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Smoothing or strengthening the 'Great Gatsby curve'?

The intergenerational impact of China's New Rural Pension Scheme

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Abstract: We examine the heterogeneous and dynamic impact of China's New Rural Pension Scheme on intergenerational wealth dependence using a nationally representative longitudinal household survey covering the period 2011–13. We adopt an instrumental quantile regression–discontinuity design to address the endogeneity of partial compliance of the pension scheme and the observed individual heterogeneity. Overall, we find that the pension scheme smooths wealth dependence between generations in the short term, but strengthens the persistence of assets among the wealthiest households in the medium term. The mechanisms underlying these distributional effects are intergenerational transfers, time reallocation, and filial adjustments of the wealth portfolio. Complementary policy interventions, particularly for the poor across generations, would be needed to neutralize the distributional impact of the pension in terms of intergenerational wealth persistence.

Keywords: China, intergenerational mobility, pension, quantile treatment effect, wealth
JEL classification: D31, H55, I38, O53

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Let us not burden our remembrance with a heaviness that's gone.

William Shakespeare (Act V, Scene 1 of *The Tempest*)

1 Introduction

Old-age pensions have become a critical component of social assistance across the developing world, to protect people in old age against poverty and life contingencies. The expansion of old-age pensions over the past 20 years is the result of important demographic transitions and major advances in health sciences that have seen developing nations improve life expectancy at birth. This has put pressure on social security systems to respond to the demands of the growing elderly population (Cohen 2003). Bolivia's Renta Dignidad, India's Indira Gandhi National Old Age Pension Scheme, Mexico's 70 y Mas, South Africa's Old Age Pension, and the Philippines' Expanded Senior Citizens Act of 2010 are notable examples of the new wave of old-age pensions.

A large number of theoretical and empirical studies have shown that anticipating pension benefits can change individual retirement incentives and intertemporal behaviour in labour supply and saving, as recently reviewed by Blundell et al. (2016), which affects intragenerational wealth dynamics and also assets dispersion and concentration (e.g., Castaneda et al. 2003; De Nardi and Yang 2014). Indeed, the rise of pension rates in the US, together with home ownership, has led to a rise in the wealth of the middle-class, which was a major structural change in the country over the twentieth century (Saez and Zucman 2016). Recent empirical evidence from industrialized nations also shows that including pension assets in the net wealth of individuals reduces intragenerational wealth inequality substantially (Cowell et al. 2016).

Since pensions can affect the intragenerational distribution of assets, following generations may also be affected through various mechanisms. For example, the inequality-smoothing effect of welfare regimes in Scandinavian countries, such as Sweden (Jansson 2014), Denmark (Landersø and Heckman 2017), and Norway (Modalsli 2017), is often considered to be an important underlying mechanism that explains the increasing trend in intergenerational mobility in those countries relative to that observed in the US. Among social policies, old-age pensions are strongly associated with intergenerational transmission of wealth.

Much of the literature has employed large-scale overlapping-generation models to estimate the effects of pensions on financial sustainability, intergenerational equity, and labour supply outcomes at the macro level; however, microeconomic evidence on the welfare effects of pension holders' decisions remains limited due to theoretical and empirical challenges (Attanasio et al. 2016).

The present study contributes to the literature by addressing the question of how public pensions impact the transmission of wealth across generations in China, a country where the population has been ageing rapidly.

Several strands of the literature provide some plausible mechanisms underpinning the causal channels between pension schemes and wealth within generations. The pioneering work of Feldstein (1974), formulated by Gale (1998), examines the perfect substitution between pension savings, typically through pay-as-you-go (PAYG) systems, and wealth of family members in a standard life-cycle model in which individuals with perfect foresight save only for retirement, and their consumption depends on the present value of total compensation rather than its

composition. Some factors can make the rate of substitution deviate from −1 (perfect offset) to a smaller value in absolute terms (imperfect offset), such as illiquidity of pension wealth and borrowing constraints, savings in the preretirement period for other reasons beyond retirement, precautionary savings against uncertain wage income, the market/availability for alternative life insurance (Hubbard et al. 1995), different returns to pensions and other financial savings (Attanasio and Brugiavini 2003), and the perceived value of benefits (Gustman and Steinmeie 2015).

Contradicting the standard life-cycle model in which pension benefits and the retirement age are exogenous, pension wealth does not substitute for other forms of wealth, but adds to total wealth, as in Gustman and Steinmeier's (2001) intertemporal decision model in which the retirement age and saving are jointly determined. Another reason explaining extremely high saving rates even with public pensions, particularly in fast-growing economies like China, is habitual preferences (Attanasio and Weber 2010). Chetty et al. (2014) further illustrate that total savings do not necessarily decline when there are more pension contributions, but rather increase to different extents, depending on how individuals set their budgets—that is, savings or consumption as their main target. Complications introduced by mixed intragenerational wealth outcomes of pensions lead to ambiguous associations with the next generation's wealth.

Intergenerational transmission models (typically overlapping-generation models) introducing bequest motives would also predict that older individuals in fast-growing economies in which the older generation used to suffer from very poor living conditions (like China) keep saving and bequeath all (considerable) wealth to their children (Attanasio et al. 2016). In fact, empirical studies find both 'crowding in' (Brandt and Deindl 2013) and 'crowding out' (Rowlingson et al. 2017) effects of public support on parental private (financial and practical) help to adult children (i.e. downstream transfers).

Social security policy affecting parental income or wealth also changes children's transfer to parents (i.e. upstream transfers). Children's altruistic motives imply that public transfer can crowd out children's transfer to parents (e.g. in Southeast Asia, such as China (Cai et al. 2006), Taiwan (Gerardi and Tsai 2014), and Mexico (Amuedo-Dorantes and Juarez 2015)), especially among those living long distances away from their parents (Jensen 2004). However, the exchange models of transfers imply that children transfer more time and/or money to parents as an exchange of parental wealth transfer (Bernheim et al. 1985; Cox and Rank 1992; Altonji et al. 1997). This leads to 'crowding in' of children's transfer to parents at the higher level of parental pension incomes (Chen et al. 2017).

Furthermore, intergenerational mobility models predict that intragenerational wealth inequality can persist into the next generation by bequests (De Nardi 2004) and parental investment into children's education and health (Becker et al. 2015).[1] Ambiguities in filial outcomes surface again when pensions are taken into account in parental decision-making. One may expect that the introduction of social security creates windfalls for retirees, which would beget more wealth for the next generation through the above two channels. Nevertheless, Gustman and Steinmeier (2008) note that benefits paid to the older generation reaching retirement age today let them just about break even on their payroll tax contributions, resulting in little wealth effect from social security to affect bequests to children. By contrast, when a pension serves as an income transfer to the poor who are financially constrained, (grand) parental recipiency improves children's wellbeing (Duflo 2000; Gutierrez et al. 2016). When introducing a pension weakens

[1] See Solon (2004) and Black and Devereux (2011) for theoretical models and empirical reviews, respectively

parental incentives to save for retirement, parental pension entitlements seem to increase their investment in children's education, contributing to intergenerational welfare improvement (Mu and Du 2015). Thus, old-age pensions can make parents' and children's life-cycle decisions intricate, which complicates the impact analysis, especially when considering the intergenerational effects on private wealth.

In this paper we use a nationally representative panel survey, the China Health and Retirement Longitudinal Study (CHARLS), collected in 2011 and 2013, to address this concern empirically. More specifically, we assess the distributional impact of China's New Rural Pension Scheme (NRPS), a notional defined contribution (NDC) type of PAYG system, on wealth between generations. Overall, the study contributes to the literature in a number of ways.

First, we provide new evidence to the literature of social protection by examining the distributional effects of parental pension status on filial wealth accumulation and its association with parental wealth. The existing literature has examined outcomes of pensions mainly in cross-sectional settings, including recipients' consumption (Zheng and Zhong 2016), private savings (Feng et al. 2011), labour supply (Galiani et al. 2016), living arrangements (Hamoudi and Thomas 2014), and their extended family members' labour mobility decisions (Chen 2015). While the impact of pensions can extend to the next generation as discussed earlier, there is no empirical study, to our knowledge, analysing the individual-level intergenerational persistence or mobility of wealth that is induced by pensions.

To identify the causal effect of the pension, we adopted a fuzzy regression discontinuity (RD) approach, which exploits not only the age eligibility threshold but also the exogenous variation in the implementation of the pension scheme. Different from a standard RD, we utilize information on not only treated compliers but also never-participants for comparison, as it is possible that non-programme communities could have benefited by the reassignment of the programme (Ravallion 2007). Taking never-participants into account yields larger treatment effects as shown by Frölich and Lechner (2015).

Second, we address two different forms of heterogeneity that are likely to affect the impact of pensions. (1) Both theoretical and empirical studies highlight heterogeneous behavioural responses to pensions, depending on observed characteristics. Engen et al. (1996) have pointed out that saving incentives induced by pension schemes can raise private saving when households finance contributions by reducing consumption, increasing labour supply, or through tax cuts, but cannot promote private savings if households use existing assets to contribute. This creates variations in wealth outcomes depending on pensioners' existing economic endowments.

Household data from the UK and Italy suggest that the substitution effect between pension and non-pension wealth is particularly high for workers between 35 and 45 as they are more liquidity constrained than older cohorts (Attanasio and Brugiavini 2003). From the perspectives of family members who have parents receiving a pension, their transfer to parents is non-linearly related to parental or household income in both developed and developing countries (Cox et al. 2004). This seems to be driven by children's motivations (Chen et al. 2017) and economic conditions, notably income volatility (Albarran and Attanasio 2003). (2) Unobserved characteristics such as individuals' time preferences and perceived value of pension benefits can also heavily influence the timing of their claiming benefits and life-cycle wealth accumulation (Gutsman and Steinmeier 2015).

In order to address not only the heterogeneous effects of pensions on adult children's wealth across the entire distribution, but also the endogeneity problem arising from self-selection into programme treatment conditional upon observed and unobserved characteristics at individual

and community levels, we apply instrumental quantile regressions to our fuzzy RD design. We also compute our estimates separately, depending on the age of eligibility.

Third, the panel data structure allows us to distinguish between static (short-term) and dynamic (medium-term) heterogeneous effects of the pension scheme.

Last but not least, the empirical findings shed new light on welfare policy. Our individual-level analysis provides the 'net' policy impact after taking individual (heterogeneous) behavioural responses into account. The estimated impacts on intergenerational mobility help us understand the extended consequences of social protection policies. The evidence from China adds to the limited knowledge-base for middle- and low-income countries that currently consider introducing or expanding non-contributory old age schemes.

The remainder of paper is organized as follows. Section 2 introduces the demographic and institutional background of pensions in rural China. Section 3 describes the dataset. Section 4 discusses the methodology and research design, while Section 5 presents the results. Section 6 concludes with a discussion of the policy implications of our findings.

2 Population ageing and the New Rural Pension Scheme in rural China

China has experienced a rapid and large-scale population ageing. Census data show that life expectancy at birth has increased from 68 years in 1982 to 75 years in 2010, while the average fertility rate in terms of the number of children per woman aged between 15 and 49 remained above 3 and even increased to 3.8 in 2015, partly because of a more relaxed family planning policy. Better living conditions and longer life have in that sense driven population ageing in China. There were 88.11 million people aged at least 65 years old at the end of 2000, constituting 6.96 per cent of the total population.[2] China became an aged society since then, as its elderly population absorbs more than 7 percent of the total population, which is the United Nations criteria for population ageing. At an average annual growth rate of 4 per cent, the size of the elderly population aged 65 years and above (or alternatively 60 years and above, which is the age threshold that we used in this analysis) continued to grow to 143.86 (or 222) million by the end of 2015, accounting for 10.5 per cent (or 16.1 per cent) of the total population. This proportion was higher than the world average of 8 per cent in 2015 (OECD 2015). The United Nations has projected that by 2050, senior citizens aged 60 years and over will make up more than 30 per cent of China's total population (UNRISD 2016), which is nearly double the projected world average of 18 per cent (OECD 2015). One of the implications of this demographic transition is reflected in China's elderly dependency ratio, which in terms of the number of people aged 65 and over supported by 100 people aged 15–64, has increased from 8 in 1982 to 14.3 in 2015.

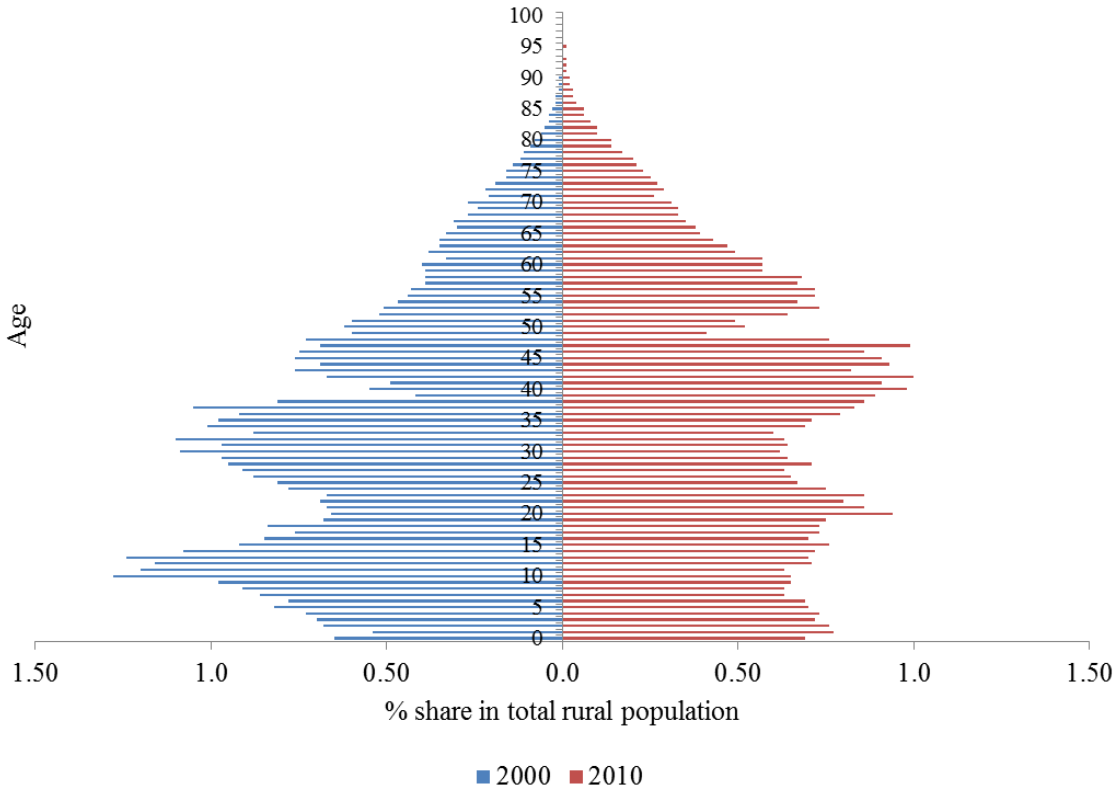
According to the most recent census at the end of 2010, 60 per cent of the population aged 65 and over lived in rural areas. Figure 1 shows demographic pyramids for rural populations: 9.46 per cent (10.68 per cent) of rural men (women) were aged 65 and above in the census 2010, as opposed to 6.82 per cent (8.23 per cent) in the census 2000. The elderly dependency ratio was higher in rural areas due to migration of young or middle-aged adults to urban areas: the census

[2] These figures are calculated by the authors based on data from the *Statistical Report of Civil Affairs* published annually by the Ministry of Civil Affairs of China (1990–2015), and aggregated data from the censuses of 2000 and 2010, which are published by the National Bureau of Statistics of China. Figures A.1, A.2, and A.3 in the Appendix illustrate annual figures.

