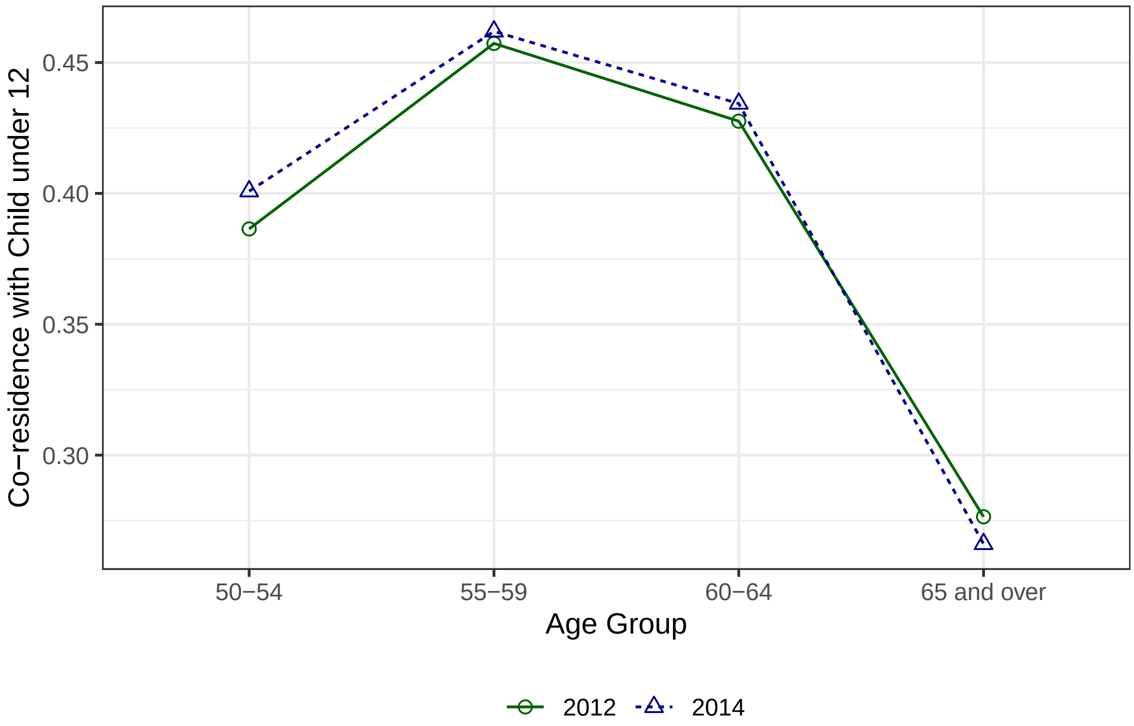
	NRPS Pensioner	HH Inc.	Food Exp.	Migration	Co-residence
NRPS Eligibility	0.413***				
	(0.024)				
NRPS pensioner		1611.194*	568.728**	−0.002	−0.032
		(828.023)	(274.646)	(0.042)	(0.053)
Age and age-squared	Y	Y	Y	Y	Y
Individual covariates	Y	Y	Y	Y	Y
County FEs	Y	Y	Y	Y	Y
Year FEs	Y	Y	Y	Y	Y
F statistics	284.799				
Observations	10663	10663	10425	10663	10663

This table presents the 2SLS estimates of NRPS on household income, food expenditure, and household composition. The data comes from CFPS wave 2012 and 2014 adult samples. Older adults are censored by ages 50-70. Eligibility is used as an instrument for pension receipt. Household total income per capita is calculated by annual household gross income divided by household size. Household food expenditure per capita is calculated by annual total food expenditure divided by household size. Households with income per capita ranking in the top 1% are dropped. Multi-generational co-residence is defined as the co-residence of older adults with children under 12. Adult child migration is defined as the migrating status of adult children. "Age and age-squared" includes age, squared age of older adults. "Individual covariates" include gender, marital status, and education levels. Robust standard errors are clustered at the county level and presented in parenthesis. CFPS national sample weights in each year are used in the regressions.

