Social Pensions and Child Health in Rural China

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(Original version submitted April 2018; final version January 2019)

ABSTRACT Social pensions are important cash transfers to the elderly and their families. The pensions may not only affect the wellbeing of the direct recipients, but also have household and intergenerational spillover effects. Using the 2012 and 2014 waves of the China Family Panel Studies (CFPS) data, this paper examines the effect of the New Rural Pension Scheme (NRPS) and its mechanisms on child health in rural China. Our study shows a significant association between the NRPS and the health status of children up to 15 years of age. Moreover, the association of the NRPS with health is larger for children who are boys, ‘left behind’, six to 10 years of age, and in poor health. In addition, we investigate possible mechanisms of the effect, including health consciousness of the caregiver, household sanitation conditions, and high-protein food consumption, and find the increase of child nutrition intake is the main channel through which the NRPS affects child health.

1. Introduction

Aging populations are a major challenge for public policy in both developed and developing countries. The world’s most populous country, China, is among those nations grappling with an aging society, especially in rural areas (Zhong, 2011). To improve quality of life and wellbeing of the rural elderly, China launched the New Rural Pension Scheme (NRPS) in 2009, which provides government transfers to eligible rural residents. In recent years, a growing literature has investigated the effects of the NRPS on poverty (Zhang, Giles, & Zhao, 2015), consumption (Wang, 2017), savings (Ma & Zhou, 2014), living arrangements (Chen, 2017), labour supply (Chen, Bengtsson, & Helgertz, 2015; Ning, Gong, Zheng, & Zhuang, 2016), and health (Cheng, Liu, Zhang, & Zhao, 2016; Zhang, Cheng, & Liu, 2016) of the rural elderly. However, the effects of pensions may extend beyond the wellbeing of direct recipients (the elderly), with household and intergenerational spillovers. Few studies have measured such impacts. In particular, the potential effects of pensions on grandchildren may be very important and should be included in policy evaluation, since childhood health could affect lifetime human capital accumulation, education, health outcomes, and labour quality (Case, Lubotsky, & Paxson, 2002; Currie, 2009). At the aggregate level, the relationship between social pensions and child health may have far-reaching consequences on the economic development, income distribution, and welfare of a country (Duflo, 2003).

A growing number of studies have examined the relationship between family income and child health in the last two decades. In the United States, a seminal study by Case et al. (2002) showed that children’s health was positively related to household income, and this association
increased with age, displaying a cumulative protective effect over childhood. Similar evidence of a positive correlation between family income and child health has been found in several other developed countries, including Canada (Currie & Stabile, 2003), the UK (Propper, Rigg, & Burgess, 2007), Germany (Reinhold & Jürges, 2012), France (Apoëu & Geoffard, 2014), and Australia (Khanam, Nghiem, & Connelly, 2009). However, the income-health gradient association remains unclear in the literature, as other studies have found differing results. For example, Currie (2013) did not find a substantial effect of family income on child welfare in the United States. Using the same data as Case et al. (2002), Chen, Martin, and Matthews (2006) found that the income-health gradient did not vary across childhood and adolescence, although Case, Paxson, and Vogl (2007) indicated that the difference between the studies can be largely explained by sample selection. Propper et al. (2007) used UK data to examine the relationship and found no strong evidence that the association strengthens with age, nor did Khanam et al. (2009) in Australia. Resolution of this issue is significant for a number of public policies, including cash transfer or income support policies, designed to reduce inter-generational inequality in income and health.

The issue of causality between household income and child health is unaddressed in most of the literature described above, and may account for the inconsistent findings. A positive association could indicate that ill children lower the labour supply level of their parents and therefore reduce family income. Also, the association could be spuriously driven by unobserved factors, such as the health status of children’s parents (Case et al., 2002). Thus, some studies examined the relationship by quantifying the impact of exogenous increase in family income – cash transfer programmes (including social pensions) – on the health status of children. For example, Gertler (2004) evaluated the impact of an anti-poverty programme, PROGRESA, on child health in Mexico and found that treatment children grew about one centimetre more and were 25.3 per cent less likely to be anaemic during the first year of the programme. Although studies focused on Brazil and Honduras did not show significant impacts due to the small size of cash transfers and implementation problems, evidence from Bangladesh, Columbia, Ecuador, India, and Nicaragua came to a similar conclusion: cash transfer programmes are positively associated with child nutrition intake and health status (see Table A1 in the Supplementary Materials). Few studies have examined the effect of social pension programmes on child health. Among them, Duflo (2003) used data from South Africa and found that the expansion of the Old Age Pension Programme in South Africa improved the health and nutrition of girls. Specifically, pensions received by women improved the height-for-age z-scores (HAZ) and weight-for-height z-scores (WHZ) of younger girls by 1.16 and 1.19 standard deviations, which bridged the entire gap in stature with their United States counterparts. Case (2004) also examined the impact of the Old Age Pension Programme on the health status of household members in South Africa and found that the pension was roughly associated with a one standard deviation (five centimetre) increase in children’s height for age. Table A1 in the Supplementary Materials summarises the details of cash transfer programmes in different countries and their effects on child health. Given the importance of children for public policy, it is clear that more studies of the relationship between household income and child health are needed, especially social pension programmes.