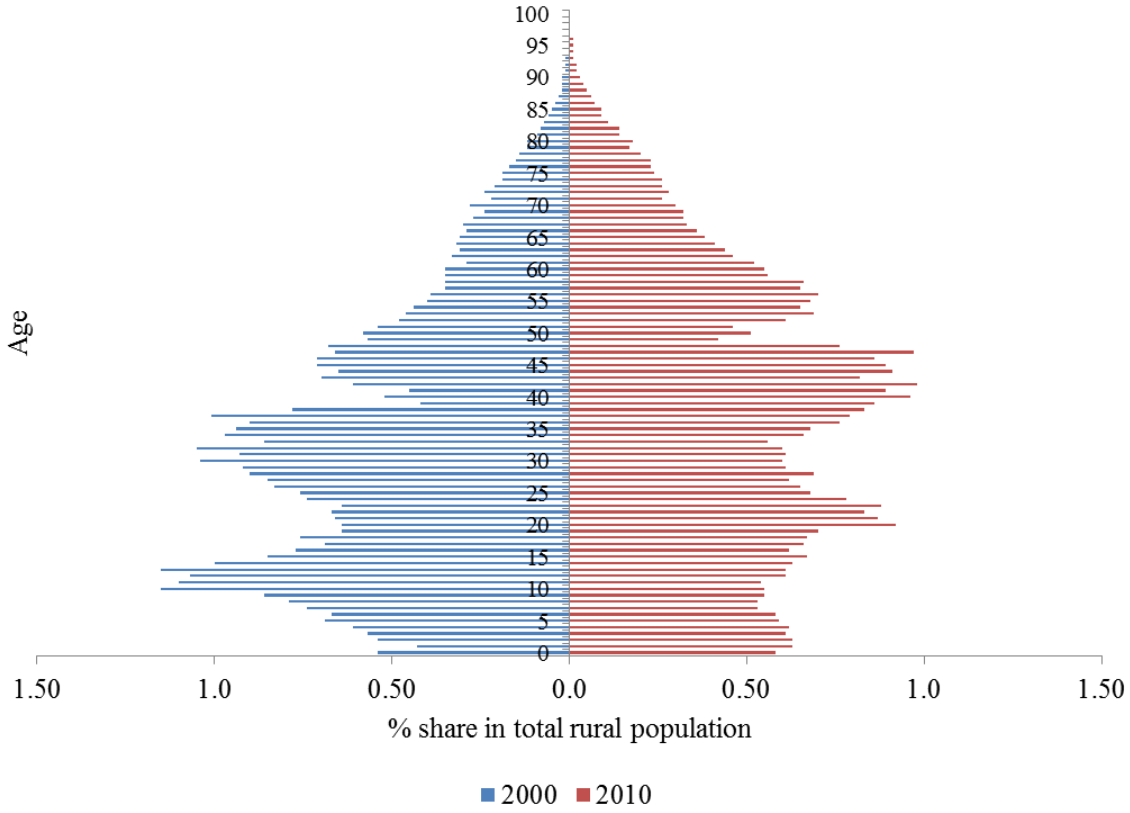
2010 points to 11.2 per cent in rural areas versus the national average of 8.9 per cent. As shown in Table 1, 26 per cent of rural households had at least one elderly family member in 2010. Over two-thirds of the single elderly people lived with other family members, while elderly couples lived independently.

Figure 1: Demographics in rural China (2000–10)

(a) Men



(b) Women



Source: Authors' calculation and compilation of data from the 2000 and 2010 censuses.

The rural population in China has long been excluded from social protection, especially the rural elderly population, who had not been entitled to participate in any pension scheme until 2009, when the government piloted the NRPS. Even though the government began to introduce the rural minimum living standard guarantee scheme (rural *Dibao*) in 2001, the coverage rate only increased marginally from 0.4 per cent in 2001 to 8.6 per cent in 2015, and it is not targeted at the elderly but rather at the poor and vulnerable.[3] The census 2010 shows that before the retirement age of 60, the rural population relied mainly on their own labour (88 per cent for those aged 45–59; see Table 2). A total of 46 per cent of those just past retirement age still relied on their own labour, while roughly 44 per cent were supported by their families (Table 2). The average share of the rural elderly relying on their own labour was 41 per cent, while family support was increasingly important as elderly persons' health deteriorated (Table 3).

[3] According to the *Statistical Report of Civil Affairs* published annually by the Ministry of Civil Affairs, the rural *Dibao* covered 3.046 million and 52.14 million rural people in 2001 and 2015, respectively. According to the *China Statistical Yearbooks* published annually by the National Bureau of Statistics, the total rural population was 795.63 million and 603.46 million in 2001 and 2015, respectively. We calculated the coverage rates of *Dibao* as the population ratios.

Table 1: Household composition of rural population

No. households	2000	Share (%)	2010	Share (%)
One elderly family member	33,859,394	73.51	35,081,872	69.43
Of whom		100		100
Live alone	4,929,507	14.56	8,121,881	23.15
Live with family members younger than 18 years old	531,928	1.57	629,624	1.79
Others	28,397,959	83.87	26,330,367	75.05
Two elderly family members	12,044,905	26.15	15,247,264	30.18
Of whom		100		100
Live alone	4,733,819	39.30	6,835,994	44.83
Live with family members younger than 18 years old	434,081	3.60	530,944	3.48
Others	6,877,005	57.09	7,880,326	51.68
At least three elderly family members	155,915	0.34	198,671	0.39
Total no. rural households with elderly family members	46,060,214	22.02	50,527,807	25.95
Total no. rural households	209,193,325	100	194,745,023	100

Note: The elderly are defined as aged 65 years old or above. The denominator used to calculate the share of rural households with elderly family members is the total number of rural households (i.e. the bottom row). The denominator used to calculate shares of rural households with one, two, or at least three elderly members is total number of rural households with elderly family members (i.e. the second row from the bottom). The denominator used to calculate the shares of different livelihood arrangement (i.e. living alone or with other family members) are the number of rural households with one, two, or at least three elderly family members.

Source: Authors' calculations and compilation of data from the census 2010.

Table 2: Sources of livelihood for the rural elderly (by age)

Source of livelihood	45–59			60–79			80+		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
Labour income	88.23%	94.46%	81.89%	46.11%	55.22%	36.86%	4.84%	7.19%	3.27%
Pension	0.82%	0.72%	0.93%	4.66%	7.12%	2.16%	4.14%	7.87%	1.64%
Unemployment insurance	0.02%	0.03%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Minimum living standard	0.80%	1.01%	0.59%	4.15%	4.81%	3.49%	6.90%	8.18%	6.05%
Wealth income	0.20%	0.23%	0.18%	0.19%	0.22%	0.17%	0.13%	0.17%	0.11%
Family	9.01%	2.76%	15.37%	43.12%	30.91%	55.50%	81.85%	74.14%	87.03%
Others	0.91%	0.79%	1.03%	1.77%	1.72%	1.81%	2.13%	2.45%	1.91%
Total no. the elderly	13,467,601	6,788,560	6,679,041	8,882,232	4,473,415	4,408,817	1,203,637	483,574	720,063

Source: Authors' calculations and compilation of data from the census 2010.

Table 3: Sources of livelihood for the rural elderly who are aged 60 or above (by health status)

Source of livelihood	Healthy			Fine			Unhealthy (independent)			Unhealthy (dependent)		
	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women
Labour income	63.00%	71.32%	52.82%	36.24%	44.97%	28.77%	8.34%	10.66%	6.54%	1.52%	1.98%	1.20%
Pension	5.31%	7.49%	2.64%	4.78%	7.86%	2.15%	2.74%	4.85%	1.11%	3.20%	6.22%	1.13%
Minimum living standard	1.73%	1.81%	1.64%	4.19%	5.07%	3.43%	10.44%	13.68%	7.93%	11.08%	14.00%	9.08%
Wealth income	0.18%	0.20%	0.17%	0.20%	0.23%	0.17%	0.19%	0.24%	0.15%	0.12%	0.16%	0.09%
Family	28.48%	18.01%	41.28%	52.60%	39.86%	63.52%	75.73%	67.63%	82.02%	82.02%	75.11%	86.77%
Others	1.30%	1.17%	1.46%	1.99%	2.02%	1.95%	2.56%	2.96%	2.25%	2.06%	2.53%	1.74%
Total	2,253,112	1,160,542	1,092,570	1,777,590	801,737	975,853	373,731	156,520	217,211	105,972	46,261	59,711

Note: 'Independent' means that the individual lives independently. 'Dependent' means that the individual lives with others.

Source: Authors' calculations and compilation of aggregated data from the census 2010.

The Chinese government piloted the NRPS in about 10 per cent of counties in 2009, aiming to cover *all* rural adults (age >16) by 2020. The rural population aged 16–59 who are not covered by the government's other pension schemes and are not in school are eligible to join the programme in their original places of household registration and on a voluntary basis. Participants have to contribute at least 15 years to enjoy the benefits. Rural elderly aged 60 and above at the time of programme implementation can be directly entitled to receive benefits without any contributions, as long as *all* of their eligible adult children join the NRPS. These terms essentially 'push' most rural adults at all ages to join, which is rationalized under the government's aim of full programme coverage. Moreover, participants aged 45–59 when the programme was implemented essentially have to pay a lump sum (up to 15-year contributions). Eligible individuals pay annual contributions into personal accounts and receive monthly benefits. The individual annual contribution ranged between 100 yuan and 500 yuan, with an increment of 100 yuan in 2009 and increased to 115–3,000 yuan in 2016.

Because provincial governments are able to set higher contribution rates than those given by the central government, the maximum annual contribution rate approached 3,600 yuan in 2016. We note that the central government injects subsidies into personal accounts at different contribution rates: 30 yuan per annum for the lowest contribution rate of 100 yuan in 2009, which increased to 40 yuan for the lowest contribution rate in 2016. Provincial governments are also allowed to decide whether and how much to provide in subsidies to personal accounts. The benefits are compared by (1) the *total* money in the private account before turning 60 (including individual contributions and government subsidies) times interest rates and divided by 139, which is the same parameter used in urban pension schemes; and (2) pension payout from the central government, which was 55 yuan initially in 2009 and increased to 115 yuan in 2016.[4]

Studies have reported that the NRPS has improved consumption of beneficiaries (Zheng and Zhong 2016), especially for one-child elders (Liu et al. 2015). Both pension enrolment and income further raise recipients' nutrient intake, access to health care, use of inpatient services, and leisure time, and reduce their reliance on their adult children, especially sons, resulting in recipients' better objective health, and cognitive functions (Cheng et al. 2016), as well as life satisfaction (Ding 2017), and adult children's migration and working off-farm (Eggleston et al. 2016).

We are not aware of any studies examining the welfare impact of participation (not recipiency) for those still having to contribute for decades, but only on determinants of their participation decisions. Those with fewer sons are more likely to join (Ebenstein and Leung 2010), while younger rural residents join less often and at lower contribution rates (Lei et al. 2013). Take-up rates also vary by age, value of durable assets, health status, and local enforcement of the programme and the size of government payout (Zhao et al. 2016). These factors are found to threaten the long-term sustainability of the scheme (Bairoliya et al. 2017).

3 Data

3.1 Data source

We use the CHARLS, a nationally representative panel dataset collected by the School of National Development at Peking University in 2011 and 2013. It has interviewed populations

[4] See Williamson et al. (2017) for a review on coverage, adequacy, and sustainability of the NRPS system.

aged 45 or older and adopted stratified sampling, selecting units with the probability proportional to size (PPS). The baseline includes 17,708 individuals aged 45 or older out of 10,257 households living in 450 communities out of 150 counties of 28 provinces. The follow-up survey covered 18,605 individuals out of 10,803 households in the same communities. We selected individuals by the following criteria. Individuals (1) were interviewed in both waves; (2) resided in rural communities as defined by the National Bureau of Statistics of China in order to be eligible to receive the pension; (3) had at least one biological child (age ≥18) with valid information; and (4) had information on pensions in the 2011 wave, which allows us to disentangle the dynamic impact of the pension scheme. The selected individuals are defined as the *parental generation*. Each individual comes from one household. These individuals are paired to their adult children, which we refer to here as the *filial generation*.

Table 4 cross-tabulates the samples by parental age. The procedure selects 1,990 parents aged 45–60 and 3,390 parents aged above 60. There are 4,733 parent–child pairs for the former group and 12,876 intergenerational pairs for the latter. The NRPS had been introduced to about 43 per cent (≈103/237 or 102/237) of sample communities by 2011 and increased to 53 per cent (≈126/237) to 81 per cent (≈192/237) in 2013. The community coverage rates were similar to the national average in 2011.[5] In the treated communities where the NRPS was introduced, those below age 60 had to make a decision on whether or not to participate in the programme, while those older than 60 could receive a pension without contributions, on the condition that all of their eligible adult children have to join the pension scheme. In 2013, about 90–92 per cent (≈1,792/1,990 or 3,114/3,390) of parents lived in the treated communities, and about 76 per cent of parents living in treated communities joined or received the NRPS. This is similar to the national rate of 79.1 per cent in the same year.[6]

[5] The national coverage rate is from the Ministry of Finance. Available at: http://www.mof.gov.cn/zhengwuxinxi/caijingshidian/zgcjb/201202/t20120216_628374.html (accessed 27 May 2017).

[6] According to the data released by the Ministry of Human Resources and Social Security of China, there had been 498 million participants in the NRPS by the end of 2013, of which 138 million were recipients. At the same time, there were 629.61 million rural residents according to the *China Statistical Yearbook* published by the National Bureau of Statistics. We calculated the national participation (including recipients) rate as the ratio of 498 million over 629.61 million, given that there were no data available on age-specific rural population in 2013.

Table 4: Sample size of the constructed panel

Sample size	45 ≤ Age < 60[a]	Age ≥60[a]
Filial generation	4,733	12,876
Parental generation	1,990	3,390
Treated[b]	1,792 (1,098 in 2011)	3,114 (1,397 in 2011)
Participants/recipients[c]	1,369 (421 in 2011)	2,367 (666 in 2011)
Non-participants/recipients	423	747
Untreated	198	276
Community	237	237
Treated	126 (103 in 2011)	192 (102 in 2011)
Untreated	101	45
Province	25	25

Notes: [a] Age cohorts are defined by parental age. [b] Being 'treated' ('non-treated') means that the individuals live in communities where the reform was (not) put into effect. [c] Being 'participants' or 'recipients' indicates those who live in communities where the reform was put into effect and joined, or received benefits of, the pension scheme.

Source: Authors' calculation based on the CHARLS (2011 and 2013).

The CHARLS survey provided sampling probabilities reflecting their sampling procedures and non-response during interview. We used the inverse sampling probabilities as the weights in all regressions, in order to correct for possible sampling biases during our sample selection. Given that roughly one parent aged below 60 had two children and one aged above 60 had three children, we clustered standard errors at the parent level.

3.2 Livelihood profile and arrangements among the rural Chinese elderly

Tables 5 and 6 compare various aspects of life between generations by parental age. As the key indicator, wealth is defined as the net worth, that is, the sum of housing assets, fixed assets (including the value of productive and household business assets), value of consumer durables, financial assets (such as savings, equity, and loans), and other forms of assets (such as jewellery) net of all debts. Pension wealth and human capital are not included, following Cowell et al. (2016) and Saez and Zucman (2016). For assets jointly owned by household members, we split the value equally by dividing it by household size. For assets—typically housing, fixed assets, and financial assets—we split the value by the individual household members' share. The debts are calculated analogously for each household member. We finally constructed individual net wealth for both generations. Table A.1 in the Appendix lists descriptive statistics of variables in our regressions.

Table 5: Life profile of parental generation (by parental age)

	45 ≤ Age <60	Age ≥60
Age in years	53.559	69.821
Gender (male = 1)	0.420	0.540
Years of education	5.581	2.951
No. biological children (alive)	2.130	3.130
Wealth (individual/per capita), yuan	79,453.801	72,720.820
Of which, share of having negative net wealth	16.46%	6.14%
Ill health last month (yes = 1)	0.126	0.143
Disabled (yes = 1)	0.079	0.165
Old-age support (children = 1)	0.719	0.739
Old-age support (pension = 1)	0.125	0.152
Living arrangement preference for those with a spouse (prefer to live with adult children = 1)	0.649	0.603
Living arrangement preference for those without a spouse (prefer to live with adult children = 1)	0.783	0.714
Actual living arrangement (live with children = 1)	0.490	0.164
Of which, with economic dependency (yes = 1)	0.552	0.343
Annual contribution to the NRPS[a]	170.659	177.213
Annual net income, yuan	4,625.153	1,602.982
Share of annual contribution in annual net income[b]	3.69%	11.06%
Treated[c] (yes = 1)	0.901	0.916
Participant/recipient[d] (yes = 1)	0.688 (0.256 in 2011)	0.698 (0.254 in 2011)
Total transfer to children in last year, yuan[e]	3,286.901 (25.09%, 13,102.4)	867.414 (21.62%, 4,011.354)
Of which,		
Money to children, yuan[f]	2,991.667 (72.89%, 16,361.44)	769.388 (56.39%, 6,309.348)
Of which, regular money to children, yuan[g]	592.933 (22.91%, 14,153.65)	74.706 (27.92%, 2,193.932)
In-kind goods to children, yuan	295.234 (52.06%, 2,260.491)	98.026 (62.05%, 730.627)
Of which, regular in-kind goods to children, yuan	25.648 (21.89%, 897.241)	15.669 (25.16%, 464.138)
Total transfer from children, yuan	2,787.055 (56.48%, 4,934.497)	3,077.006 (83.36%, 3,735.899)
Of which,		
Money from children, yuan	2,236.718 (67.45%, 5,871.023)	2,189.975 (65.83%, 3,326.593)
Of which, regular money from children, yuan	528.571 (27.55%, 5,035.070)	596.032 (34.00%, 2,663.155)
In-kind goods from children, yuan	550.337 (44.65%, 1,232.487)	887.032 (65.80%, 1,348.006)
Of which, regular in-kind goods from children, yuan	123.444 (26.16%, 1,056.827)	205.819 (28.26%, 1,106.719)
Net transfer, yuan[h]	−499.847	2,209.592
Of which,		
Positive net transfer	5,081.610 (47.17%)	3,609.963 (77.71%)
Negative net transfer	−20,694.680 (14.00%)	−10,943.540 (5.44%)

Total transfer to parents in last year, yuan	365.239 (33.95%, 1,075.716)	43.451 (6.03%, 720.045)
Of which,		
Money to parents, yuan	239.721 (22.3%, 1,028.649)	22.108 (3.53%, 627.004)
In-kind goods to parents, yuan	125.518 (24.07%, 521.576)	21.343 (4.59%, 465)
Total transfer from parents, yuan	25.876 (2.43%, 1,064.957)	2.839 (0.29%, 987.838)
Of which,		
Money from parents, yuan	22.586 (1.2%, 1,875.439)	2.431 (0.19%, 1,252)
In-kind goods from parents, yuan	3.290 (1.65%, 199.615)	0.408 (0.12%, 350)

Notes [a] The average annual contribution to the NRPS is calculated only among those have paid premium. [b] It is calculated as the ratio of the two rows above. [c] Being 'treated' ('non-treated') means that the individuals live in communities where the NRPS was (not) put into effect. [d] Being 'participants' or 'recipients' indicates those who live in communities where the NRPS was put into effect and joined, or received benefits of, the NRPS. [e] The percentages in brackets denote the share of parents making transfers in all parents. The value following it is the average value of transfers among those making transfers. [f] The percentages in brackets denote the share of parents making monetary or in-kind transfers out of parents ever making any form of transfers. The value following it is the average value of transfers among those making monetary or in-kind transfers. [g] The percentages in brackets denote the share of parents making regular monetary or in-kind transfers out of parents ever making monetary or in-kind transfers. The value following it is the average value of transfers among those making regular monetary or in-kind transfers. [h] The net transfers are calculated as the total transfers from children minus total transfers to children.