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

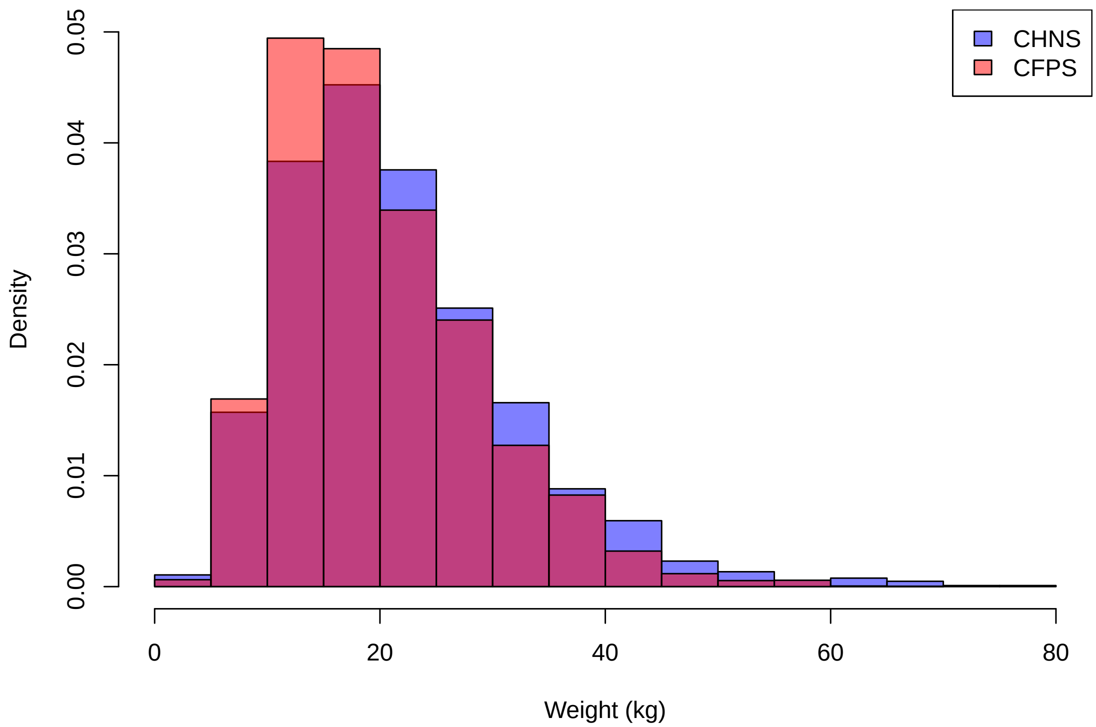
Appendix Figures and Tables

Figure A1: Share of Grandparents Co-residing with Grandchildren under Age 12



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

Figure A2: Distributions of Weight for Children under 12 in CFPS and CHNS Samples



Source: The CFPS sample in the histogram is from the full sample for the analysis of this study. It comes from waves 2012 and 2014 and includes children with rural hukou aged between 6-144 months. The CHNS sample is from waves 2009 and 2011, filtering children with rural hukou aged between 0 and 12 years old.

Table A1: Age Eligibility and Pension Receipt: Sub-sample Results by Gender of Children

	Either gender		Male		Female	
	Boys	Girls	Boys	Girls	Boys	Girls
NRPS eligibility	0.448***	0.465***				
	(0.035)	(0.030)				
Male eligibility			0.390***	0.419***	0.046*	0.061**
			(0.038)	(0.033)	(0.023)	(0.025)
Female eligibility			0.025	0.050**	0.413***	0.396***
			(0.022)	(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	167.61	245.97	64.03	112.66	98.38	106.07
Observations	3898	3468	3898	3468	3898	3468

This table presents the OLS estimates of NRPS eligibility on pension receipt. The sample comes from the 2012 and 2014 CFPS and includes children aged between 6-144 months and their households. Children observed in both years are pooled together. "Age and gender" includes dummies of child age (in months) and the dummy of child gender. "Household covariates" include household size, household location (rural or urban), farmland asset, 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 woman aged over 50 and a man aged over 50 within the household. Robust standard errors are clustered at the county level and presented in parenthesis. CFPS national sample weights in each year are used in the regressions.