The purpose of this paper is to estimate the effect of the New Rural Pension Scheme (NRPS) on child health in rural China, and to contribute to the existing literature in several key ways. First, our analyses were based on a large data set from the world’s largest developing country, China. Given rapid economic growth and massive labour migration in China, the wellbeing of tens of millions of children in rural China, especially ‘left-behind’ children, is of major importance to public policy. If low family income is a key contributor to intergenerational transmission of poverty and reduced health, then the NRPS cash transfer programme may not only improve the wellbeing of the rural elderly, but may also reduce income and health inequality among children and the broader Chinese society over generations. Second, instead of using subjective child health measures, such as self-reported health or parents’ reported health, which are subject to reporting bias and relative perceptions by socio-economic status (Johnston, Propper, & Shields, 2009; Mu,
the present study used the World Health Organization’s anthropometric indices, height-for-age z-score (HAZ) and weight-for-age z-score (WAZ), to capture the change of long-term and short-term child health status. Third, we estimated the heterogeneity and mechanisms of associations between the NRPS and child health. Specifically, we measured differences in the effects by child gender, age, and left behind status. We adopted quantile regression methods to explore the heterogeneous associations between the NRPS and different levels of child health. We also examined three channels through which the NRPS may affect the health of rural children: 1) high-protein food consumption; 2) health consciousness regarding children; and 3) household sanitation conditions. In addition, we identified the effect of the NRPS on the prevalence and severity of child disease. Finally, we used household fixed effects models, two stage least square (2SLS) regressions with instrumental variables (IV) and a propensity score matching with difference-in-difference (PSMDD) strategy to address potential endogeneity in our analyses and checked the robustness of our findings.

Our study shows that the NRPS has led to a statistically significant, but modest improvement in the short- and long-term health of children in rural China. Results suggest that HAZ and WAZ of children in rural China could increase by 0.205 and 0.159 standard deviations if a family member receives a NRPS benefit. Although we did not find an increasing association between social pensions and child health by child age, our analyses indicate that social pensions are more effective for the health of boys and left-behind children. Our results suggest that social pensions are most effective for children who are ages six to 10 years old, as they enter primary school. Importantly for policy, children with poorer health status benefit more from social pensions received by family members. In addition, our analyses show that the main channel between the NRPS and child health is through improved child nutrition.

The paper is structured as follows: Section 2 illustrates the brief background of NRPS in China. Next, Section 3 describes the data and main variables. Section 4 outlines the empirical framework and presents regression results. Finally, Section 5 concludes the paper with discussion of policy implications and the context of the literature.

2. Brief background of the New Rural Pension Scheme in China

Due to the household registration (hukou) system, old age social pensions in China are administered by two separate systems for rural and urban residents in the last several decades. Before the New Rural Pension Scheme (NRPS), the Chinese government experimented with pilot programmes to extend a rural pension scheme starting in 1986. This programme placed most of the financial responsibility on individuals, was supplemented by local collectives, and covered both the collective and private sectors in rural China. Despite broad geographical coverage by the early 1990s, the pilot scheme expansion was halted in late 1990s because of a lack of public financial support, weak financial management, and associated issues.

In an effort to improve the quality of life of rural elderly, China launched the New Rural Pension Scheme in 2009. Operated at the county level, the NRPS was initially piloted in about 10 per cent of counties nationwide and nearly all counties in China were included by the end of 2012. For rural residents aged 16 years or above who are not students and not covered by the basic urban pension scheme, participation in the NRPS is voluntary. Individuals may begin drawing benefits at 60 years of age. According to the ‘Statistical Bulletin of Human Resources and Social Security Development of China in 2012’, 460 million rural residents were participating in the NRPS, nearly one third of the country’s total population.