Source: Authors' calculation based on the CHARLS 2011 and 2013.

Table 6: Life profile of filial generation (by parental age)

	45 ≤ Age < 60	Age ≥60
Age in years	25.812	39.058
Gender (male = 1)	0.527	0.531
Years of education	8.388	6.381
Married (yes = 1)	0.694	0.949
No. biological children (alive)	1.214	1.996
Wealth (individual/per capita), yuan	125,234.400	89,260.300
Of which, share of having negative net wealth	6.00%	3.04%
Annual net income, yuan	4,414.170	1,579.192
Total transfer to parents in last year, yuan[a]	1,169.825 (38.15%, 3,066.667)	809.540 (59.22%, 1,367.028)
Of which,		
Money to parents, yuan[b]	938.829 (62.80%, 3,919.085)	576.168 (71.57%, 1,359.486)
Of which, regular money to parents, yuan[c]	221.860 (26.17%, 3,539.505)	156.812 (31.00%, 1,193.453)
In-kind goods to parents, yuan	230.996 (73.16%, 827.749)	233.372 (68.06%, 578.997)
Of which, regular in-kind goods to parents, yuan	51.814 (25.13%, 738.844)	54.150 (25.70%, 522.686)
Total transfer from parents, yuan	1,379.628 (13.92%, 9,909.544)	228.221 (8.99%, 2,538.702)
Of which,		
Money from parents, yuan	1,255.708 (68.35%, 13,195.85)	202.421 (49.74%, 4,526.741)
Of which, regular money from parents, yuan	248.875 (22.83%, 11,457.71)	19.655 (26.37%, 1,666.818)
In-kind goods from parents, yuan	123.920 (51.26%, 1,736.319)	25.790 (61.84%, 463.938)
Of which, regular in-kind goods from parents, yuan	10.765 (21.16%, 712.877)	4.123 (23.55%, 314.854)
Net transfer, yuan[d]	209.803	−581.329
Of which,		
Positive net transfer	15,659.170 (8.19%)	6,129.578 (3.05%)
Negative net transfer	−3,137.835 (34.20%)	−1,365.976 (56.23%)

Notes: [a]. The percentages in brackets denote the share of children making transfers in all children The value following it is the average value of transfers among those making transfers. [b] The percentages in brackets denote the share of children making monetary or in-kind transfers out of children ever making any form of transfers. The value following it is the average value of transfers among those making monetary or in-kind transfers. [c] The percentages in brackets denote the share of children making regular monetary or in-kind transfers out of children ever making monetary or in-kind transfers. The value following it is the average value of transfers among those making regular monetary or in-kind transfers. [d] The net transfers are calculated as the total transfers from parents minus total transfers to parents.

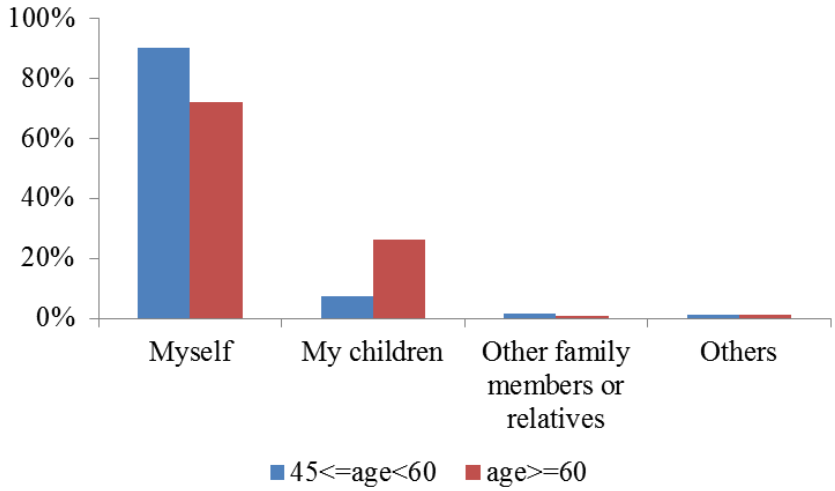
Source: Authors' calculation based on the CHARLS 2013.

The parental generation earned less income than the filial generation, which is partly due to age effects and the amount of human capital owned by the filial generation. Adult children owned more wealth as a result of the higher value of housing assets, which is consistent with the time trend that has been observed in developed countries. Between 6 and 16.5 per cent (3–6 per cent) of parents (adult children) have negative net wealth. This fraction is smaller than that of Sweden

(26 per cent in Black et al. 2015), and similar to that of Germany (9 per cent) and the US (14 per cent) (Cowell et al. 2016). Within each generation, the older the age, the less income and wealth owned, consistent with an age effect. Nearly two-thirds of parents prefer to live with adult children (Table 5). This preference is much stronger (71–78 per cent among parents without a spouse). The rate of actual co-residence with children is lower than the stated preferences, but is still higher than one-third (34.3–55.2 per cent in Table 5).

A total of 90 per cent (71.9 per cent) of participants (recipients) paid for the NRPS by themselves rather than relying on their children (Figure 2). More than 70 per cent of parents expected financial support from children in old age (Table 5) regardless of their age compared to the eligibility age of 60 years old, while only 13–15 per cent considered pension income as their main source of financial support.

Figure 2: Distribution of means of old-age support in the parental generation



Source: Authors' calculation based on the CHARLS 2013.

The average annual payment to the NRPS among participants was 152.6 yuan (approximately US$25) in 2013. Indeed 79 per cent (75 per cent) of parents joining the NRPS and being aged between 45 and 60 (60 or above) paid the lowest contribution rate of 100 yuan (approximately US$16.4); 75 per cent of parents who had already received the monthly benefits in 2013 reported the lowest level of payout of 55 yuan (approximately US$9).

Transfers within the extended family are extensive as well as intensive. Roughly one-quarter of parents made transfers to children over the previous year. The amount of transfers was substantial, amounting to 71 per cent of parental net income (≈3,287/4,625) for those aged below 60, and mainly by cash. Those aged above 60 years old transferred less (54 per cent of net income; ≈867/1,603) and mainly by in-kind goods, possibly due to their low income. This cohort, however, received more transfers from children—83 per cent of them received transfers as opposed to 56 per cent for their counterparts younger than 60 years old. As a result, 77 per cent of parents older than 60 had positive net transfers from adult children, with an average amount that tripled their annual net income. In comparison, 14 per cent of those below 60 years old made net transfers to rather than from their adult children, with an average amount of 1,379 yuan a year, which was about 31 per cent of children's average annual net income (see Table 6).

Moreover, about one-third of the parental generation aged below 60 also helped their parents. The average amount (365 yuan) was equivalent to 7.9 per cent of their annual net income. The

incidence and amount of this upstream transfer declined quickly for the cohort aged above 60, which is predictable given low survival rates of their parents. For the filial generation, increasingly more adult children made upstream transfers to their parents when their parents turned 60 or older, from an average of 38 per cent to 59 per cent (see Table 6). We also note that 34 and 56 per cent of adult children with parents under 60, and older than 60, respectively, were 'net givers' in terms of positive net transfers to parents (see the bottom row of Table 6).

Table 7 presents the intergenerational transitions of wealth. For both cohorts, the percentages along the diagonal line are higher than those off it, indicating intergenerational persistence of wealth. Among the filial generation whose parents were below 60 years old (Table 7a), 72 per cent of the richest (fifth) quantile successfully maintained their parental position in the wealth distribution as opposed to 57.6 per cent in the first quantile, indicating stronger persistence among the rich than the poor. Of all the filial generation in this cohort, 56.5 per cent have the same wealth position as their parents; 19.3 per cent increased their rank compared with their parents, but 24.2 per cent reduced their rank. By contrast, the poorest quantile showed stronger intergenerational persistence (90 per cent) than the richest quantile (79 per cent) for those whose parents were older than 60 (Table 7b). Of all the filial generation in this cohort, 73.8 per cent have the same wealth rank as their parents; only 15 per cent moved to higher wealth positions, while 11.2 per cent slid downward. Comparing Tables 7a and 7b, wealth persistence is stronger for the older members of the filial generation than for the younger ones, while the latter experience more mobility in both upward and downward directions.

Table 7: Intergenerational transition of wealth status (by parental age)

(a) 45 ≤ Age < 60

Filial quintile	Parental quintile					Row total
	1	2	3	4	5	
1	57.64%	35.54%	3.51%	3.00%	0.31%	100%
2	20.17%	48.81%	25.44%	5.17%	0.41%	100%
3	14.08%	8.28%	52.38%	22.57%	2.69%	100%
4	6.93%	3.83%	14.99%	52.02%	22.23%	100%
5	4.14%	2.17%	2.38%	19.67%	71.64%	100%

(b) Age ≥ 60

Filial quintile	Parental quintile					Row total
	1	2	3	4	5	
1	89.83%	8.57%	0.99%	0.46%	0.15%	100%
2	12.41%	73.45%	12.03%	1.84%	0.27%	100%
3	3.04%	16.70%	65.29%	13.99%	0.61%	100%
4	2.91%	2.76%	16.25%	61.11%	16.97%	100%
5	1.80%	1.11%	1.03%	16.75%	79.30%	100%

Note: The sum of elements in each row is 100%.

Source: Authors' calculation based on the CHARLS 2013.

Table 8 compares parental and filial observed characteristics between participants (recipients) and non-participants (non-recipients) of the NRPS. There appear to be demographic differences among those older than 60: recipients are younger and less educated. Both participants and

recipients are more likely to be females and earn less, while recipients' children earned more than non-recipients' children did. This is consistent with the requirements of the NRPS introduced in Section 2—those older than 60 can receive payments without contribution as long as all of their adult children join. There are no wealth differences in the cohort younger than 60 years old, but recipients (older than 60) and their adult children have less wealth than non-recipients and their adult children. Generally speaking, there are no significant differences in parental health, or preferential or actual living arrangements. Nor does parents' expected age of stopping working or total transfers from or to children vary by their NRPS status.

Table 8: Comparison between participants (recipients) and non-participants (non-recipients) (by parental age)

	45 ≤ Age < 60			Age ≥60		
	Participants	Non-participants	Difference (std.)	Recipients	Non-recipients	Difference (std.)
	(1)	(2)	(1)–(2)	(3)	(4)	(3)–(4)
Parental generation						
Age in years	53.642	53.376	0.265 (0.171)	69.414	70.768	−1.354 (0.289)***
Gender (male = 1)	0.396	0.472	−0.076 (0.024)***	0.519	0.590	−0.071 (0.019)***
Years of education	5.487	5.790	−0.303 (0.212)	2.783	3.341	−0.558 (0.140)***
No. of biological children (alive)	2.135	2.119	0.016 (0.047)	3.126	3.138	−0.012 (0.067)
Annual net income (individual), yuan	3,489.458	7,288.782	−3,799.324 (592.166)***	1,444.377	2,011.234	−566.857 (266.546)**
Net wealth (individual/per capita), yuan	75,972.31	89,575.320	−13,603 (14,077.56)	66,983.07	87,815.640	−20,832.57 (12,053.25)*
Ill health last month (yes = 1)	0.129	0.121	0.008 (0.018)	0.148	0.132	0.016 (0.015)
Disabled (yes = 1)	0.078	0.079	−0.001 (0.013)	0.166	0.164	0.002 (0.014)
Old-age support (children = 1)	0.740	0.670	0.069 (0.022)***	0.762	0.624	0.138 (0.017)***
Old-age support (pension = 1)	0.117	0.168	−0.051 (0.016)***	0.128	0.258	−0.130 (0.014)***
Living arrangement preference for those with a spouse (prefer to live with adult children = 1)	0.620	0.633	−0.013 (0.023)	0.571	0.544	0.028 (0.019)
Living arrangement preference for those without a spouse (prefer to live with adult children = 1)	0.753	0.763	−0.010 (0.021)	0.671	0.634	0.037 (0.018)**
Actual living arrangement (live with children = 1)	0.488	0.504	−0.016 (0.024)	0.159	0.174	−0.014 (0.014)
Of which, with economic	0.550	0.548	0.002 (0.034)	0.368	0.288	0.080 (0.043)*

dependency (yes = 1)						
Expected age stopping agricultural work	62.899	62.000	0.899 (0.849)	69.934	70.609	−0.675 (0.826)
Expected age stopping non-agricultural work	59.914	59.768	0.146 (0.945)	66.692	66.040	0.652 (1.126)
Expected age stopping self-employment	62.098	60.385	1.713 (1.518)	70.692	68.667	2.026 (2.133)
Total transfer from all adult children in last year	2,579.050	3,276.989	−697.938 (495.048)	3,120.910	3002.840	118.070 (257.584)
Total transfer to all adult children in last year	2,798.778	4,229.964	−1,431.186 (1,044.030)	838.881	963.821	−124.939 (251.072)
Filial generation						
Age in years	25.944	25.522	0.421 (0.203)**	38.611	40.137	−1.527 (0.229)***
Gender (male = 1)	0.526	0.528	−0.002 (0.016)	0.532	0.528	0.004 (0.010)
Years of education	8.529	8.081	0.448 (0.148)***	6.312	6.542	−0.230 (0.081)***
No. of biological children (alive)	1.214	1.214	0.0003 (0.029)	2.086	1.785	0.301 (0.391)
Annual net income (individual), yuan	4,580.774	4,176.992	403.782 (418.138)	1,684.717	1,370.791	313.925 (137.442)**
Net wealth (individual/per capita), yuan	129,124.1	121,760.90	7,363.253 (14,532.1)	85,409.59	100,745.80	−15,336.22 (7,248.534)**
Live with parents with economic dependency (yes = 1)	0.193	0.213	−0.020 (0.013)	0.050	0.043	0.007 (0.004)

Note: ***, **, and * denote 1, 5, and 10 per cent significance levels.

Source: Authors' calculations based on the CHARLS 2013.

4 Model

4.1 Identification strategy

To begin the exposition about our identification strategy to measure the causal effect of NRPS, let y_i be the outcome variable—the filial generation i's net wealth—and D_j be a 0–1 dummy variable indicating whether i's parent j—either father or mother—participates in the NRPS:

$$y_i = y_i^0\left(1 - D_j\right) + y_i^1 D_j \tag{1}$$

The average treatment effect (ATE) is therefore:

$$\delta \equiv \mathrm{E}\left(y_i^1 - y_i^0\right) \tag{2}$$

We use the community's treatment status of the NRPS, Z_c, to instrument endogenous D_j.[7] Z_c is a 0–1 dummy variable indicating whether the NRPS had been introduced to the community c where j lives at the time of interview. As discussed in Section 2, the NRPS was implemented on a rolling basis; 43 per cent of our sample counties set up the NRPS in 2011 (Table 4). Despite that there are no public official documents showing how the counties were selected for the NRPS in its pilot stage, the central government asked provincial governments to introduce the programme to poor and remote rural areas in 2011 and stated that the coverage rate should be at least 85 per cent by the end of 2011, while the national average was only 60 per cent at the same time.[8] Typically those areas are designated as the 'national poor counties' by the State Council. We thus chose community income as the running variable influencing the probability of treatment of the community and fixed the threshold at 400 yuan in 1992 prices—1,018 yuan in 2013 prices inflated by the national Rural Consumer Price Index—which is the annual per capita net income used by the State Council to define 'nationally designated counties' before 2012. As such, $Z_c = 1\left(R_c \geq r\right)$.