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

Table A2: NRPS and Child BMI Z Score: ITT Estimates

	Full	Full	Boys	Girls
Eligible Grandparents	0.419***			
	(0.141)			
Eligible Grandfathers		0.357**	0.351*	0.248
		(0.145)	(0.202)	(0.244)
Eligible Grandmothers		0.118	0.351	0.073
		(0.172)	(0.238)	(0.236)
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
Observations	7366	7366	3898	3468

The sample comes from the CFPS 2012 and 2014, and it includes children aged between 6-144 months and their households. Children observed in both years are pooled together. "Grandparent eligibility" indicates whether children's grandparents are over 60, regardless of their living arrangements at any time. "Grandfather eligibility" indicates whether children's grandfathers are over 60, regardless of their living arrangements at any time. "Grandmother eligibility" indicates whether children's grandmothers are over 60, regardless of their living arrangements at any time. "Age and gender" includes dummies of child age (in months) and the dummy of child gender. "Household covariates" include household size, household location (rural or urban), farmland asset, 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 woman aged over 50 and a man aged over 50 within the household. Robust standard errors are clustered at the county level and presented in parenthesis. CFPS national sample weights in each year are used in the regressions.

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

Table A3: NRPS and Child BMI Z Score: Keeping the First Wave of Repeated Individuals

	Full	Full	Boys	Girls
NRPS pensioner	1.236***			
	(0.381)			
Male pensioner		1.618***	1.741**	1.543
		(0.609)	(0.789)	(1.040)
Female pensioner		−0.057	0.501	−0.402
		(0.587)	(0.760)	(0.968)
Age and gender	Y	Y	Y	Y
Household covariates	Y	Y	Y	Y
County FEs	Y	Y	Y	Y
Observations	4832	4832	2557	2275

The sample comes from the 2012 and 2014 CFPS and includes children aged between 6-144 months and their households. Each child presents once in the sample. Children observed in the first wave will be kept if present in both years. "Age and gender" includes dummies of child age (in months) and the dummy of child gender. "Household covariates" include household size, household location (rural or urban), farmland asset, 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 woman aged over 50 and a man aged over 50 within the household. Robust standard errors are clustered at the county level and presented in parenthesis. CFPS national sample weights are used in the regressions.
$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Table A4: DID-IV Estimates of NRPS on Child BMI Z Score: With Individual Fixed Effects

	Full	Full	Boys	Girls
NRPS pensioner × After county rollout	0.974**			
	(0.441)			
Male pensioner × After county rollout		0.819	2.552***	-1.061
		(0.668)	(0.941)	(0.875)
Female pensioner × After county rollout		0.236	-0.265	1.086
		(0.569)	(0.840)	(0.748)
After county rollout	-0.151	-0.119	-0.556*	0.284
	(0.207)	(0.206)	(0.302)	(0.252)
NRPS eligibility	0.235			
	(0.237)			
Male eligibility		0.130	0.340	0.112
		(0.292)	(0.465)	(0.364)
Female eligibility		0.073	-0.153	0.445
		(0.307)	(0.444)	(0.376)
Age and gender	Y	Y	Y	Y
Household covariates	Y	Y	Y	Y
Individual FEs	Y	Y	Y	Y
Year FEs	Y	Y	Y	Y
Observations	7,619	7,619	4,112	3,507

This table presents the DID - 2SLS estimates of NRPS on child BMI z score. The sample comes from the 2010, 2012 and 2014 CFPS and includes children aged between 6-144 months and their households. Columns (1) uses the interaction of household eligibility with county NRPS rollout status–the DID treatment variable–as the instrument for household pension receipt interacted with county NRPS rollout, and report the 2SLS estimates. Columns (2)-(4) employ the same strategy but differentiate the gender of pension recipients. County rollout status is defined as whether at least one household within the county has received the pension by survey time. "Age and gender" includes dummies of child age (in months) and the dummy of child gender. "Household covariates" include household size, household location (rural or urban), farmland asset, 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 woman aged over 50 and a man aged over 50 within the household. Individual fixed effects are added into all regressions. Robust standard errors are clustered at the individual level and presented in parenthesis. CFPS household panel weights are used in the regressions.