The most distinctive difference between the NRPS and the previous rural pension programme is that the NRPS has a defined benefit portion, a non-contributory basic pension for eligible elderly. The personal NRPS account is made up of two components: a social pension account and an individual contributory pension account. Participants must have contributed at least 100 to 500 RMB yuan (1 RMB yuan is approximately 0.16 USD) annually for 15 years in order to receive the non-contributory basic pension and monthly payments from the individual account. Eligible rural residents who are
already aged 60 or over can receive a non-contributory basic pension directly from their social pension account without paying a premium if their children have participated in the NRPS. The social pension account is a defined benefit, set to provide minimum income in order to promote economic wellbeing of the rural elderly. The initial value of the basic pension benefit under the scheme, which was subsidised by the central government, was 55 RMB yuan per month, which increased to 70 RMB yuan in 2014. Local governments are encouraged to supplement the basic pension benefits at their discretion from their own revenues. The benefits of individual contributory pension accounts are calculated on the basis of accumulation in the participant’s contributions and accrued investment returns, which are paid monthly by dividing the accumulation at age 60 by 139 (Ning et al., 2016).

According to the report from Ministry of Human Resources and Social Security of China, the per capita basic pension was 78.6 RMB yuan (12.5 USD) per month in March 2013, which accounts for approximately 12 per cent of the average per capita net income of rural residents (7916 RMB yuan) and 22 per cent of the rural elderly income in 2012 (Jin, Wang, & He, 2018; Ma & Zhou, 2014). Although the amount of the NRPS pensions may not be adequate to cover all the living expenses of the rural elderly, past research has shown that it equalled 41 per cent of China’s latest official rural poverty line and helped to improve the economic status of rural households, especially for the households headed by older adults and those falling into poverty (Cheng et al., 2016). For example, Qin (2017) used data from the China Family Panel Studies (CFPS) survey and demonstrated that the NRPS increased income of households with older adults by 19.7 per cent in rural China. Based on the same survey data, Shen and Guo (2018) found that the vulnerability and poverty of households who benefited from the NRPS had been reduced by 14–21 per cent. Therefore, although the amount of non-contributory basic pension is relatively low compared to old age pension programmes in some other developing countries, such as South Africa and Mexico (Zhang et al., 2015), it is not negligible that the NRPS helps the elderly and their family members to pay for basic subsistence.

3. Data and variables

3.1. Data

The data used in this study are from the 2012 and 2014 waves of the China Family Panel Studies (CFPS), which has been conducted by the Institute of Social Science Survey (ISSS) at Peking University. The CFPS is a nationally representative, longitudinal survey drawn from 25 out of 31 provinces in mainland China, accounting for approximately 95 per cent of the national population (Xie, 2012). The baseline CFPS survey was launched in 2010, followed by additional waves in 2012, 2014, and 2016. In 2010, 14,960 households were interviewed, selected using random sampling methods with probability proportional to size (PPS). Three levels of data were collected through in-person interview, including individual, household and community modules. Individuals aged 16 years old or above complete an adult survey module. Data on children aged zero to 15 years of age was reported by their primary caregiver and, for children aged 10 to 15, an additional self-report questionnaire. The CFPS data provided information on individual anthropometric measures, pension status, and other socio-economic information of family members. Because the baseline 2010 questionnaire was different from subsequent waves and did not include all the key measures (including the NRPS), and because data from the most recent 2016 wave are incomplete at present, we only used the 2012 and 2014 waves of CFPS data.

We matched children aged zero to 15 to their grandparents using household and relationship identifiers in the data. Two sample restrictions were applied to facilitate the analyses. First, only those rural households with at least one child aged zero to 15 were selected. Second, we selected observations on the basis of different standards of child health measures. According to the World Health Organisation, HAZ can be used to measure the health status of individuals aged zero to 19 and WAZ should only be used for children aged zero to 10 (WHO, 2006). We adopted the cut-offs recommended by the WHO for data exclusion (Mei & Grummer-Strawn, 2007) to avoid bias caused
by errors in measurement or data entry, and excluded observations if a child’s HAZ was below −6 or above +6, or WAZ was below −6 or above +5. Finally, our sample was restricted to 6972 children zero to 15 years of age for HAZ, and 5409 children zero to 10 years of age for WAZ.

3.2. Dependent variables

The dependent variable in this study is child health, measured as two continuous variables, height-for-age z-score and weight-for-age z-score. Both of them have been accepted as good health indicators and are widely used in many existing studies (Goode & Mavromaras, 2014; Mansuri, 2006). HAZ and WAZ are also comparable across different genders and ages. HAZ is an accurate short- and long-term health indicator, and WAZ is more sensitive to short-term shocks to individual health status. Although alternative anthropometric measures such as body mass index (BMI) were also available, they were not used in our study, as they could only be applied to a limited age group and have higher bias for measurement of health (Lei, Liu, & Hill, 2017). The derivation of the Z-score for HAZ and WAZ is as follows:

\[ Z_i = \frac{y_{ij} - \bar{y}_j}{\sigma_j} \]  

where \( y_{ij} \) is the height (cm) or weight (kg) of child \( i \) in group \( j \) defined by gender and age measured in month by subtracting date of birth from and date of the interview. \( \bar{y}_j \) and \( \sigma_j \) are the mean and standard deviation of the height (cm) or weight (kg) for the corresponding reference group \( j \) of children with same gender and age in the United States.