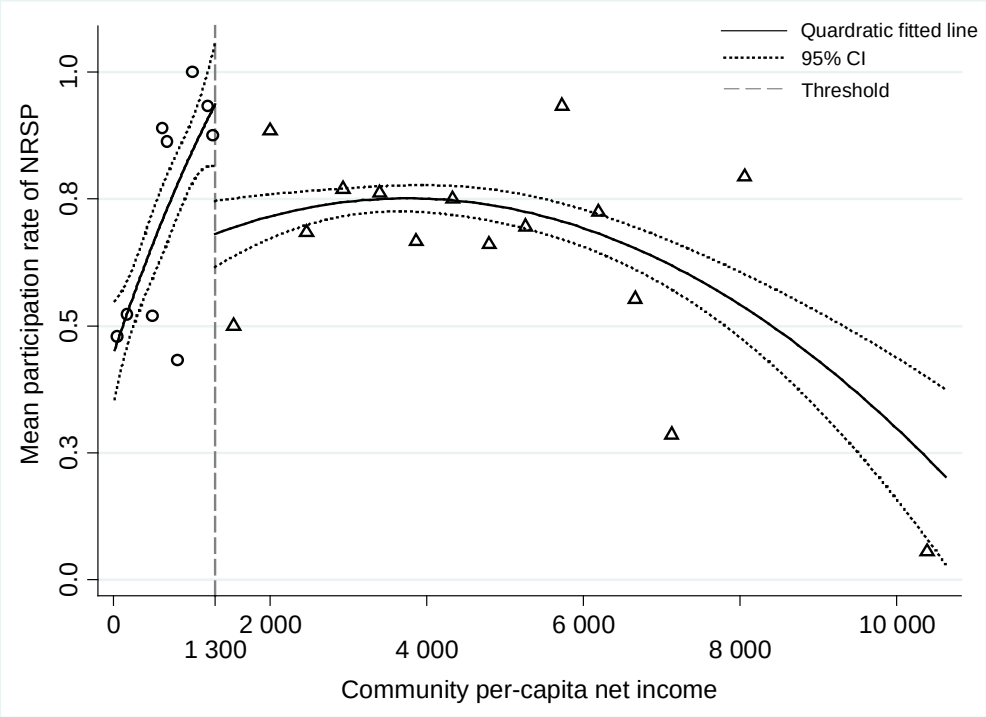
Individuals change programme participation at $Z_c = 1$, i.e. $\lim_{\kappa \to \infty} E\left[D_j \mid Z_c = 1 + \kappa \right] - \lim_{\kappa \to \infty} E\left[D_j \mid Z_c = 1 - \kappa \right] \neq 0$. Given this imperfect compliance of D_j in treated communities, the story fits a fuzzy RD framework. Figures 3a and 3b illustrate the imperfect jump of compliance around the threshold for working-age and pension-age cohorts, respectively.

[7] Ideally the excluded instrument to individual compliance would be continuous to identify a marginal treatment effect (MTE) by integrating which one can obtain its variants (Heckman and Vytlacil, 2005), but here we only have a binary, given the 'natural experiment' nature of the NRPS.

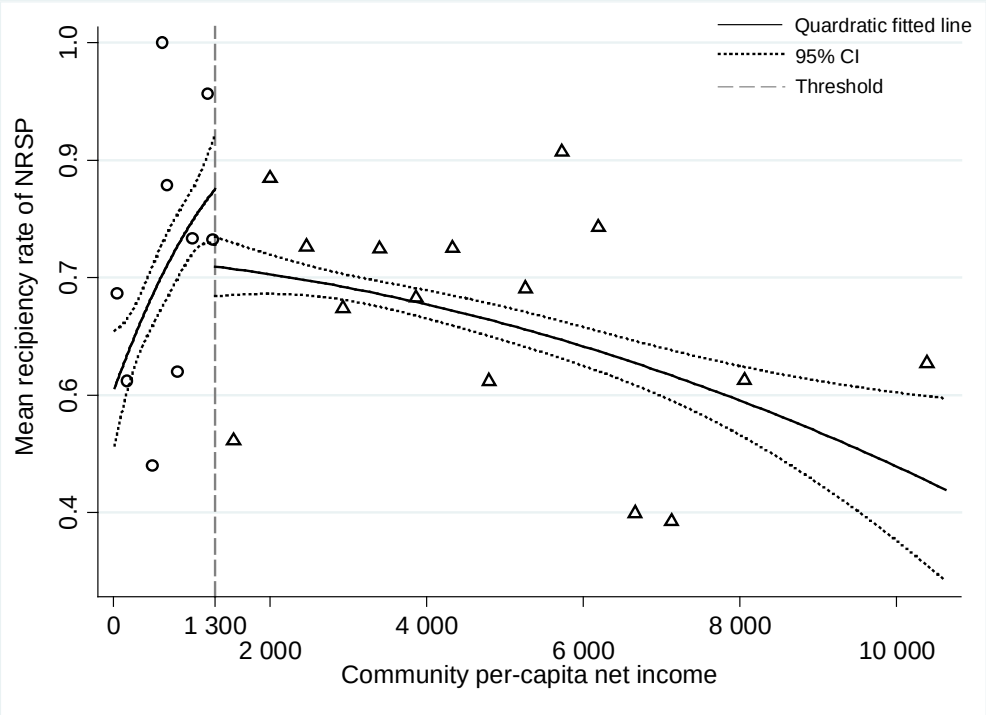
[8] This is according to the internal memo of the Ministry of Human Resources and Social Security of China. The coverage rates come from the Ministry of Finance, as cited in footnote 3.

Figure 3: Discontinuity of participation rates in treated counties

(a) Participants of the NRPS (45 ≤ parental age < 60)



(b) Recipients of the NRPS (parental age ≥60)



Note: Individuals are grouped into bins in the left- and right-hand sides of the threshold (1,018 yuan). The bin size is 50 yuan. The circles and triangles denote the proportion of NRPS participants within each bin.

Source: Authors' calculation based on the CHARLS 2013.

The density test formulated by McCrary (2008) shows that in all treated communities where the NRPS was introduced, one cannot reject the null hypothesis of zero discontinuity at the cut-off in the estimated conditional density function of community per capita net income between participants and non-participants.[9] Thus, even though the parental generation could partially manipulate participation, there is no completely endogenous sorting.

There are two types of individuals' treatment and compliance status in the context of the NRPS, i.e. $T_i \in \{c, n\}$:

1. Compliers $c = \{Z_c = 1, D_j = 1\}$ whose parents live in communities where the NRPS has been introduced and join the NRPS.
2. Never-participants $n = \{D_j = 0\}$ regardless of whether the NRPS was available. Such parents have the least inclination to join the NRPS.

We are interested in a larger programme effect, including those never treated. That is, the local ATE for compliers as shown by Imbens and Agrist (1994):

$$E\left(y^1 - y^0 \mid T = c\right) = \frac{E\left(y \mid Z_c = 1\right) - E\left(y \mid Z_c = 0\right)}{E\left(D \mid Z_c = 1\right) - E\left(D \mid Z_c = 0\right)} \tag{3}$$

The usual assumption holds, that is, the treatment is monotonously increasing in the instrument. Z_c exploits the exclusion restriction and satisfies usual assumptions in Abadie (2003). It is thereby able to identify potential outcomes for compliers.

The treatment and instrument variables will be confounded as Z_c may not be independent of the potential outcomes. This is of particular concern in the context of the NRPS as it was implemented first in areas of poverty and/or limited support to the elderly. Our model in Section 4.3 takes this into account.

4.2 Instrument propensity-score weighting for compilers

We use Frölich and Lechner's (2015) identification strategy as below, adapting the MTE framework to the binary excluded instrument and addressing the selection-on-observables. Consider a non-separable model of parental pension status, together with filial wealth as below:

$$\Pr\left(Z_c = 1 \mid \mathbf{X}_Z, \mathbf{X}_1\right) = \theta_0 + \theta_1 \mathbf{X}_Z + \theta_2 \mathbf{X}_{YZ} + \theta_3 \mathbf{X}_{DZ} + \theta_4 \mathbf{X}_{YDZ} + \eta_c + u_c \tag{4}$$

$$\Pr\left(D_j = 1 \mid Z_c, \mathbf{X}_D, \mathbf{X}_2\right) = \omega_0 + \omega_1 Z_c + \omega_2 \mathbf{X}_D + \omega_3 \mathbf{X}_{YZ} + \omega_4 \mathbf{X}_{YD} + \omega_5 \mathbf{X}_{YDZ} + \eta_j + \upsilon_j \tag{5}$$

$$\ln y_i = \beta_0 + \beta_1 D_j + \beta_2 \mathbf{X}_Y + \beta_3 \mathbf{X}_{YZ} + \beta_4 \mathbf{X}_{YD} + \beta_5 \mathbf{X}_{YDZ} + \eta_j + \eta_c + \varepsilon_i \tag{6}$$

where, following Boserup et al. (2016), $\ln y_i$ is approximated by $\ln\left(y + \sqrt{y^2 + 1}\right)$, in order to include those with negative net worth in regressions and thus overcome the selection problem

[9] The log-difference in height is −1.681 (0.006) with the *p*-value being 0.183 (0.282).

in log transformation; $\mathbf{X}_1 = (\mathbf{X}_{YZ}, \mathbf{X}_{DZ}, \mathbf{X}_{YDZ})$ and $\mathbf{X}_2 = (\mathbf{X}_{YZ}, \mathbf{X}_{YD}, \mathbf{X}_{YDZ})$; the subscript of $\mathbf{X}$ denotes which dependent variable(s) the vector $\mathbf{X}$ affects.

Specifically, $\mathbf{X}_Z$ is a vector of community-level characteristics only affecting whether the NRPS was introduced before 2013, including the share of the elderly aged 65 or above in all adults aged at least 16 in the community,[10] the average age and years of education among community leaders, the share of days with electricity over the last year, and the quality of community roads. $\mathbf{X}_{YZ}$ affects both community treatment status and the filial generation's wealth, including the community average welfare expenditure and the natural logarithmic community per capita net income (which is also the forcing variable). $\mathbf{X}_{DZ}$ affects individual participation and community treatment status of the NRPS, including whether the community has already established the elderly care centre(s), whether the community has provided any pension-type support for the elderly aged 65 or above, and the share of families hiring a carer to take care of the elderly. $\mathbf{X}_D$ only affects parental compliance, including the eligibility of the parental generation to participate in the NRPS (namely, whether she or he has local rural *Hukou* and has not participated in or received an urban resident pension) and his/her preference of old-age care, i.e. whether the individual intends to rely on children. $\mathbf{X}_{YD}$ is the forcing variable—quadratic smoothing of the natural logarithmic community per capita net income, $f(R_c) = R_c + R_c^2 + (R_c - r_0) + (R_c - r_0)^2$. $\mathbf{X}_{YDZ}$ affects simultaneously three outcomes, namely: parental compilation to the NRPS, filial wealth, and the community treatment status of the NRPS. It includes parental characteristics such as wealth, gender, age, age squared, the number of biological adult children, and years of education.

Equations (4) and (5) are estimated jointly in a probit set-up with community- and individual-level random effects (η_c and η_j) and jointly distributed disturbances, $(\mathbf{u}, \upsilon) \sim NID(0, \Sigma)$. Z_c does not enter Equation (6), fulfilling the exclusion restriction. $\mathbf{X}_Z$ and $\mathbf{X}_D$ help improve identification. As per Frölich and Lechner (2015) and Abadie and Imbens (2016), we calculated the instrument propensity scores as below to identify potential outcomes for *tc* and *nc* and alleviate the high-dimensionality problem:

$$p(\mathbf{X}_1) = \Pr(Z_c = 1 \mid \mathbf{X}_1 = x_1) \tag{7}$$

where $0 < \Pr(Z_c = 1 \mid \mathbf{X}_1 = x_1) < 1$ requires that no value perfectly predicts (non-)assignment to the instrument. The instrument propensity score in Equation (7) refers to the probability of a community having been treated with the NRPS by 2013, conditioning on multiple community-level covariates.

The existence of $\mathbf{X}_{DZ}$, $\mathbf{X}_{YZ}$, $\mathbf{X}_{YD}$, and $\mathbf{X}_{YDZ}$ confounds the instrument and/or the treatment variable. However, Equations (4)–(6) make filial wealth outcomes satisfy $(y^d, T) \perp\!\!\!\perp Z \mid \mathbf{X}_1$, implying that Z_c is as good as randomly assigned, given $\mathbf{X}_1$, and $y^d \perp\!\!\!\perp D \mid \mathbf{X}_2$ where $d = \{0,1\}$

[10] We are restricted from using the age of 60 years old, which is the same as the benefit age of the NRPS, by lack of relevant data at the community level.

, implying that variation in the instrument Z_c does not change potential outcomes other than through D_j. This latter allows us to identify potential outcomes even for never-participants.

Abadie et al. (2002) and Abadie (2003) set up a weighting scheme κ_i^c for compliance subpopulation. It refers to the 'complier-finding' probability and identifies the expectations for compliers, i.e. $E\left(\kappa^c\right) = E\left[\Pr\left(T = c \mid \mathbf{X}_1\right)\right] = \Pr\left(D^1 > D^0 \mid \mathbf{X}_1\right)$, which is the denominator of Equation (3), $E\left(D \mid Z_c = 1\right) - E\left(D \mid Z_c = 0\right)$. Abadie et al. (2002) prove that:

$$\kappa_i^c = 1 - \frac{D_j\left(1 - Z_c\right)}{1 - \Pr\left(Z_c \mid \mathbf{X}_1\right)} - \frac{\left(1 - D_j\right)Z_c}{\Pr\left(Z_c \mid \mathbf{X}_1\right)} = \frac{Z_c - p_i\left(\mathbf{X}_1\right)}{p_i\left(\mathbf{X}_1\right)\left[1 - p_i\left(\mathbf{X}_1\right)\right]} \tag{8}$$

Abadie (2003) further shows that it implies:

$$E\left(Q_{y_i|D,Z,\mathbf{X}} \mid T = c\right) = \frac{E\left(\kappa^c \cdot Q_{y_i|D,Z,\mathbf{X}}\right)}{E\left(\kappa^c\right)} \tag{9}$$

where $Q_{y_i|D,Z,\mathbf{X}}$ could be any real function and here takes the form of the quantile function of filial wealth which will be defined in the next subsection.

4.3 Propensity-score weighted conditional quantile treatment effects

We obtain the local quantile treatment effect of the NRPS, as the difference between the inferred marginal distributions of filial potential wealth for compliers evaluated at a particular quantile at the cut-off of the running variable, which takes the form:

$$\hat{\delta}\left(\tau\right) = \hat{Q}_{\ln y^1|c,\, R=r_0}\left(\tau\right) - \hat{Q}_{\ln y^0|c,\, R=r_0}\left(\tau\right) \tag{10}$$

where τ varies from 0.01 to 0.99 with an increment of 0.01; $\hat{Q}_{\ln y|c,\, R=r_0}\left(\tau\right) = \inf\left\{a : F_{\ln y|c,\, R=r_0}\left(a\right) \geq \tau\right\}$ is the τ th quantile of filial wealth for the local complier.

The conditional distribution function of filial wealth is expressed as:

$$F_{\ln y^1|c}\left(\ln y\right) = \frac{\lim\limits_{r \to r_0^+} E\left[1\left(\ln y^1 \leq \ln y\right)D \mid R = r\right] - \lim\limits_{r \to r_0^-} E\left[1\left(\ln y^1 \leq \ln y\right)D \mid R = r\right]}{\lim\limits_{r \to r_0^+} E\left[D \mid R = r\right] - \lim\limits_{r \to r_0^-} E\left[D \mid R = r\right]} \tag{11}$$

$$F_{\ln y^0|c}\left(\ln y\right) = \frac{\lim\limits_{r \to r_0^+} E\left[1\left(\ln y^0 \leq \ln y\right)\left(1 - D\right) \mid R = r\right] - \lim\limits_{r \to r_0^-} E\left[1\left(\ln y^0 \leq \ln y\right)\left(1 - D\right) \mid R = r\right]}{\lim\limits_{r \to r_0^+} E\left[1 - D \mid R = r\right] - \lim\limits_{r \to r_0^-} E\left[1 - D \mid R = r\right]} \tag{12}$$

Both $F_{\ln y^d|c}\left(\ln y \mid D, r\right)$ where $d = \{0,1\}$ and $E\left(D^Z \mid R = r\right)$ where $Z \in \{0,1\}$ are continuous in r at r_0.[11]

Frandsen et al. (2012) show that Equations (10)–(12) can be estimated consistently through linear weighted two-stage least squares. The first step consists of calculating the 'complier-finding' weights as in Section 4.2. In the second step, we estimate the quantile regression of filial wealth with the weights as below:

$$\begin{aligned} &Q_{\ln y_i|D,Z,\mathbf{X}}\left(\tau \mid D, \mathbf{X}, T = c\right) \\ &= \alpha(\tau) + \delta(\tau) D_j + \beta_1(\tau) D_j\left(R_c - r_0\right) + \beta_2(\tau)\left(1 - D_j\right)\left(R_c - r_0\right) + \beta_3(\tau) f\left(R_c\right) \\ &\quad + \beta_4(\tau)\mathbf{X}_Y + \beta_5(\tau)\mathbf{X}_{YD} + \beta_6(\tau)\mathbf{X}_{YZ} + \beta_7(\tau)\mathbf{X}_{YDZ} + \beta_8(\tau)\hat{\eta}_j + \beta_9(\tau)\hat{\eta}_c + \varepsilon_{ij} \end{aligned} \quad (13)$$

Two interaction terms between the NRPS participation and the distance of the forcing variable from the cut-off, $\left(R_c - r_0\right)$, pick up possible behavioural changes around the cut-off, i.e. any shifts to the estimated impact of participation $\hat{\delta}(\tau)$. This might happen if the individual expects (not) to participate in NRPS when the local livelihood improves, i.e. the average net income in their community moves upward to (away from) the cut-off, and adapts their livelihood strategies and accumulation behaviour to such expectations. Moreover, including $f\left(R_c\right)$ corrects for any direct association between the forcing variable (i.e. the community per capita net income) and the filial wealth.