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

Table A5: DID-IV Estimates of NRPS on Child BMI Z Score: Without Sample Weights

	Full	Full	Boys	Girls
NRPS pensioner × After county rollout	0.835**			
	(0.355)			
Male pensioner × After county rollout		0.682	1.078*	0.369
		(0.441)	(0.561)	(0.709)
Female pensioner × After county rollout		0.453	0.024	0.809
		(0.447)	(0.645)	(0.592)
After county rollout	0.029	0.044	-0.110	0.176
	(0.173)	(0.174)	(0.245)	(0.177)
NRPS eligibility	-0.173			
	(0.152)			
Male eligibility		-0.255	-0.305	-0.310
		(0.177)	(0.197)	(0.291)
Female eligibility		0.024	0.328	-0.187
		(0.175)	(0.234)	(0.203)
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
Observations	10,559	10,559	5,647	4,912

This table presents the DID-2SLS estimates of NRPS on child BMI z score. The sample comes from the 2010, 2012 and 2014 CFPS and includes children aged between 6-144 months and their households. Columns (1) and (3) use the interaction of household eligibility with county NRPS rollout status–the DID treatment variable–as the instrument for household pension receipt interacted with county NRPS rollout, and report the 2SLS estimates. Columns (2) and (4) employ the same strategy but differentiate the gender of pension recipients. County rollout status is defined as whether at least one household within the county has received the pension by survey time. "Age and gender" includes dummies of child age (in months) and the dummy of child gender. "Household covariates" include household size, household location (rural or urban), farmland asset, 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 woman aged over 50 and a man aged over 50 within the household. Robust standard errors are clustered at the county level and presented in parenthesis. No sample weight is used in the regressions.

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

Table A6: Summary of the Educational Years By Ancestor Worship Behaviors

	Full Sample: Ancestor Worship			Boys: Ancestor Worship		
	No	Yes	T Test	No	Yes	T Test
Grandparents' Edu Years	5.463	5.532	0.608	5.278	5.491	0.255
	(4.474)	(4.349)		(4.497)	(4.401)	
N	1673	3037		879	1588	
Father's Edu Years	7.608	7.925	0.000	7.621	7.906	0.019
	(3.583)	(3.394)		(3.547)	(3.349)	
N	2410	4267		1273	2266	
Mother's Edu Years	6.362	6.901	0.000	6.303	6.856	0.000
	(4.077)	(3.804)		(4.108)	(3.801)	
N	2410	4267		1273	2266	

The table summarizes grandparents' and parents' educational years by household ancestor worshipping behaviors. The first three columns summarize the full sample by ancestor worshipping behaviors, and Columns 4-6 summarize the boys. Grandparents' educational years are measured by the educational years of the grandparent with the highest level. Standard deviations are in parenthesis. P-values of two sample t-tests between households with and without ancestor worship behaviors are shown in the third and sixth columns.