3.3. Independent variables

3.3.1. Social pensions. Our key independent variable is the NRPS social pension. Since most of the elderly in our sample only receive the non-contributory basic pension, we test two different measures of NRPS receipt: a dummy indicator (1 = yes, 0 = no) for whether a family member received the NRPS social pension, and an integer count of the number of the NRPS social pensioners in the household (Ma & Zhou, 2014). Theoretically, the more family members who receive a social pension, the larger the increase in family income. This variable therefore captures a ‘dose’ effect of the amount of increased household income. Although it is an empirical question, larger increases may plausibly improve child health status by larger amounts, either directly or indirectly. Grandparents may directly spend more time and resources on grandchildren after receiving social pensions, but social pensions may also crowd out inter-generational financial support from adult children to the elderly (Chen & Zeng, 2013), which in turn frees resources for parents to better take care of children.

3.3.2. Control variables. Prior research has shown that various factors may correlate with child health and social pensions (Chen & Li, 2009; Goode & Mavromaras, 2014). Accordingly, we included characteristics of the child, family, and parents as control variables. Child characteristic variables are child gender (1 = boys, 0 = girls) and age. Family characteristic variables are the number of siblings, number of elderly, and the natural log of annual family income per capita (RMB yuan). Parents’ characteristics variables include basic demographic data such as their age, height (cm), weight (kg), education (years), and whether one or two parents migrate to cities for at least half a year (1 = yes, 0 = no). In order to deal with missing data, we used the mean of parents’ age, education, height, and weight for those children who have two parents; for children with one parent, only observations with complete data were used in the study. We estimated the association by using the sample of children who have two parents and found that the results were not significantly different. On account of the high percentage of missing on parents’ height and weight, we generated two variables, ‘parent height missing (1 = yes)’ and ‘parent weight missing (1 = yes)’. We included
these dummies in place of dropping such observations, thereby retaining the largest feasible sample size for analysis and producing more generalizable results.

### 3.4. Descriptive statistics

Table A2 in the Supplementary Materials presents descriptive statistics for the total sample and separately by year of data. For the dependent variable, Chinese rural children in our sample were 1.06 standard deviation shorter (HAZ = −1.06) and 0.28 standard deviation lighter (WAZ = −0.28) than the reference American children (reference group) with the same gender and age (measured in months). The average HAZ and WAZ of children was higher in 2014 than that in 2012, showing that the overall health status of children in rural China was getting better. For the key independent variable, 20 per cent of children’s families had at least one NRPS pensioner. The average number of pensioners was 0.26, and the mean of pension recipients is 1.3 for those families that have eligible old adults. 31.2 per cent of families with NRPS pensioners have two pension recipients. More old adults received the NRPS pension in 2014 than the number in 2012. Sample children were 7.8 years old on average, 53 per cent boys, and had an average of 0.9 additional siblings and 0.5 elderly family members. The average age and education level of children’s parents were 35 years of age and 6.6 years of schooling. In our sample, 41 per cent of rural children are ‘left-behind children’ with at least one parent migrating to cities for more than six months.

### 4. Empirical results and analyses

#### 4.1. Social pensions and child health

We examined the association of NRPS with child health by using a regression framework in this section. The basic linear child health production function is specified as follows:

\[
H_i = \alpha + \beta \text{NRPS}_i + \gamma X_i + \epsilon_i
\]  

(2)

where \( H \) represents the dependent variables of child health, NRPS represents the key independent variables (whether a family member received the NRPS pension and the number of pensioners), \( \beta \) measures the association between NRPS and child health, \( X \) is a set of control variables, including characteristics of child, family, and parents, and \( \epsilon_i \) is an unobserved disturbance term.

Table 1 presents the estimated results of the association of the NRPS and child health with two specifications. Province and year dummies are included in all models, and Huber-White robust standard errors are reported in parentheses. The estimated results in column (1) to column (4) show a significant association between the NRPS and child health. More specifically, a family that has an NRPS pension receiver is associated with 0.205 standard deviation of child height growth and 0.159 standard deviation of child weight increase, on average. More family members receiving NRPS pensions are associated with better health status, but the marginal effect is smaller. Compared to cash transfer programmes in other developing countries (see Table A1), the marginal effect size of the NRPS in China is close to that in Colombia, Ecuador, and South Africa, considering potential diminishing marginal effect on the size of cash transfers. For control variables, girls are relatively lighter than boys. More siblings and elderly family members are negatively associated with child health. Parents’ education level, height, and weight are positively associated with the HAZ and WAZ of children and parent migration can adversely affect child health. In column (5) to column (8), we used child height (cm) and weight (kg) as the dependent variables to better understand the effect size of the NRPS on health status of rural children. The estimates demonstrate that the average height and weight of children whose family has a NRPS pensioner are 1.171cm taller and 0.892 kg heavier than their counterparts whose families have no NRPS pensioner. Similarly, the marginal effect size
### Table 1. Social pensions and child health