Equation (9) implies that the RD quantile treatment effects can be obtained by:

$$\begin{aligned} &\left(\hat{\boldsymbol{\alpha}}(\tau), \hat{\boldsymbol{\beta}}(\tau), \hat{\boldsymbol{\delta}}(\tau)\right) \\ &\equiv \underset{(\alpha,\beta,\delta)\in\Theta}{\arg\min}\, E_n \rho_\tau \left[\begin{array}{l} \ln y_i - \hat{\alpha} - \hat{\delta} D_j - \hat{\beta}_1 D_j\left(R_c - r_0\right) - \hat{\beta}_2\left(1 - D_j\right)\left(R_c - r_0\right) \\ -\hat{\beta}_3 f\left(R_c\right) - \hat{\beta}_4 \mathbf{X}_Y - \hat{\beta}_5 \mathbf{X}_{YD} - \hat{\beta}_6 \mathbf{X}_{YZ} - \hat{\beta}_7 \mathbf{X}_{YDZ} - \hat{\beta}_8 \hat{\eta}_j - \hat{\beta}_9 \hat{\eta}_c \end{array}\right] \cdot \hat{\boldsymbol{\kappa}}_i \cdot K\left(\frac{R_c - r_0}{h}\right) \end{aligned} \quad (14)$$

where the 'compiler-finding' weights are calculated based on the instrument propensity scores, $\hat{\boldsymbol{\kappa}}_i^c = \dfrac{Z_c - \hat{p}_i\left(\mathbf{X}_1\right)}{\hat{p}_i\left(\mathbf{X}_1\right)\left[1 - \hat{p}_i\left(\mathbf{X}_1\right)\right]}$; $K(\cdot)$ is a kernel function with a bandwidth h. $\hat{\boldsymbol{\delta}}(\tau)$ is algebraically equivalent to the non-parametric estimated treatment effect for compliers in Equation (10). Given that compliance to the NRPS is nil for parents living in non-treated communities, $\hat{\boldsymbol{\delta}}(\tau)$ corresponds to the effect of treatment on the treated. Under the continuity assumption of the running variable around the cut-off and of the unobservables, $\hat{\boldsymbol{\delta}}(\tau)$ is an unbiased estimate of the ATE.

[11] See Frandsen et al. (2012) for a complete set of assumptions underlying RD quantile treatment effects.

5 Estimation results

5.1 Model specification

Table 9 reports the standard two-step instrumental variable least square (2SLS) estimation results of Equation (6) and the quantile RD effects based on Equation (10). The 2SLS uses community treatment status (Z_c) and other as the excluded instruments to parental compliance with the NRPS. They perform well in terms of over-identification tests and other goodness-of-fit tests for both cohorts.

Table 9: Determinants of filial wealth (by parental age)

Independent variables	45 ≤ age <60				Age ≥60			
	2SLS-IV	Quantile IV			2SLS-IV	Quantile IV		
		τ = 0.1	τ = 0.5	τ = 0.9		τ = 0.1	τ = 0.5	τ = 0.9
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Parental characteristics								
NRPS participation in 2013	−18.481 (6.229)***	−4.412 (1.529)***	2.613 (2.743)	−1.048 (4.181)	8.484 (2.517)***	−1.942 (0.697)***	−0.838 (0.771)	2.264 (2.259)
NRPS participation in 2011	0.446 (1.312)	0.378 (0.519)	−1.244 (2.356)	−0.048 (0.446)	−0.653 (0.581)	−0.685 (1.251)	−0.244 (0.872)	−0.007 (2.677)
ln(net wealth)	0.401 (0.087)***	0.164 (0.024)***	0.311 (0.248)	0.867 (0.020)***	0.978 (0.025)***	0.829 (0.071)***	0.926 (0.063)***	0.999 (0.303)***
NRPS participation in 2013 × ln(net wealth)	−0.350 (0.377)	0.740 (0.038)***	−0.024 (0.256)	−0.816 (0.021)***	−0.871 (0.279)***	0.237 (0.071)***	0.074 (0.067)	−0.218 (0.235)
NRPS participation in 2011 × ln(net wealth)	−0.004 (0.119)	−0.042 (0.047)	0.080 (0.222)	0.036 (0.026)	0.065 (0.057)	0.060 (0.124)	0.009 (0.081)	0.017 (0.253)
Age	3.992 (1.810)**	−0.007 (2.638)	0.852 (1.458)	0.153 (1.470)	−0.152 (0.083)*	−0.202 (0.200)	−0.107 (0.179)	0.226 (0.504)
Age square	−0.038 (0.017)**	−0.005 (0.023)	−0.009 (0.006)*	−0.007 (0.008)	0.001 (0.0006)*	0.001 (0.001)	0.001 (0.001)	−0.002 (0.003)
Gender (man = 1)	1.470 (0.562)***	1.061 (0.524)**	0.145 (0.267)	0.452 (0.276)*	−0.173 (0.074)**	0.076 (0.232)	−0.020 (0.133)	−0.010 (0.228)
Years of education	−0.081 (0.074)	−0.011 (0.025)	0.023 (0.037)	0.002 (0.042)	0.013 (0.010)	−0.011 (0.027)	0.020 (0.014)	0.026 (0.029)
Illness in the last month (yes = 1)	−0.578 (0.889)	−0.356 (0.167)**	0.126 (0.153)	−0.149 (0.302)	0.112 (0.141)	0.105 (0.386)	0.127 (0.195)	0.048 (0.661)
Disabled (yes = 1)	0.554 (0.550)	0.189 (0.612)	−0.003 (0.379)	0.593 (0.448)	−0.131 (0.109)	−0.085 (0.291)	−0.020 (0.208)	0.045 (0.392)
No. children	−0.235 (0.272)	−0.212 (0.096)**	0.006 (0.117)	0.092 (0.148)	−0.036 (0.026)	−0.082 (0.055)	−0.015 (0.042)	0.033 (0.080)
Filial generation								
Age	−0.165 (0.153)	0.114 (0.085)	0.007 (0.026)	0.028 (0.030)	0.003 (0.012)	−0.014 (0.021)	0.005 (0.015)	−0.006 (0.019)
Age square	0.003 (0.004)	−0.002 (0.002)	−0.0004 (0.0004)	−0.0003 (0.0003)	−0.0002 (0.0002)	0.0001 (0.0004)	−0.0001 (0.0002)	0.0001 (0.0002)

Gender (man = 1)	−0.378 (0.362)	0.013 (0.229)	−0.134 (0.158)	−0.128 (0.169)	−0.108 (0.059)*	−0.094 (0.175)	−0.075 (0.074)	−0.049 (0.065)
Years of education	0.094 (0.031)***	0.010 (0.017)	0.047 (0.035)	0.013 (0.020)	0.013 (0.011)	0.010 (0.023)	0.001 (0.010)	−0.003 (0.012)
Marriage (married = 1)	−0.942 (0.558)*	0.121 (0.457)	−0.202 (0.206)	−0.181 (0.291)	0.245 (0.159)	0.556 (0.264)**	0.002 (0.072)	0.120 (0.340)
No. of children	0.258 (0.320)	−0.225 (0.158)	0.152 (0.300)	0.002 (0.212)	0.072 (0.049)	0.055 (0.097)	0.016 (0.018)	−0.026 (0.054)
Total transfer to parent	0.030 (0.102)	−0.002 (0.077)	0.036 (0.038)	−0.002 (0.002)	−0.0003 (0.010)	0.017 (0.101)	−0.006 (0.013)	0.005 (0.015)
NRPS participation in 2013 × total transfer to parent	0.334 (0.158)**	0.016 (0.007)	−0.001 (0.004)	0.003 (0.003)	0.083 (0.050)*	−0.004 (0.109)	0.014 (0.017)	0.013 (0.027)
NRPS participation in 2011 × total transfer to parent	−0.032 (0.120)	0.016 (0.036)	−0.004 (0.004)	−0.002 (0.004)	−0.025 (0.014)*	−0.058 (0.093)	0.005 (0.013)	0.003 (0.015)
Total transfer from parent	−0.013 (0.031)	0.015 (0.008)*	0.004 (0.004)	−0.003 (0.001)**	0.014 (0.015)	0.036 (0.015)**	0.002 (0.006)	−0.007 (0.007)
NRPS participation in 2013 × total transfer from parent	0.062 (0.037)*	−0.008 (0.013)**	0.003 (0.004)	0.004 (0.001)***	−0.005 (0.017)	−0.052 (0.019)**	−0.006 (0.008)	0.006 (0.006)
NRPS participation in 2011 × total transfer from parent	0.004 (0.004)	−0.0004 (0.009)	0.001 (0.001)	0.006 (0.007)	−0.001 (0.012)	0.014 (0.011)	0.008 (0.005)	−0.001 (0.004)
Household fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Community fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Provincial dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Joint significance in the first stage, *F* statistic (*p*-value)	40.750 (0.000)	–	–	–	25.260 (0.000)	–	–	–
Over-identification test, χ^2 statistic (*p*-value)	2.598 (0.458)	–	–	–	0.426 (0.514)	–	–	–
Goodness-of-fit in the second stage, Wald χ^2 statistic (*p*-value)	29,577.45 (0.000)	–	–	–	37,000 (0.000)	–	–	–
Pseudo R^2	–	0.939	0.956	0.913	–	0.995	0.996	0.995
Parente-Santos Silva test for intra-cluster correlation, *T* statistic (*p*-value)	–	30.831 (0.000)	34.180 (0.000)	34.115 (0.000)	–	49.700 (0.000)	61.630 (0.000)	53.436 (0.000)
Machado-Santos Silva test for heteroscedasticity, χ^2 statistic (*p*-value)	–	171.963 (0.000)	216.152 (0.000)	50.959 (0.000)	–	820.948 (0.000)	1,398.614 (0.000)	979.714 (0.000)

Notes: [a] Regressions are weighted ones. The weights are the sampling weights—the individuals' inverse probabilities of being sampled. The standard errors in all estimations are clustered within the same parents. ***, **, and * denote 1, 5, and 10 per cent statistical significance levels. [b] Constants and controls of the forcing variable (i.e. the community net income) in $f\left(R_c\right)$ are not reported. [c]. In 2SLS-IV regressions (Columns 1 and 5), the excluded instruments for parental NRPS status are community treatment status, community-existing old-age care, the share of the elderly aged 65 or above in the community who have been covered by any form of pension schemes, the share of families hiring carers in the community, parental qualification for the NRPS and whether the parent considers pension income as his/her old-age support.

Source: Authors' calculation based on the CHARLS 2011 and 2013.

The treatment effect of the NRPS differs between the 2SLS and quantile specifications. For those whose parents are younger than 60 years old, the average negative impact of the NRPS on filial wealth accumulation in the short term seems to be driven by those at the bottom quintile of filial wealth distribution. For those whose parents have approached the eligible age of the NRPS, the average positive effect in the short term is likely to be driven by those at the top of the filial wealth distribution. Differences also exist in other key variables like parental wealth for the cohort younger than 60 years old and its interaction with the NRPS status for the cohort being at least 60 years old. Moreover, given that we cannot reject the null hypotheses of homoscedasticity and the absence of intra-cluster correlation, quantile regressions are more appropriate specifications than the standard linear 2SLS.

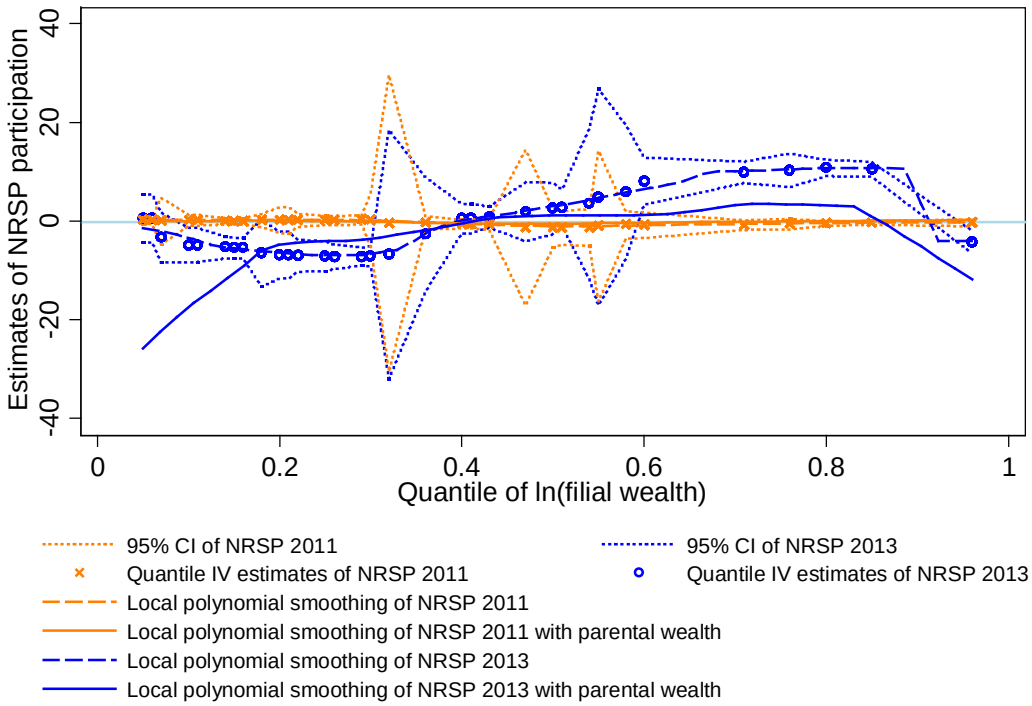
5.2 Wealth-dependent treatment effects of the NRPS

Immediate treatment effects

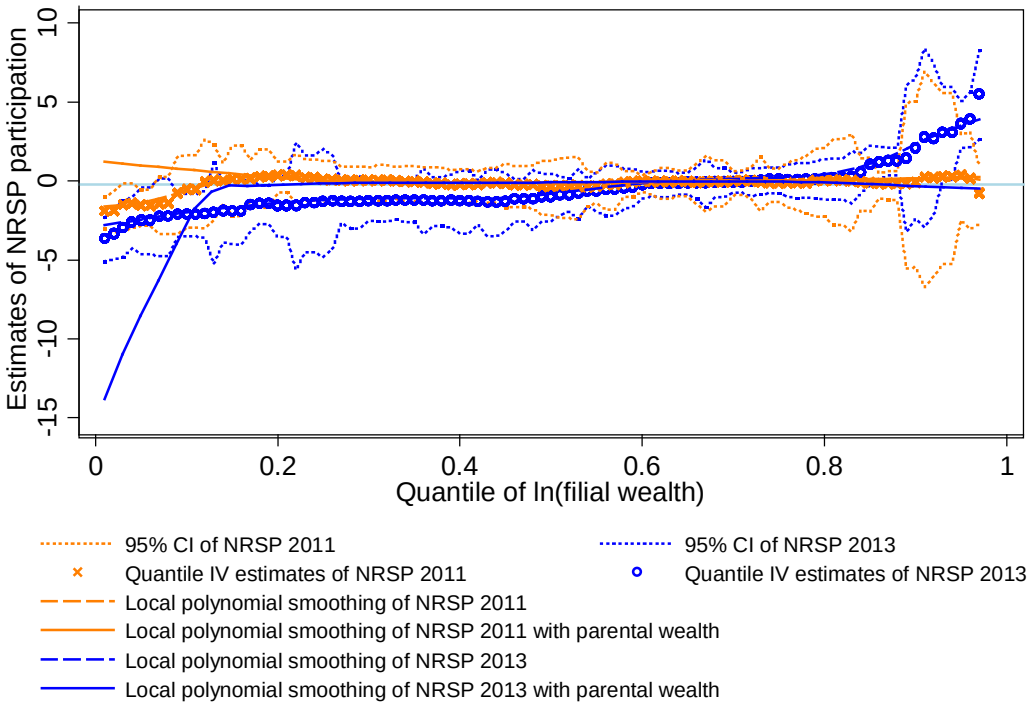
Figure 4 shows the estimated impact of parental NRPS status on filial wealth against the entire distribution of filial wealth. For those having less wealth than the median, having parents join/receive the pension per se does not account for filial wealth accumulation (the blue dashed lines in Figures 4a and 4b). This negative impact becomes much larger for those in the bottom quintile when taking parental wealth into account (the blue solid line in Figures 4a and 4b). This seems to be at odds with the general argument that old age pensions can function as an insurance mechanism that protects the poor.

Figure 4: Impact of the NRPS on filial wealth (by parental age)

(a) 45 ≤ age < 60



(b) age ≥ 60



Source: Authors' calculation based on the CHARLS 2011 and 2013.