Table A7: Falsification Test of Boys: Conditional on Ancestor Worship and Famine Exposure

	Ancestor Worship		Famine Exposure	
	(1)	(2)	(3)	(4)
NRPS pensioner	−0.829		0.128	
	(0.706)		(1.958)	
Male pensioner		0.589		0.100
		(1.019)		(4.515)
Female pensioner		−1.409		0.075
		(1.040)		(4.289)
Observations	1222	1222	314	314

The sample comes from the CFPS 2010, and it includes children aged between 6-144 months and their households. All columns report the 2SLS estimates that use false household eligibility as the instrument for false household pension receipt. False eligibility and pension receipt in 2010 are constructed as whether the same household has the eligibility or has received the pension in 2012 or 2014. "Age and gender" includes dummies of child age (in months) and the dummy of child gender. "Household covariates" include household size, household location (rural or urban), farmland asset, 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 woman aged over 50 and a man aged over 50 within the household. Columns (1) - (2) conditions on households' ancestor worship behaviors. Columns (3) - (4) conditions on famine exposure of children's grandparents. Robust standard errors are clustered at the county level and presented in parenthesis. CFPS national sample weights in each year are used in the regressions.

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

Table A8: NRPS and BMI Z Scores: Children under 8

					Ancestor Worship	
	Full	Full	Boys	Boys	Boys	Boys
NRPS pensioner	1.105***		1.235**		1.585**	
	(0.388)		(0.498)		(0.711)	
Male pensioner		1.225**		1.076		1.701*
		(0.549)		(0.752)		(0.908)
Female pensioner		−0.034		0.858		0.639
		(0.527)		(0.694)		(0.945)
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	4979	4979	2611	2611	1501	1501

This table presents the 2SLS estimates of NRPS on child BMI z score. The sample comes from the 2012 and 2014 CFPS and includes children aged between 6-96 months and their households. Children observed in both years are pooled together. The last two columns present the results of boys conditional on households with ancestor worship behaviors. Ancestor worship is defined by the CFPS question "whether the household has participated in activities such as family ancestor worship or grave sweeping during the last 12 months". "Age and gender" includes dummies of child age (in months) and the dummy of child gender. "Household covariates" include household size, household location (rural or urban), farmland asset, 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 woman aged over 50 and a man aged over 50 within the household. Robust standard errors are clustered at the county level and presented in parentheses. CFPS national sample weights in each year are used in the regressions.

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

Table A9: Grandparent's Education Years and Household Ancestor Worship Behaviors between Excluded and Included Samples

	Largest 1% BMI Z	Excluded Sample	Analytical Sample	T Test (1)-(3)	T Test (2)-(3)
GP's Highest Education	4.348	5.004	5.542	0.027	0.073
	(4.351)	(4.506)	(4.398)		
N	69	238	5200		
Ancestor Worship	0.557	0.614	0.639	0.128	0.396
	(0.499)	(0.487)	(0.480)		
N	88	293	6677		

The table summarizes grandparents' educational years and household worshipping behaviors across samples. The first column includes children with the highest 1% BMI z scores, and the second column includes all excluded children (e.g., those with the highest/lowest 1% BMI z score or height-for-age z score). The third column includes all children in our analytical sample. P-values of two-sample t-tests between the first and third columns are shown in the fourth column, and those of two-sample t-tests between the excluded and analytical samples are shown in the last column.

Table A10: Associations Between NRPS and Household Income by Sources

	Transfer	Wage	Business	Capital	Other
NRPS pensioner	618.378***	640.349	−174.029	36.658*	−24.225
	(159.152)	(667.883)	(211.545)	(18.965)	(53.073)
Age and age-squared	Y	Y	Y	Y	Y
Individual covariates	Y	Y	Y	Y	Y
County FEs	Y	Y	Y	Y	Y
Year FEs	Y	Y	Y	Y	Y
Observations	10663	10663	10663	10663	10663

This table presents the 2SLS estimates of NRPS on household income by sources. The data comes from CFPS wave 2012 and 2014 adult samples. Older adults are censored by ages 50-70. Eligibility is used as an instrument for pension receipt. 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 wages include all the wages from each household member. Household capital income includes all gains from financial investment and rental income from real estate properties, land, and machinery. 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. Adults in households with income per capita ranking in the top 1% in each category are dropped. "Age and age-squared" includes age, of squared age of older adults. "Individual covariates" include gender, marital status, and education levels. Robust standard errors are clustered at the county level and presented in parenthesis. CFPS national sample weights in each year are used in the regressions.

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