| Variables                        | Specification (1): z-scores | Specification (2): height (cm)/weight (kg) |
|----------------------------------|-----------------------------|---------------------------------------------|
|                                  | HAZ                         | Height                                      |
| NRPS (1 = Yes)                   | 0.205***                    | 1.171***                                    |
|                                  | (0.076)                     | (0.422)                                     |
| Number of pensioners             |                             |                                             |
| Gender (1 = boys)                | 0.054                       | 1.423***                                    |
|                                  | (0.048)                     | (0.258)                                     |
| Age                              | 0.046***                    | 6.164***                                    |
|                                  | (0.007)                     | (0.039)                                     |
| Number of siblings               | -0.183***                   | -0.702***                                   |
|                                  | (0.029)                     | (0.154)                                     |
| Number of elderly                | -0.095**                    | -0.331                                       |
|                                  | (0.040)                     | (0.222)                                     |
| Log (family income per capita)   | 0.012                       | 0.144                                       |
|                                  | (0.021)                     | (0.114)                                     |
| Parent age                       | 0.003                       | 0.072***                                    |
|                                  | (0.005)                     | (0.027)                                     |
| Parent education (years)         | 0.059***                    | 0.262***                                    |
|                                  | (0.008)                     | (0.045)                                     |
| Parent height (cm)               | 0.029***                    | 0.197***                                    |
|                                  | (0.005)                     | (0.031)                                     |
| Parent weight (kg)               | 0.010***                    | 0.070***                                    |
|                                  | (0.004)                     | (0.020)                                     |
| Parent migration (1 = Yes)       | -0.008                      | -0.595**                                    |
|                                  | (0.049)                     | (0.273)                                     |
| Parent height missing (1 = Yes)  | 3.753***                    | 24.653***                                   |
|                                  | (1.028)                     | (5.928)                                     |
| Parent weight missing (1 = Yes)  | 1.296**                     | 11.283***                                   |
|                                  | (0.605)                     | (3.586)                                     |
| Province dummies                 | Yes                         | Yes                                         |
| Year dummy                       | Yes                         | Yes                                         |
| Observations                     | 6972                        | 6972                                         |
| R²                               | 0.106                       | 0.135                                       |

**Notes:** *p < 0.1; **p < 0.05; ***p < 0.01. Huber-White robust standard errors are in parentheses.
decreases when the number of pensioners is larger, showing a diminishing marginal effect of the NRPS on child health.

4.2. Heterogeneity of the association between social pensions and child health

Investigating the heterogeneous associations between the NRPS and child health is beneficial to better understand the effects of the NRPS policy in rural China. Therefore, we divided our sample into subgroups by child gender (boys and girls), parents’ migration (whether father or mother has migrated to cities for more than half a year), and child age (zero to five, six to 10, and 11–15 years of age). For conciseness, we only used the binary measure of the NRPS in the following subgroup analyses. (Results with the integer measure of number of household NRPS recipients are similar and available from the authors upon request). The regression estimates of subgroup analyses are presented in Table 2. The results show a larger effect of the NRPS on the height and weight of boys than girls. One possible reason is that roots of preference for sons lie deep in Chinese culture, especially for the elderly in rural areas. The pensioners may spend more time and money on their grandsons than granddaughters. In terms of parent migration, the NRPS coefficient is substantially larger and more statistically significant for ‘left-behind children’, indicating that ‘left-behind children’ benefit more from social pensions received by grandparents than non left-behind children. This is possibly because these children live in the families with lower social economic status, which could result in poorer health status, and their health status are more sensitive to the family income increase. In terms of child age, the NRPS coefficient is the largest and statistically significant only for children six to 10 years of age compared to other age groups, showing that the NRPS is most effective in improving child health for children in elementary school.