We discuss separately the two cohorts. For those whose parents are younger than 60 years old, there are two likely reasons for the negative effect of the pension scheme on filial wealth. One is additional economic burdens brought about by the NRPS to the poor; 38.46 per cent of the filial generation in the bottom wealth quintile had participating parents in the NRPS. The most-reported reason for non-participation in treated communities was 'unaffordability'. Among the filial generation in the bottom wealth quintile having participating parents, the parental average annual premium was 146 yuan, equivalent to 5.87 per cent of parental annual net income (2,488 yuan). All participating parents chose the method of annual payment and had to pay for on average 9.65 years before starting to receive the benefit. In total, 9.8 per cent of participating parents relied on children to pay the premiums. In this case, the filial generation's annual premium payment, including him/her and at least one parent, would constitute 7.8 per cent of their net income (≈146 × 2/3,741.6 yuan). As such, it is not surprising to see that individuals in the bottom wealth quintile having parents below 60 years old experienced negative 'net' transfer, which is the transfer they received from parents minus the transfer they gave to parents. Their parental participation in the NRPS aggravated this negative net transfer, at least in the short term, by 42.8 per cent, from −170.21 yuan per annum to −243.01 yuan, because it pushed up filial total transfer to parents by 44 per cent at a 10 per cent significance level, from 537.28 yuan per annum to 773.25 yuan.

The other reason might be related to behavioural changes induced by intergenerational transfers. The first behavioural change is time reallocation between generations. In the bottom filial generation wealth quintile, 90.2 per cent of participating parents relied on their own income for the pension payment. As a result, participating parents worked 7.95 months over the last year, which was 2 months longer than non-participating parents did (5.83 months) at the 10 per cent significance level. This additional work was concentrated in agriculture. The share of parents working in household agriculture over the previous year was 10.7 percentage points higher for

those having joined the NRPS (78.2 per cent) than for those having not (67.5 per cent) at the 1 per cent significance level.[12]

Increased parental work in income-generation activities would squeeze out their time spent in helping their children with various aspects of life, typically taking care of their grandchildren. Our data show that parents joining the NRPS visited their children 9.7 per cent less (≈(4.72 – 5.18)/4.72, i.e. from more than twice to at most once per month) than those non-participants did, at the 5 per cent significance level. Among extended families having three generations, 98.4 per cent of the parental generation without the NRPS took care of their grandchildren in the previous year, while 80 per cent of NRPS participants did so. The number of weeks parents spent in grandchild care in the previous year also dropped from 55.3 for non-participants to 47.2 for participants. These changes are statistically significant at the 1 per cent level. Parental less practical help in turn would crowd out the filial generation's time that could have been devoted to activities that generate wealth. Unfortunately, we are unable to test this last 'step' of the channel, given that our data do not contain information on both generations' specific time allocation.

The second behavioural change is filial adjustment in the wealth portfolio. Those members of the filial generation in the bottom wealth quintile increased their financial wealth by 30.5 per cent, from 1,933.89 yuan to 2,523.66 yuan if their parents joined the NRPS. Correspondingly, the share of financial wealth in total wealth increased from 3.47 per cent to 5.45 per cent, with the difference being significant at the 10 per cent level. Meanwhile, the value of agricultural and business assets does not vary between adult children with participants and non-participants at three conventional significance levels. The value of durable assets reduced by one-third at the 10 per cent significance level, from 3,055.88 yuan to 2,027.02 yuan.[13] These conform to the illiquidity hypothesis of pension wealth. On anticipating continuous help to their parents due to contribution to an illiquid asset in the next one decade, the poor who have already been heavily liquidity constrained would switch from accumulating (non-financial) productive assets of little liquidity to financial ones of high liquidity.

Further looking into the composition of financial assets, the increases were driven by bonuses and subsidies attached to work rather than by cash, deposits, or funds. The former increased from 2.5 yuan to 133.8 yuan in the previous year at the 10 per cent significance level, while the latter increased from 1,102.75 yuan to 1,343.02 yuan without statistical significance. This implies that for those at the bottom of the wealth distribution, not only do participating parents work more, as we showed before, but so do their adult children.[14] Interestingly, the increased work-related bonuses and subsidies are roughly equivalent to the average annual contribution to the NRPS.

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[12] This difference increases to 15 percentage points between new participants and never-participants at the 1 per cent significance level, indicating an immediate strong work motivation of the NRPS. There is no statistically significant difference in expected retirement age between participants and non-participants. Neither do they differ in non-agricultural work, possibly because of limited non-agricultural opportunities and/or high initial thresholds for the poor.

[13] We are not able to directly check adult children's consumption or ascertain whether adult children sold some durable assets as a response to parental participation. Our dataset does not have information on whether adult children sold assets, their consumption, or labour/time allocation.

[14] Unfortunately, it is not possible to test this since there is no information on adult children's labour and time allocation, consumption, or their own NRPS status in our dataset.

The negative impact of the NRPS on filial wealth also appears to affect those staying in the bottom wealth quintile and having parents older than 60 years old, i.e. receiving the benefit (the blue solid line in Figure 4b). Moreover, the magnitude of this negative impact was stronger than that of those whose parents were still contributing (Figure 4a). This is likely due to the eligibility of the NRPS recipiency introduced in Section 2. All 'eligible' rural adults have to join the NRPS in order to have their parents (aged 60 or above when the NRPS was introduced) get benefit without contribution. This term, on the one hand, pushes up coverage rates as expected by policy makers at all ages, while on the other hand unintendedly imposes additional burdens on the poor, especially when local enforcement of the policy also varies substantially.

For the cohort older than 60 years old, 45.3 per cent of the filial generation in the bottom wealth quintile had parents receive the benefits. Under different local interpretations and time variation in the implementation of the NRPS, one-quarter of recipients in the parental generation said that they still had to pay an average premium of 143.4 yuan per annum for an average of 2.95 years before taking benefits. A total of 4.6 per cent of recipients paid a lump sum of an average amount of 5,139 yuan, which is equivalent to an average annual contribution of 231.8 yuan; 78 per cent of recipients relied on themselves for these payments, while the remaining 22 per cent resorted to family members. This means that the filial generation not only has to pay their own premiums (equivalent to 13.5 per cent of their annual net income (≈146 yuan/1,083 yuan for the bottom quintile) but also their parents' occasional annual premium or lump sum, which would be at least an additional 34.6 per cent (≈(143.4+231.8) yuan/1,083 yuan) per annum, in order to make their parents eligible for benefits. Even considering that siblings can share their parental contributions, this additional burden would be 14.5 per cent (≈34.6%/2.39) per person in the case of an average sibling size of 2.39.

Different from parents aged below 60 years old, those receiving payouts and aged 60 years old or above worked less, although some still had to pay large contributions. The shares of undertaking agricultural work (defined by working for at least ten days over the last year) reduced from 56.6 per cent to 46.5 per cent if the parent received the payout. Similarly, 7 per cent undertook non-agricultural work (defined by working at least one hour over the last week) without the payout, but only 3.67 per cent still did so on receiving the payout. The total number of months worked in various kinds of employment does not change significantly with NRPS treatment.

In respect of the two filial behavioural responses, there is partial evidence supporting time reallocation. Parents visited children 6.4 per cent (≈(4.54 – 4.85)/4.85) less when they had the NRPS, but without statistical significance. The probability of taking care of grandchildren declined from 98.7 per cent to 90.7 per cent, as the number of weeks spent in grandchild care in the previous year also did. Both changes are statistically significant at the 5 per cent level. In contrast to the cohort below 60 years old, the illiquidity hypothesis does not hold here. The filial generation in the bottom wealth quintile appears to use their existing financial wealth to pay possibly large pension contributions: the share of financial wealth in total wealth dropped sharply from 2.18 per cent to 0.54 per cent at the 1 per cent significance level if their parents became NRPS recipients. The average value of financial wealth reduced from 278.24 yuan to 13.26 yuan at the 1 per cent significance level. Interestingly, this reduction (264.98 yuan) was roughly 1.85 times the parental average annual contribution (264.98/143.4). This echoes our

previous argument that adult children not only have to join in order to make their parents eligible for the payout, but also might help their parental contribution to the pension scheme.[15]

In contrast to the bottom wealth quintile, there is a positive impact of the pension on filial wealth accumulation for the rich in both cohorts, but apparently for different reasons. For the cohort with parental age below 60 years old, 65.6 per cent of the filial generation in the top wealth quintile have participating parents with an average annual premium of 152 yuan for 10.49 years, lump-sum payment of 1,381.6 yuan (equivalent to an annual amount of 285.3 yuan) reported by 19 individuals, and supplementary annual payment of 858.3 yuan reported by 12 individuals. The annual premium is only 3.8 per cent of participants' net income (3,968.4 yuan) and 99 per cent of participants paid for themselves rather than their children doing so. Given the parental generation's good economic conditions, participants do not necessarily work more. There are no statistically significant differences in the total number of parental working months over the last year between participants and non-participants, but more (fewer) participants worked in agriculture (non-agricultural activities) and participants reported a two-year higher expected retirement age than non-participants. From the sixth decile of wealth distribution, adult children are 'net recipients' and parents transfer more net wealth to their adult children, from an average of 90.94 yuan without the NRPS to 270 yuan per annum with the NRPS. The incidence and the amount of time of grandchild care also increased for participating parents.

For the cohort with parental age of at least 60 years old, 69.9 per cent of top wealth-holders have their parents receiving payouts from the NRPS. We suspect time reallocation rather than direct intergenerational transmission matters here in explaining the positive impact of the NRPS on filial wealth. In this cohort, adult children in the top wealth quintile are 'net givers' in terms of negative net transfer from parents, the 'deficit' was expanded from −485.62 yuan per annum for non-beneficiaries to −583.55 yuan for beneficiaries, possibly because the design of the NRPS involves large lump-sum contributions within a short time. Beneficiaries alternatively spent more time in taking care of their grandchildren—the number of weeks in the last year increased from 37.9 without the NRPS to 41.4 with the NRPS at the 10 per cent significance level.

As such, there are positive effects of parental participation and membership to the NRPS on filial wealth for the rich (the blue dashed lines in Figures 4a and 4b). Nevertheless, they disappear when parental (already substantial) wealth is taken into account (the blue solid lines in Figures 4a and 4b).

Dynamic treatment effects

By focusing on those parents that first joined NRPS in 2011, we can estimate the medium- term effects of the NRPS. Overall, we find insignificant effects of the pension scheme on filial wealth accumulation in the subsequent two years (see Columns 2–4 and 6–8 of Table 9 and also the orange dashed lines in Figures 2a and 2b). When taking parental wealth into account, individuals at the bottom of the wealth distribution and having parents with NRPS benefits still have opportunities to accumulate wealth (the orange solid line in the left part of Figure 4b). The reasons could be attributed to intergenerational transfers as well as the two behavioural responses discussed earlier. Even though the filial generation in the bottom wealth quintile are

[15] Most components of non-financial wealth, namely housing assets, agricultural assets, and business assets, dropped sharply at the 1 per cent significance level on parental recipiency of the pension, but again, we cannot ascertain a causal interpretation for the NRPS. That is, our dataset does not have information on whether adult children sold assets.

still 'net givers', they transferred less to their parents if their parents have been recipients since 2011 (522.34 yuan per annum) compared with those whose parents only received benefits in 2013 (628.88 yuan per annum). Consequently, the filial financial wealth rebounded substantially from 7.14 yuan if their parents just became pensioners in 2013 to 77.53 yuan if their parents joined early in 2011. The difference between them is statistically significant at the 1 per cent level. For time reallocation, even though parents visited their children less frequently and were less likely to take care of their grandchildren compared with never-participating parents, the differences between new and continuous participants are not statistically significant.

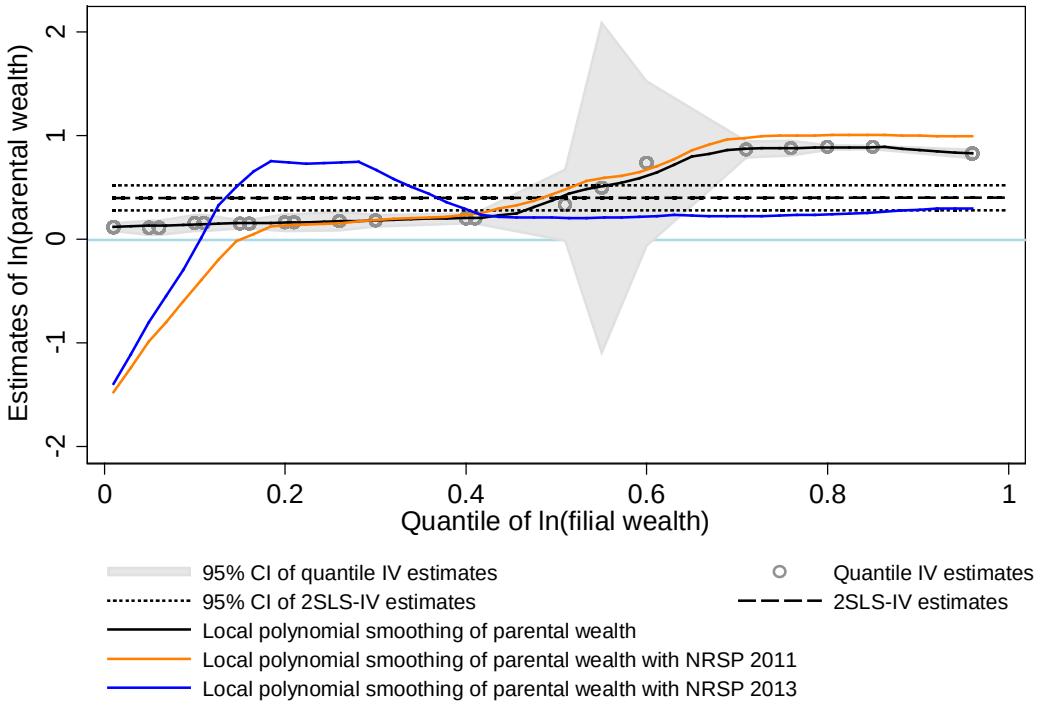
For the filial generation in the bottom quintile, we regressed the frequency of parental visits to adult children on the controls in Equation (6). The interaction between parental NRPS membership in 2011 and parental wealth is −0.348 at the 10 per cent significance level. Given that our frequency measure takes a descending order, the negative estimate indicates more visits to adult children among 2011 NRPS recipients if they had more wealth. We also regressed the number of weeks spent by parents engaged in grandchild care in the previous year on the same controls for the bottom quintile. The estimated coefficient of parental wealth is negative, indicating that in poor extended families, parents offer more practical help and thus, the filial generation would have more chance to embark on wealth accumulation activities. Overall, if parents offer more practical help, the filial generation would have more chance to embark on wealth accumulation activities, as reflected by the upward orange solid line for the bottom quintile in Figure 4b.

5.3 Intergenerational dependence of wealth in the presence of NRPS

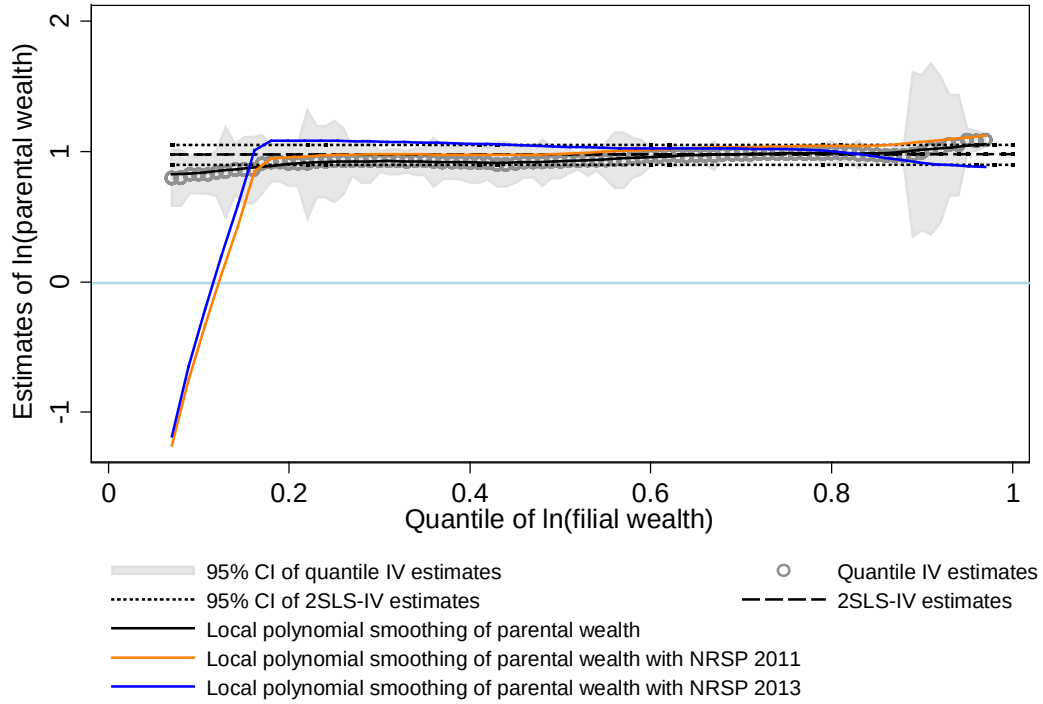
Given the wealth-dependent impact of the NRPS, parental wealth may well exhibit different patterns of association with that of their children. Figure 5 draws the estimated impact of parental wealth on filial wealth with and without the NRPS, respectively. There is clearly positive intergenerational association in wealth, as indicated by black dashed lines in Figure 5. As indicated by Table 9, the estimates of parental wealth are highly heterogeneous for those whose parents are below 60 years old, but become more homogeneous as parents become older (i.e. for those whose parents are at least 60 years old).