As HAZ and WAZ are continuous variables, we also used unconditional quantile regression to explore heterogeneity in the effect of the NRPS on children with different health status. Table 3 presents the regression estimates of OLS regressions and quantile regressions from 10th quantile to 90th quantile of HAZ (Panel A) and WAZ (Panel B). The estimates in Panel A show that the coefficient and statistical significance of the NRPS gradually decreases with the increasing quantiles of HAZ, demonstrating that the NRPS is more effective for those children who have poorer health

|  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|
|  | Boys | Girls | Yes | No | 0 ~ 5 | 6 ~ 10 | 11 ~ 15 |
| NRPS (1 = Yes) | 0.268** | 0.146 | 0.493*** | −0.009 | 0.215 | 0.324*** | 0.073 |
| Control variables | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Province dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year dummy | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 3686 | 3286 | 2840 | 4132 | 2436 | 2289 | 2247 |
| R² | 0.107 | 0.118 | 0.106 | 0.114 | 0.060 | 0.145 | 0.205 |

|  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |
| NRPS (1 = Yes) | 0.229** | 0.052 | 0.175** | 0.173* | 0.123 | 0.190** |
| Control variables | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Province dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year dummy | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 2866 | 2543 | 2085 | 3324 | 3240 | 2168 |
| R² | 0.141 | 0.149 | 0.168 | 0.134 | 0.103 | 0.187 |

Notes: *p < 0.1; **p < 0.05; ***p < 0.01. Huber-White robust standard errors are in parentheses.
status. The results in Panel B also show that the effect size of the NRPS is the greatest for children with the poorest WAZ. However, in the meantime, we found that children with high (for example, 75\textsuperscript{th} quantile) WAZ were more sensitive to the NRPS than those with median WAZ, indicating that the NRPS may also increase the risk of overweight for those children who have relatively heavy body weight in the short-run.

### 4.3. Possible channels of the association between NRPS and child health

The previous sections have shown a significant and positive association between the NRPS pension and child health. But how does this relationship arise? In this section, we applied a stepwise approach to identify the mechanisms of the effect, which consists of two steps: first, we examined the effects of the NRPS on possible intermediate factors which may affect child health; second, we included intermediate factors that were significant in the first step as independent variables alongside the NRPS measure in modelling child health outcomes. If intermediate factors in the second step are significantly associated with child health outcomes and the positive coefficient of the NRPS is reduced in the estimation, then we argue that these factors are the mediators between the NRPS and child health.

Past research has demonstrated that cash transfer programmes can benefit child health in the following ways. First, household food security and dietary quality might be improved with the increase of income, which is beneficial to child nutritional intake. For example, evidence from South Africa showed that food figured prominently in the pensioners’ responses of the open-ended question ‘In what ways did your life become better when your pension started, if any?’ (Case, 2004). Attanasio and Mesnard (2006) found that the frequency of animal source food children consumed was higher among beneficiary children versus controls in Columbia. In rural Mexico, beneficiary children of cash transfer programme consumed more iron, zinc, vitamin A, and energy than non-beneficiary children (Ramirez-Silva, Rivera, & Leroy, 2008). Second, cash transfers improve the household economic status and relieve poverty-related stress of the caregiver, which may in turn result in more positive parenting behaviour toward children. Specifically, the caregiver may have better health consciousness regarding children and stronger economic capability to provide children with health services (Leroy, Ruel, & Verhofstadt, 2009). For instance, Goode and Mavromaras (2014) found that Chinese children from richer families are more likely to have medical insurance and

### Table 3. Estimates of quantile regression

| Variables | OLS | Q10 | Q25 | Q50 | Q75 | Q90 |
|-----------|-----|-----|-----|-----|-----|-----|
| Panel A - Dependent variable: HAZ |
| NRPS (1 = Yes) | 0.205*** | 0.382** | 0.242*** | 0.132 | 0.157* | 0.098 |
| (0.076) | (0.150) | (0.111) | (0.084) | (0.086) | (0.127) |
| Control variables | Yes | Yes | Yes | Yes | Yes | Yes |
| Province dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Year dummy | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 6972 | 6972 | 6972 | 6972 | 6972 | 6972 |
| R\(^2\)/Pseudo R\(^2\) | 0.107 | 0.106 | 0.106 | 0.080 | 0.061 | 0.069 |
| Panel B - Dependent variable: WAZ |
| NRPS (1 = Yes) | 0.159** | 0.276* | 0.117 | 0.034 | 0.198** | 0.156 |
| (0.065) | (0.167) | (0.092) | (0.077) | (0.085) | (0.176) |
| Control variables | Yes | Yes | Yes | Yes | Yes | Yes |
| Province dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Year dummy | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 5409 | 5409 | 5409 | 5409 | 5409 | 5409 |
| R\(^2\)/Pseudo R\(^2\) | 0.135 | 0.070 | 0.093 | 0.075 | 0.065 | 0.063 |

Notes: *p < 0.1; **p < 0.05; ***p < 0.01. Huber-White robust standard errors are in parentheses.
preventative health services. Third, cash transfers may influence child health through better household sanitation conditions. The money may be used to upgrade household facilities, some of which may have positive health consequences. For example, Case (2004) found that families with beneficiary elderly of the old age pension programme in South Africa had a higher probability to use running water and have a flush toilet.

Therefore, we examined three possible channels through which the NRPS affect child health in rural China: high-protein food consumption by children, health consciousness of caregivers, and household sanitation conditions. First, we generated six binary variables regarding high-protein food consumption from CFPS questionnaires: whether the child ate meat, fish, egg, dairy, and soy products, and any high-protein food in the most recent week before the interview. It is worth mentioning that children’s self-reported food consumption questions are only available for children aged 10–15 in CFPS data set. To obtain the full information, for children aged zero to 10, we used the food consumption of their main caregiver to represent these children’s nutritional intake. This approach is reasonable because in most cases children consume the same food as their caregivers in the same household. Second, three binary variables were used to measure health consciousness of caregivers: whether the child would be sent to hospital directly when they get sick (medical seeking behaviour), whether the child had social medical insurance, and whether the child had commercial medical insurance. Third, household sanitation conditions were also represented by three binary variables: whether the household had running water for cooking, whether a household used clean fuels for cooking (natural gas or electricity), and whether the household had access to an in-house flushing toilet. Binary probit models were used to estimate these relationships, and all coefficients were converted to marginal effects.

Table 4 presents results of the relationships between NRPS and high-protein food consumption of children, health consciousness of caregiver, and household sanitation conditions. The results show that the NRPS is significantly associated with consumption of meat, egg, dairy, and soy products and overall high-protein food consumption of children, showing that the NRPS has a positive effect on child nutrition intake. On average, children in families with pensioners are 6.3 per cent more likely to consume high-protein food in a week than their counterparts with no household pension recipients. In terms of health consciousness of caregiver and household sanitation conditions, only a significant and positive association between the NRPS and child social medical insurance was found. The small size of the NRPS pension may explain the findings since improvements of household sanitation facilities may require a high expenditure.

After establishing significant and positive associations between the NRPS and child nutrition intake and health insurance, we extend the model of the NRPS and child health with inclusion of significant intermediate factors in step one (see Table 5). The estimates show that the coefficient of the NRPS decreases with the inclusion of high-protein food consumption, which is significantly and positively associated with HAZ and WAZ of children, indicating that high-protein food consumption is one channel through which the NRPS affect child health. Child social medical insurance is not significantly correlated with the health outcomes of children, displaying the insurance’s low level of benefit. To sum up, our analyses indicate that high-protein food consumption is the main channel between the NRPS and child health in rural China.

The present study also examined the associations of the NRPS with child disease, which may also explain the effect of the NRPS on the health status of children. Specifically, we tested whether the NRPS reduced the prevalence of child disease (prevalence effect) and buffered the adverse effect of health shocks on child health (severity effect). Table A3 in Supplementary Materials reports the estimated results, which indicate that the NRPS has no significant prevalence effect and severity effect on child disease due to the small size of the social pensions.
4.4. Robustness checks

Although a set of variables that may correlate with child health were controlled for in the previous models, we still need to consider potential endogeneity. On the one hand, family structure and resources may simultaneously affect the NRPS and child health. It is possible that households headed by elderly persons are more likely to have NRPS pensions but have less current knowledge about...
good care practices for young children. It is also possible that more resourceful families have better capabilities and a higher tendency to both participate in the NRPS and to raise healthier children. On the other hand, although the NRPS policy has not clearly stated the selection criteria of pilot areas before it became a nationwide pension scheme, counties with better economic and social conditions may have started the policy earlier. In the meantime, children who lived in the counties with better conditions may be more likely to be healthier. Additionally, some other public projects were implemented between 2012 and 2014 in rural China, which may correlate with the NRPS policy and affect the health status of children.

In order to address these problems, we applied several approaches to check the robustness of our findings. First, we restricted our sample to those households headed by elderly persons to address potential family structure heterogeneity. Second, we adopted a family fixed effects model for the full sample to control those time-invariant factors between households and counties which might be correlated with both the NRPS and child health. In addition, to better eliminate the influence of any constant and unmeasured factors, we generated balanced panel data and limited the results of fixed effects model to families that were in both samples from 2012 and 2014. The estimated results of the above robustness checks are presented in Table 6. The coefficients of the NRPS in the restricted sample models and fixed effects models are all positive and significant, showing that the NRPS is significantly associated with higher HAZ and WAZ of children, which are consistent with the previous analysis.

However, the household fixed effects model may still be unable to address transitory shocks in families and counties, such as parental unemployment and divorce, and the implementation of other public projects in the county level. Therefore, we further employed a difference-in-difference (DD) approach, a propensity score matching with difference-in-difference (PSMDD) strategy, and two stage least square (2SLS) regression with instrumental variable (IV) to address the potential endogeneity in our analysis. The estimates of DD, PSMDD, and 2SLS, which can be consulted in Supplementary Materials Table A4 and Figure A1, are consistent with OLS estimates and again imply a positive effect of social pensions on child health in rural China.