Figure 5: Distributional impact of parental wealth for the NRPS (by parental age)

(a) 45 ≤ age < 60



(b) Age ≥ 60



Source: Authors' calculation based on the CHARLS 2011 and 2013.

When taking parental compliance with the NRPS into account, intergenerational wealth dependence drops for individuals in the bottom wealth quintile for both cohorts and in both the short and medium term (solid blue and orange lines in Figures 5a and 5b). Among the top wealth-holders, the NRPS appears to enhance intergenerational wealth dependence. This is consistent with the impact of the NRPS for the poor, as discussed above.

We calculated the correlation coefficient of intergenerational wealth dependence, as elasticity in log-linear coefficients is heavily subject to life-cycle bias (Nybom and Stuhler 2016) and the intergenerational correlation coefficient is less biased in the presence of intergenerational co-residence (Emran et al. 2017). Adapting Equation (13) to Björklund and Jäntti's (2009) definition, the intergenerational correlation coefficient of wealth is calculated as:

$$\exp\left(\hat{\beta}(\tau)\right)\frac{\sigma^{j}(\tau)}{\sigma^{i}(\tau)} \tag{15}$$

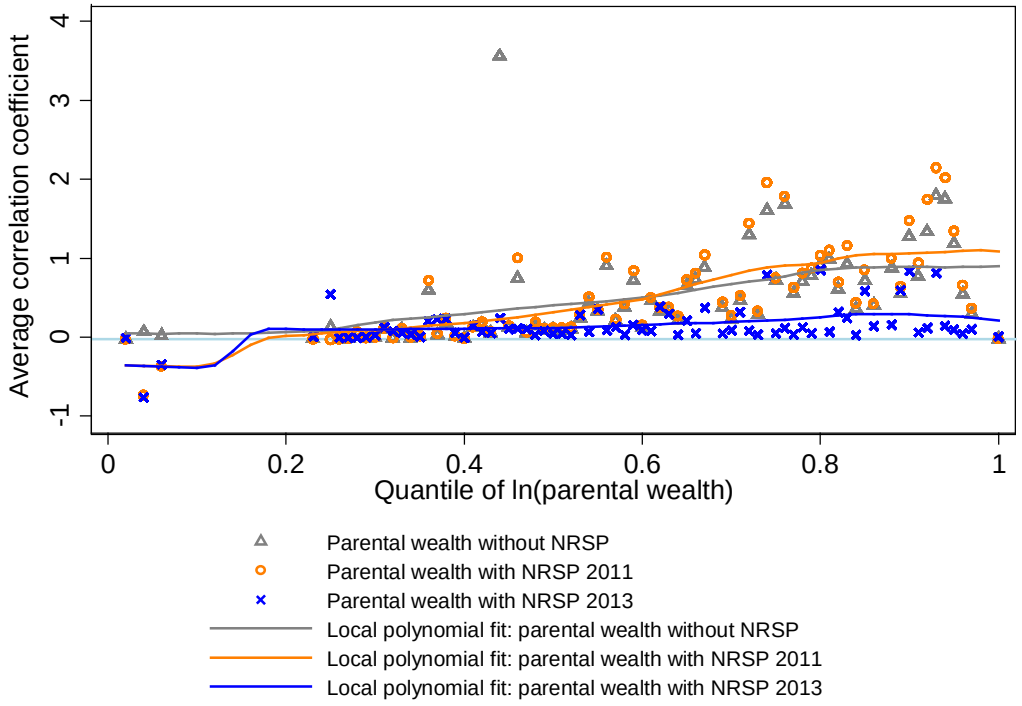
where $\hat{\beta}(\tau)$ is the estimated coefficient of log parental net wealth in Equation (13) at the τ th quantile at the distribution of filial wealth; $\sigma^{i}(\tau)$ and $\sigma^{j}(\tau)$ denote respectively the standard deviations of filial and parental wealth at the τ th quantile at the distribution of filial wealth. Considering the NRPS, Equation (15) is re-written as:

$$\left[\exp\left(\hat{\beta}(\tau)\right)+\exp\left(\hat{\delta}(\tau)\right)\cdot D_{j}\right]\frac{\sigma^{j}(\tau)}{\sigma^{i}(\tau)} \tag{16}$$

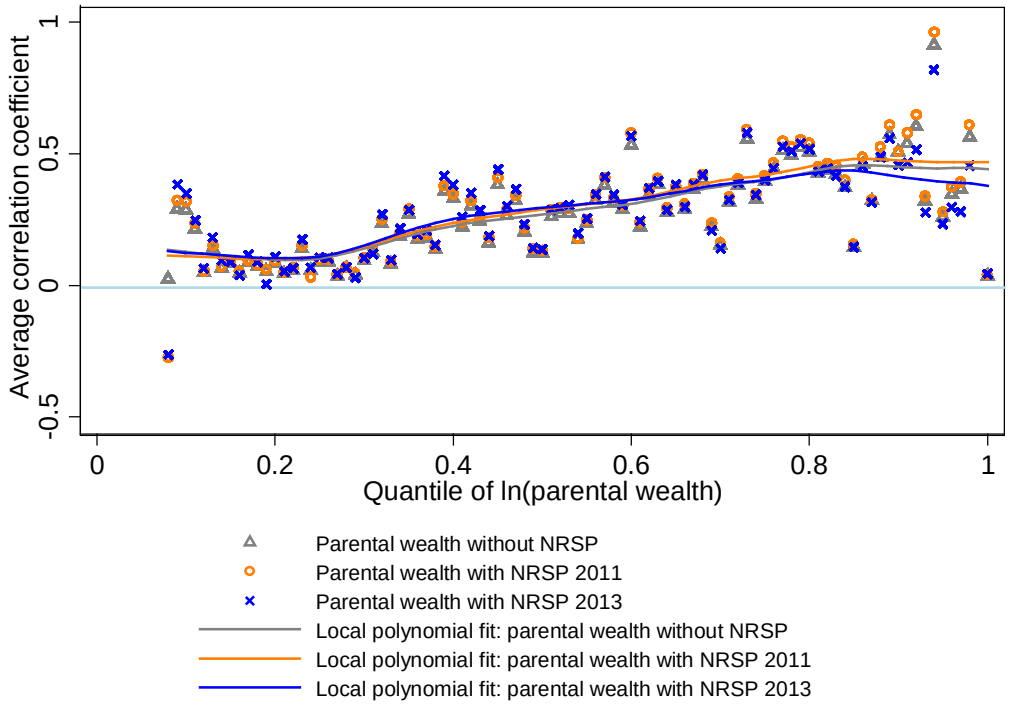
where $\hat{\delta}(\tau)$ is the estimated coefficient of the interaction between log parental net wealth and compliance to the NRPS. Figures 6a and 6b draw the results of Equations (15) and (16) along the distribution of parental wealth. There is an (non-linearly) increasing trend of intergenerational dependence of wealth for both age cohorts. This pattern is consistent with the general finding of greater intergenerational persistence at the peak of economic status (e.g. Black et al. 2015).

Figure 6: Correlation coefficient of intergenerational transmission of wealth

(a) 45 ≤ age < 60



(b) Age ≥ 60



Source: Authors' calculation based on the CHARLS 2011 and 2013.

For the cohort with parental age below 60, in the absence of the NRPS, the average correlation coefficient across all quantiles is 0.55. In the presence of the NRPS, its short-term treatment effects as discussed in Section 5.2 smooth the pattern of intergenerational dependence to nearly a flat line by pulling the poor filial generation to even negative coefficients (due to their negative net worth) and weakening the rich's association with their parents. The average intergenerational correlation coefficient drops to 0.14.

In the medium term, though, the pattern of intergenerational dependence returns to the initial position for those in the bottom half of the wealth distribution. The average intergenerational correlation coefficient rebounds to 0.50, which is 9 per cent (≈(0.50 – 0.55)/0.55) less than the one observed among adult children with parents without the NRPS, although the top wealth quintile's intergenerational dependence is strengthened. From the sixth decile, the difference in the intergenerational correlation coefficient between with and without the medium-term impact of the NRPS rises from 0.04 to 0.18 (equivalent to 11–19 per cent increases) and all are at a 1 per cent significance level.[16]

For the cohort with parental age below 60, the average correlation coefficient is 0.26 without the NRPS. It remains the same in the presence of short-term treatment effects of the NRPS, but rises to 0.27 under the medium-term impact. The difference in this coefficient between with and without the medium-term influences of the NRPS ranges between 3 per cent and 6.9 per cent from the second to the top decile, and are at 1–5 per cent significance levels.

6 Conclusion

We have analysed the distributional effects of the NRPS on wealth in the context of rural China. We find that the pension scheme affects the intergenerational wealth dependence through design features and eligibility conditions that generate behavioural responses between generations.

Our analysis indicates that the NRPS is an important yet insufficient policy instrument to protect people in old age, especially when they are located at the bottom-end of the wealth distribution. Parental compliance with the NRPS only seems to help the richest filial generation (in the top wealth quintile) accumulate wealth, but decreases wealth for the filial generation in the bottom quintile when parental limited wealth is taken into account. While the richest adult children seem to benefit from intergenerational transmissions of wealth and time reallocation of old adults, both stimulated by the NRPS, the poorest adult children seem to bear the burden of the pension's contributions due to high contributions relative to their income and low benefits, the time reallocation of pensioners induced by the scheme, and filial adjustment of the wealth portfolio under liquidity constraints.

The results suggest that the distributional treatment effect of the NRPS changed the pattern of the wealth dependence between generations right after compliance. In the medium term, however, the NRPS seems to strengthen intergenerational wealth persistence for the richest families and leaves the poorest with a negative net worth mobility. This, however, does not necessarily imply that the wealth inequality will increase across generations in the long term.

[16] The differences for the bottom half of the wealth distribution are trivial and statistically insignificant.

It is worth noting that the estimated treatment effects capture the comparison of filial counterfactual wealth with and without parental NRPS. Households located at different points of the wealth distribution may well have other arrangements for the support of elderly parents, including transfers within extended families.

Old-age pensions are generally regarded as effective policy responses to protect the elderly and their families against poverty and income shocks; however, our study shows that eligibility conditions can undermine their effectiveness. In the particular context of rural China, complementary transfers will be needed to support the poorest populations to absorb the cost of parental pension contributions and also assist with filial livelihood arrangements that can lessen their liquidity constraints. The absence of such complementary transfers will further strengthen intergenerational inequality of wealth in China.

References

Abadie, A. (2003). 'Semiparametric Instrumental Variable Estimation of Treatment Response Models'. *Journal of Econometrics*, 113(2): 231–63.

Abadie, A., and G. Imbens (2016). 'Matching on the Estimated Propensity Score'. *Econometrica*, 84(2): 781–807.

Abadie, A., J. Angrist, and G. Imbens (2002). 'Instrumental Variables Estimates of the Effect of Subsidized Training on the Quantiles of Trainee Earnings'. *Econometrica*, 70(1): 91–117.

Albarran, P., and O.P. Attanasio (2003). 'Limited Commitment and Crowding out of Private Transfers: Evidence from a Randomised Experiment'. *Economic Journal*, 113(486): 77–85.

Altonji, J.G., F. Hayashi, and L. Kotlikoff (1997). 'Parental Altruism and Inter Vivos Transfers: Theory and Evidence'. *Journal of Political Economy*, 105(6): 1121–66.

Amuedo-Dorantes, C., and L. Juarez (2015). 'Old-age Government Transfers and the Crowing out of Private Gifts: The 70 and Above Program for the Rural Elderly in Mexico'. *South Economic Journal*, 81(3): 782–802.

Attanasio, O.P., and A. Brugiavini (2003). 'Social Security and Households' Saving'. *Quarterly Journal of Economics*, 118(3): 1075–119.

Attanasio, O.P., and G. Weber (2010). 'Consumption and Saving: Models of Intertemporal Allocation and Their Implications for Public Policy'. *Journal of Economic Literature*, 48: 693–751.

Attanasio, O.P., A. Bonfatti, S. Kitao, and G. Weber (2016). 'Global Demographic Trends: Consumption, Saving, and International Capital Flows'. In: J. Piggott and A. Woodland (eds), *Handbook of the Economics of Population Aging*, Vol. 1. Amsterdam: Elsevier.

Bairoliya, N., D. Canning, R. Miller, and A. Saxena (2017). 'The Macroeconomic and Welfare Implications of Rural Health Insurance and Pension Reforms in China'. *Journal of the Economics of Ageing*, DOI: https://doi.org/10.1016/j.jeoa.2017.01.004.

Becker, G.S., S.D. Kominers, K.M. Murphy, and J.L. Spenkuch (2015). 'A Theory of Intergenerational Mobility'. MPRA Working Paper 66334. Munich: University of Munich.

Bernheim, B.D., A. Shleifer, and L.H. Summers (1985). 'The Strategic Bequest Motive'. *Journal of Political Economy*, 93(6): 1045–76.

Björklund, A., and M. Jäntti (2009). 'Intergenerational Income Mobility and the Role of Family Background'. In: B. Nolan, W. Salverda, and T.M. Smeeding (eds), *The Oxford Handbook of Economic Inequality*. Oxford: Oxford University Press.

Black, S.E., and P.J. Devereux (2011). 'Recent Development in Intergenerational Mobility'. In: O. Ashenfelter and D. Card (eds), *Handbook of Labor Economics*, Vol. 4, Part B. Amsterdam: Elsevier.

Black, S.E., P.J. Devereux, P. Lundborg, and K. Majlesi (2015). 'Poor Little Rich Kids? The Determinants of the Intergenerational Transmission of Wealth'. NBER Working Paper 21409. Washington, DC: NBER.

Blundell, R., E. French, and G. Tetlow (2016). 'Retirement Incentives and Labor Supply'. In: J. Piggott and A. Woodland (eds), *Handbook of the Economics of Population Aging*, Vol. 1. Amsterdam: Elsevier.

Boserup, S.H., W. Kopczuk, and C.T. Kreiner (2016). 'Intergenerational Wealth Formation Over the Life Cycle: Evidence from Danish Wealth Records 1984–2013'. Mimeo.

Brandt, M., and C. Deindl (2013). 'Intergenerational Transfers to Adult Children in Europe: Do Social Policies Matter?'. *Journal of Marriage and Family*, 75: 235–51.

Cai, F., J. Giles, and X. Meng (2006). 'How Well do Children Insure Parents Against Low Retirement Income? An Analysis Using Survey Data from Urban China'. *Journal of Public Economics*, 90(12): 2229–55.

Castaneda, A., J. Díaz-Giménez, and J. Ros-Rull (2003). 'Accounting for the U.S. Earnings and Wealth Inequality'. *Journal of Political Economy*, 111(4): 818–57.

Chen, T., G.W. Leeson, J. Han, and S. You (2017). 'Do State Pensions Crowd out Private Transfers? A Semiparametric Analysis in Urban China'. *Chinese Sociological Review*, DOI: http://dx.doi.org/10.1080/21620555.2017.1298968.

Chen, X. (2015). 'Old-Age Pension and Extended Families: How is Adult Children's Internal Migration Affected?' *Contemporary Economic Policy*, 34(4): 646–59.

Cheng, L., H. Liu, Y. Zhang, and Z. Zhao (2016). 'The Health Implications of Social Pensions: Evidence from China's New Rural Pension Scheme'. *Journal of Comparative Economics*, DOI: https://doi.org/10.1016/j.jce.2016.12.002.

Chetty, R., J.N. Friedman, S. Leth-Petersen, T.H. Nielsen, and T. Olsen (2014). 'Active vs. Passive Decisions and Crowdout in Retirement Savings Accounts: Evidence from Denmark'. *Quarterly Journal of Economics*, 129(3): 1141–219.

Cowell, F., B. Nolan, J. Olivera, and P. Van Kerm (2016). 'Wealth, Top Incomes and Inequality'. Working Paper 9. London: London School of Economics and Political Science, International Inequality Institute.

Cox, D., and M.R. Rank (1992). 'Inter-Vivos Transfers and Intergenerational Exchange'. *Review of Economics and Statistics*, 74: 305–14.

Cox, D., B.E. Hansen, and E. Jimenez (2004). 'How Responsive are Private Transfers to Income? Evidence from a Laissez-Faire Economy'. *Journal of Public Economics*, 88(9–10): 2193–219.

De Nardi, M. (2004). 'Wealth Inequality and Intergenerational Links'. *Review of Economic Studies*, 71(3): 743–68.

De Nardi, M., and F. Yang (2014). 'Bequests and Heterogeneity in Retirement Wealth'. *European Economic Review*, 72: 182–96.