5. Discussion

This paper contributes to research on the effect of the NRPS on child health in rural China by using data from China Family Panel Studies. We not only investigated the association between the NRPS and child HAZ and WAZ, but also analysed the heterogeneity and possible channels of the effect, and discussed and tested the possible endogeneity problem. The results of our study show that families with the NRPS pension receivers are significantly associated with better health status of children up to 15 years of age. We also find that the association is larger for children who are boys, ‘left behind’, and six to 10 years of age. The estimates of quantile regression demonstrate that the relationship is

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| Variables       | (1) Elderly households | (2) FE: full sample | (3) FE: balanced panel |
|-----------------|------------------------|---------------------|------------------------|
| NRPS (1 = Yes)  | 0.234***               | 0.210*              | 0.243*                |
|                 | (0.083)                | (0.123)             | (0.139)               |
| Control variables | Yes                    | Yes                 | Yes                   |
| Province dummies | Yes                    | Yes                 | Yes                   |
| Year dummy      | Yes                    | Yes                 | Yes                   |
| Observations    | 2499                   | 6972                | 3964                  |
| R²              | 0.104                  | 0.027               | 0.035                 |

Note: † p < 0.15; *p < 0.1; **p < 0.05; ***p < 0.01. Huber-White robust standard errors are in parentheses.
heterogeneous across the distribution of child health and the NRPS pension helps most for those children in poor health. For the channels through which the NRPS affect child health, we tested mechanisms, including high-protein food consumption, health consciousness regarding children, and household sanitation conditions, and found that high-protein food plays the biggest role, indicating that the NRPS pension received by the elderly affect child health mainly through increased nutrition intake. Our study also examined the prevalence effect and severity effect of the NRPS on child disease and did not find significant results, which might be mainly because of the limited size of social pensions. Considering possible endogeneity problems, household fixed effects model, IV estimation approach, and PSMDD strategy were adopted to check the robustness of the results and the estimates were consistent with OLS regressions.

Our findings have several implications for the evaluation of the NRPS policy and child health protection. First, when evaluating the effect of the NRPS policy, most previous studies only paid attention to the wellbeing of the elderly but ignored the effect on the wellbeing of other family members. Therefore, the evaluation of policy effect may be underestimated and the positive effect of the NRPS on the elderly in rural China could possibly be overrated. Considerations of such household and intergenerational spillovers are needed in the impact evaluations of relevant public policies. Recently, some studies examined the spillover effect of the NRPS policy from an intergenerational perspective. For example, Chen and Zeng (2013) found the NRPS pension received by the elderly could crowd out intergenerational financial support from adult children. Our study shows that the NRPS can also affect the health status of the older adults’ grandchildren, which helps to better understand the effect of the NRPS policy. Second, it is advisable to promote the wellbeing of children in rural China by increasing the amount of basic non-contributory pension and implementing other related cash transfer programmes, especially for the ‘left-behind’ children in rural areas who are mainly cared for by their grandparents. Third, nutrition intake plays a key role in the healthy growth of rural children, as is found in this study. Policy-makers should pay more attention to the importance of child nutrition and better use the fund and investment to improve the ability, accessibility, and condition to provide high quality food for children, especially in rural areas. At the same time, according to our analyses, although the NRPS is positively associated with better child health status, social pensions may also increase the risk of being overweight for those children with relatively high weight. Thus, healthy dietary habit instructions are also needed to maximise the benefits of cash transfer programmes on child health.

Despite the contributions and policy implications to development studies, it warrants mentioning the limitations of the present study and implications for future research. First, due to the lack of data on child food consumption, we could only examine the general relationship between the social pensions and different food consumption of children rather than specific nutrition intake. It is worthwhile for future studies to carefully investigate the channels between social pensions and child health. Second, although we can conclude that social pensions are beneficial for child health in rural China and several robustness checks, including subsample regression, fixed effects model, IV approach, DD approach, and PSMDD strategy, support our findings, these estimates are still subject to some limitations. Therefore, researchers should be cautious in making generalisations from our findings. Additional studies with other data sources and approaches will help to further strengthen our understanding of the short-term and long-term association of social pensions with child health.

Acknowledgements

The authors would like to thank peer reviewers for helpful comments that improved the manuscript. The data and codes used for this study are available upon request. This study was designed by Xiangming Fang and Xiaodong Zheng. Secondary data analyses were conducted by Xiaodong Zheng and Xiangming Fang. The manuscript was written and revised by all authors.
Funding

We are grateful to the support of the National Social Science Foundation of China [17BRK018].

Disclosure statement

No potential conflict of interest was reported by the authors.

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