Ding, Y. (2017). 'Personal Life Satisfaction of China's Rural Elderly: Effect of the New Rural Pension Programme'. *Journal of International Development*, 29(1): 52–66.

Duflo, E. (2000). 'Child Health and Household Resources in South Africa: Evidence from the Old Age Pension Program'. *American Economic Review*, 90(2): 393–98.

Ebenstein, A., and S. Leung (2010). 'Son Preference and Access to Social Insurance: Evidence from China's Rural Pension Program'. *Population and Development Review*, 36(1): 47–70.

Eggleston, K., A. Sun, and Z. Zhan (2016). 'The Impact of Rural Pensions in China on Labor Migration'. *World Bank Economic Review*, DOI: https://doi.org/10.1093/wber/lhw032.

Emran, M.S., W. Green, and F. Shilpi (2017). 'When Measure Matters: Coresidency, Truncation Bias, and Intergenerational Mobility in Developing Countries'. *Journal of Human Resources*, DOI: 10.3368/jhr.53.3.0216-7737R1.

Engen, E.M., W.G. Gale, and J.K. Scholz (1996). 'The Illusory Effects of Saving Incentives on Saving'. *Journal of Economic Perspectives*, 10(4): 113–38.

Feldstein, M.S. (1974). 'Social Security, Induced Retirement, and Aggregate Capital Accumulation'. *Journal of Political Economy*, 82(5): 905–26.

Feng, J., L. He, and H. Sato (2011). 'Public Pension and Household Saving: Evidence from Urban China'. *Journal of Comparative Economics*, 39(4): 470–85.

Frandsen, B.R., M. Frölich, and B. Melly (2012). 'Quantile Treatment Effects in the Regression Discontinuity Design'. *Journal of Econometrics*, 168(2): 382–95.

Frölich, M., and M. Lechner (2015). 'Combining Matching and Nonparametric Instrumental Variable Estimation: Theory and an Application to the Evaluation of Active Labour Market Policies'. *Journal of Applied Econometrics*, 30(5): 718–38.

Gale, V.G. (1998). 'The Effects of Pension on Household Wealth: A Reevaluation of Theory and Evidence'. *Journal of Political Economy*, 106(4): 706–23.

Galiani, S., P. Gertler, and R. Bando (2016). 'Non-Contributory Pensions'. *Labour Economics*, 38: 47–58.

Gerardi, K., and Y. Tsai (2014). 'The Effect of Social Entitlement Programmes on Private Transfers: New Evidence of Crowding Out'. *Economica*, 81(324): 721–46.

Gustman, A.L., and T.L. Steinmeie (2001). 'Retirement and Wealth'. *Social Security Bulletin*, 64(2): 66–91.

Gustman, A.L., and T.L. Steinmeie (2008). 'Projecting Behavioral Responses to the Next Generation of Retirement Policies'. *Research in Labor Economics*, 28: 141–96.

Gustman, A.L., and T.L. Steinmeie (2015). 'Effects of Social Security Policies on Benefit Claiming, Retirement and Saving'. *Journal of Public Economics*, 129: 51–62.

Gutierrez, E., L. Juarez, and A. Rubli (2016). 'The Effect of a Transfer Program for the Elderly in Mexico City on Co-Residing Children's School Enrolment'. *World Bank Economic Review*, DOI: https://doi.org/10.1093/wber/lhw012.

Hamoudi, A., and D. Thomas (2014). 'Endogenous Coresidence and Program Incidence: South Africa's Old Age Pension'. *Journal of Development Economics*, 109: 30–37.

Heckman, J.J., and E. Vytlacil (2005). 'Structural Equations, Treatment Effects, and Econometric Policy Evaluation'. *Econometrica*, 73(3): 669–738.

Hubbard, R., J.S. Glenn, and S.P. Zeldes (1995). 'Precautionary Savings and Social Insurance'. *Journal of Political Economy* 103: 360–99.

Imbens, G.W., and J.D. Angrist (1994). 'Identification and Estimation of Local Average Treatment Effects'. *Econometrica*, 62(2): 467–75.

Jansson, B. (2014). 'Intragenerational Income Mobility in Gothenburg, Sweden, 1925–94: Before, During, and After the Rise of the Welfare State'. *Australian Economic History Review*, 54(1): 14-36.

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

Landersø, R., and J. Heckman (2017). 'The Scandinavian Fantasy: The Sources of Intergenerational Mobility in Denmark and the US'. *Scandinavian Journal of Economics*, 119(1): 178–230.

Lei, X., C. Zhang, and Y. Zhao (2013). 'Incentive Problems in China's new Rural Pension Program'. In C. Giulietti, K. Tatsiramos, and K.F. Zimmermann (eds), *Labor Market Issues in China*. Bingley: Emerald Group Publishing Limited.

Liu, H., X. Han, Q. Xiao, S. Li, and M.W. Feldman (2015). 'Family Structure and Quality of Life of Elders in Rural China: The Role of the New Rural Social Pension'. *Journal of Aging and Social Policy*, 27(2): 123–38.

McCrary, J. (2008). 'Manipulation of the Running Variable in the Regression Discontinuity Design: A Density Test'. *Journal of Econometrics*, 142(2): 698–714.

Modalsli, J. (2017). 'Intergenerational Mobility in Norway, 1865–2011'. *Scandinavian Journal of Economics*, 119(1): 34–71.

Mu, R., and Y. Du (2015). 'Pension Coverage for Parents and Educational Investment in Children: Evidence from Urban China'. *World Bank Economic Review*, DOI: https://doi.org/10.1093/wber/lhv060.

Nybom, M., and J. Stuhler (2016). 'Biases in Standard Measures of Intergenerational Income Dependence'. *Journal of Human Resources*, DOI: 10.3368/jhr.52.3.0715-7290R.

OECD (2015). *Pensions at a Glance 2015: OECD and G20 Indicators*. Paris: OECD Publishing.

Ravallion, M. (2007). 'Evaluating Anti-Poverty Programs'. In: T.P. Schultz and J.A. Strauss (eds), *Handbook of Development Economics*, Vol. 4. Amsterdam: Elsevier.

Rowlingson, K., R. Joseph, and L. Overton (2017). *Inter-generational Financial Giving and Inequality*. Basingstoke: Palgrave Macmillan.

Saez, E., and G. Zucman (2016). 'Wealth Inequality in the United States Since 1913: Evidence from Capitalized Income Tax Data'. *Quarterly Journal of Economics*, 131(2): 519–78.

Solon, G. (2004). 'A Model of Intergenerational Mobility Variation Over Time and Place'. In: M. Corak (eds), *Generational Income Mobility in North America and Europe*. Cambridge: Cambridge University Press.

UNRISD (2016). 'Changing Demands, Emerging Providers: New Directions in Social Policy in China'. Project Brief, 14 February 2016. Geneva: United Nations Research Institute for Social Development.

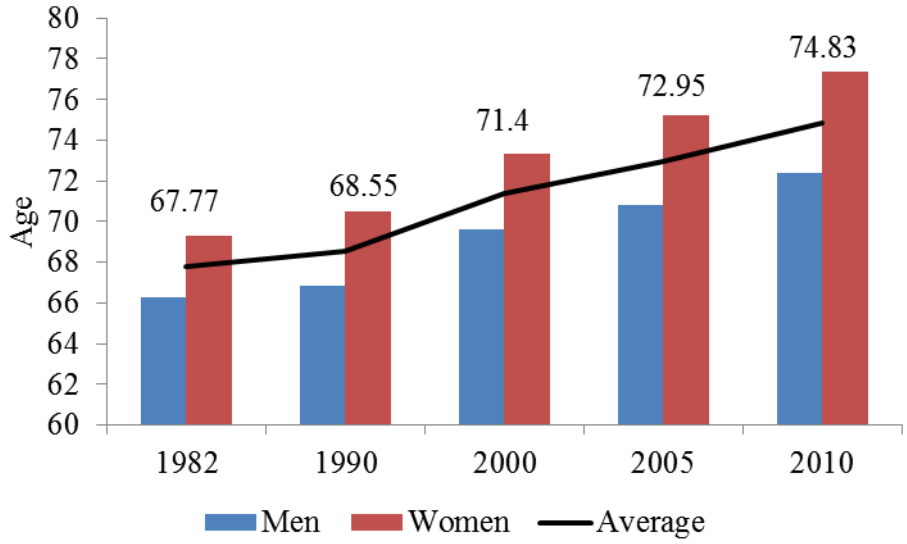
Williamson, J.B., L. Fang, and E. Calvo (2017). 'Rural Pension Reform in China: A Critical Analysis'. *Journal of Aging Studies*, 41: 67–74.

Zhao, Q., S. Brosig, R. Luo, L. Zhang, A. Yue, and S. Rozelle (2016). 'The New Rural Social Pension Program in Rural China: Participation and its Correlates'. *China Agricultural Economic Review*, 8(4): 647–61.

Zheng, H., and T. Zhong (2016). 'The Impacts of Social Pension on Rural Household Expenditure: Evidence from China'. *Journal of Economic Policy Reform*, 19(3): 221–37.

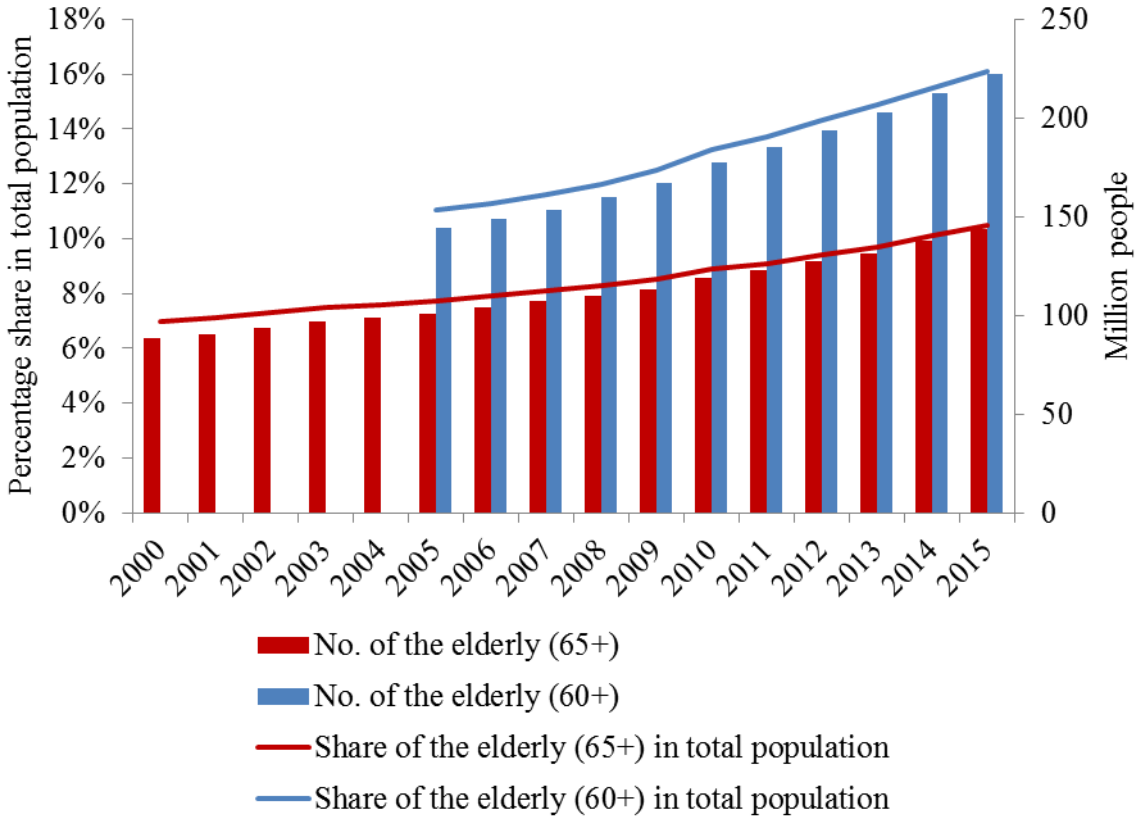
Appendix

Figure A.1: Life expectancy at birth



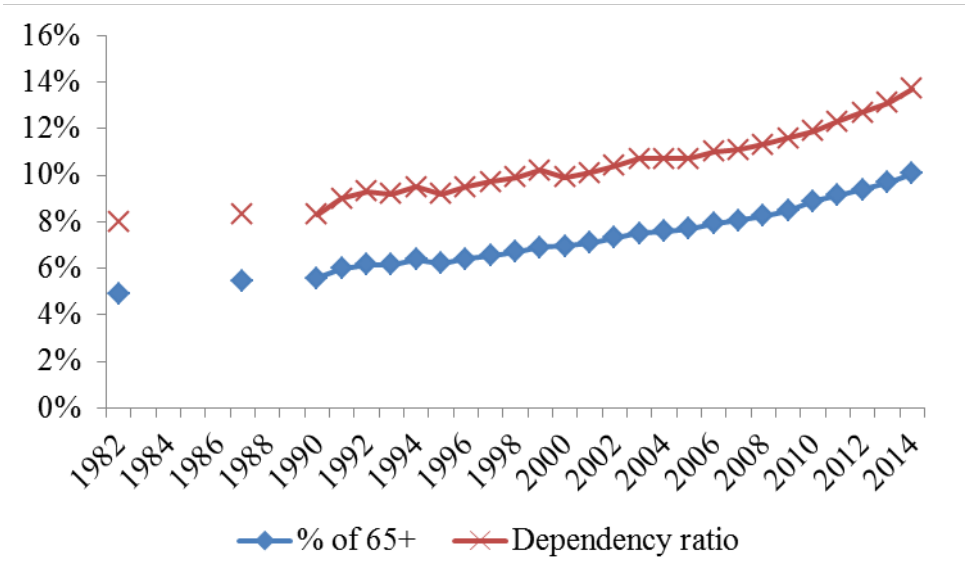
Source: Authors' compilation of aggregated data from the censuses in 1982, 1990, 2000, 2005, and 2010, released by the National Bureau of Statistics of China.

Figure A.2: Population ageing in China (2000–15)



Source: Authors' compilation of data from the Statistical Report of Civil Affairs published annually by the Ministry of Civil Affairs of China.

Figure A.3: Dependency ratio



Note: To keep consistency with the percentage share of the elderly, dependency ratio is calculated as the number by which the population aged 65 or above supported by 10,000 people aged 15–64 has increased.

Source: Authors' compilation and calculations based on from the censuses in 1982, 1990, 2000, 2005, and 2010, released by the National Bureau of Statistics of China.

Table A.1: Definition and descriptive statistics of variables

Variables	Definition	Mean	S.D.
Parents:			
Participation to /recipiency of the NRPS in 2013	Dummy variable, 1 = participation for parents below 60 years old/recipiency of benefits for parents aged 60 or above in 2013; 0 = otherwise.	0.695	0.460
Participation to /recipiency of the NRPS in 2011	Dummy variable, 1 = participation for parents below 60 years old/recipiency of benefits for parents aged 60 or above in 2011; 0 = otherwise.	0.255	0.436
Net wealth	The sum of financial assets and non-financial assets net of all debts. Financial assets include cash, deposits, loans lent to others, stocks, funds, and bonds. Non-financial assets include housing assets, fixed assets (such as productive assets and consumer durables) and other assets. Pension wealth is not included.	75,220.59	308,679.3
Net annual income	Total income net of costs involved in production and taxes. For those who have not retired, total income includes agricultural income, wage income, subsidies, and government or family transfers. For retirees, total income further includes all kinds of pension income.	2,725.029	9,471.827
Age	Age measured by years.	63.811	10.217
Years of education	The number of years of completed formal education.	3.899	4.194
Gender	Dummy variable, 1 = man; 0 = women.	0.493	0.500
No. children	The number of biological children who are alive.	2.692	1.364
Health	Dummy variable, 1 = ill over the last year; 0 = otherwise.	0.137	0.344
Disabled	Dummy variable, 1 = disabled; 0 = otherwise.	0.134	0.341
Filial:			
Net wealth	Same as above.	98,978.57	399,784.2
Net annual income	Same as above.	2,345.051	9,289.76
Age	Same as above.	35.262	11.769
Years of education	Same as above.	6.899	4.462
Gender	Same as above.	0.530	0.499
No. children	Same as above.	1.456	14.939
Marriage	Dummy variable, 1 = married; 0 = otherwise.	0.880	0.325
Community:			
Community treatment	Dummy variable indicating whether the NRPS has been implemented in the community by 2013, 1 = yes and 0 = no.	0.835	0.372
Per capita net income	Community average net income over the last year, yuan.	3,818.709	4,607.672
Share of the elderly	Percentage share of the population aged 65 or above in the community in 2013.	0.213	0.147
Community old-age care	Dummy variable, 1 = the community has set up old-age care centres for the elderly; 0 = otherwise.	0.278	0.449

Note: The table reports 2013 statistics except those being specified. All monetary variables have been translated into 2013 prices by using provincial consumer price indices from various issues of *China Statistical Yearbooks* published annually by the National Bureau of Statistics.

Source: Authors' calculation based on the CHARLS 2011 and 2013.