# The Behavioral Effects of New Pension Coverage: the Case of the New Rural Pension in China

By

**QIANG, Feifei**

**THESIS**

Submitted to

KDI School of Public Policy and Management

in partial fulfillment of the requirements

for the degree of

DOCTOR OF PHILOSOPHY IN DEVELOPMENT POLICY

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Committee in charge:

Professor Taejong KIM

Professor Booyuel KIM

Professor Shun WANG

Professor Heesuk Yun

Dr. Yoonsoo PARK

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## *1.1  Social welfare systems in China*

Before the new rural pension reform in 2009, there are three major public pension programs in China's current social welfare system. They are *Pension Program for the Government or Institution* (政府机关和事业单位退休金), *Basic Pension of the Firms* (企业职工基本养老保险) and *Rural Pension*[1] (农村养老保险，"老农保"). The key feature of these three public pension programs is that they are designed for different groups of citizens depending on the diverse nature of employment relations and capacity of individuals to make contributions (World Bank 2013). For instance, *pension program for the government or institution* is designed for public employees working in government or public institutions, such as public schools, hospitals and other research institutes. Normally, there is no restriction for *hukou* status. *Basic pension of the firms* is designed for firm employees with full contract who are mostly non-agricultural *hukou* holders. And *rural pension* is for all agricultural *hukou* holders who are not covered by the previous 2 programs. As a consequence, rural residents would have very little access to the first two programs as most of them are not eligible.

It should be pointed out that the scope of China's public pension system is distinguished by *hukou*[2] status instead of residence area. For example, in the special case of migrate workers,

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[1] Rural pension here refers to "old" or existing rural pension program before the reform. And "old" and "new" are terms used in this paper to distinguish the rural pension programs before and after the reform. Old rural pension (short for ORP) is with the official name rural pension (农村养老保险，"老农保") while new rural pension (short for NRP) is officially named as new rural social pension insurance（新农村社会养老保险，"新农保"）.

2 A *hukou* is a record in a government system of household registration required by law in China, and determines where citizens are allowed to live. There are mainly two types of *hukou* status, Agricultural *Hukou* and Non-agricultural *Hukou*, which is mainly assigned to rural and urban residents respectively. In general, an individual's *hukou* status is initially determined by parents' *hukou* status. And it is very difficult to change one's

most of them are not eligible to *Basic Pension of the Firms* even though they work and live in urban areas, because migrate workers normally do not have full contract with firms and they are agricultural *hukou* holders.

While the eligibility of these three programs is different, the setting on levels of contribution as well as pension benefits also differs a lot. The public service employee pension system is equivalent to traditional DB systems in the US, with a pension benefit replacement rate of 90% after retirement. This pension is entirely funded (100%) by the government from its general revenue. The urban employee pension system is operated by each local government and comprised of a pay-as-you-go basic pension and a 401(k)-type individual fund. Contribution rates were updated in 2006, which are financed by 17% employer contribution in basic pension and mixture of 11% in individual fund (with contributions 3% come from employer and 8% made by employee) referring to employee's salary. And the rural pension system is entirely funded by individuals given voluntary participation. There was no government subsidy or pension benefits under this scheme and operating expenses were covered by the pension funds. In other words the government responsibility and support has been seen very limited under this old rural pension scheme. By the end of 2008, the number of persons covered by these three pension programs is 219 million, 19 million and 56 million respectively[3].

When we consider the fact that more than 70 percent of China's population are agricultural *hunkou* holders according to 2010 population census, rural residents are much less covered by social safety network in the sense of both fewer covered population and lower level of pension benefits.

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hukou status once it is assigned at birth. Therefore, the term rural residents and urban residents used in the rest of papers are used according to the *hukou* status instead of currently location of residence.

[3] Data source: China Labour Statistical Yearbook 2010.

And all these differences seem just confirm the existence of huge rural-urban segregation in China. A report from the Asian Development Bank (Leisering et al. 2002) described China as a country with a distinct rural and urban divide that is established both politically and legally. On the contrary, the recent series of pension reforms are considered as key transformation from the existing formal sector workers centered system to one with universal coverage incorporating both formal and informal workers. Therefore, the rural pension reform is an important step to promote equalization of basic public service

## *1.2 Motivations for rural pension reform*

Apart from the historical rural-urban gap in the pension welfare presented above, here are two more socio-economic drives for this new rural pension reform.

### 1.2.1 Population aging

China constitutes one fifth of the world's population, reached to 1.35 billion in the past sixty years and is expected to touch 1.5 billion by 2030 with 440 million of age sixty and above by 2050 (UN 2010). This extraordinary jump has created huge concern for the policy makers for various reasons. First, the economic pace is expected to slow down because of the low productivity of older population compared to the working age population. Second concern is the increasing dependency ratio of older people on younger population will consequently change the saving and consumption behavior of the families. Third is the burden on the economy as a whole because elderly people require more healthcare than the younger and are likely to impose constraints on public finances.

There are mixed views about population aging and its impact on economic growth that varies from country to country case. Some argues that population aging is likely to induce fiscal challenges for the governments as the proportion of people who make payments to

the government will decrease (OECD 2003). There are other finding which suggest that population aging will not create that severe economic consequences as predicted by various researchers particularly in the case of China (Bloom et al. 2010). According to a report from the Canadian government which argues that population aging create opportunities for investment in human capital that may stimulate economic growth and mitigate the risk of aging population. Similarly there are also mixed views about China. Cai and Wang (2006) argued that having the comparative advantage in labor intensive commodities, the challenge for Chinese labor market is the supply of skilled labor force to sustain its economic pace otherwise China can lose its competitiveness in the world exports. Other argues that relaxing rural to urban migration can sustain the export competitiveness of China (Peng and Mai 2008). Nonetheless, like many other countries China economic growth is expected to decrease in the coming future because of increase in the aging population which is likely to divert government attention in establishing social safety nets and broadening the coverage of social welfare program in the country.

## 1.2.2 Support for the elderly in China

China has made good progress in expanding social welfare programs from the last few decades; however this is not enough and much need to be done in order to cater the increasing trend of elderly people. During 1960 and 1970 China was presented as a model for its strong social safety nets in both rural and urban areas, however after 1978 economic reforms the coverage of social safety nets are stopped in rural areas and became limited in urban areas. The existing government anti-poverty programs which include social welfare system and unemployment insurance provide support to only 4-6% of the population aged 60 and above. Most of the elderly population mainly depends on their own labor income

followed by support from family members (Bloom et al. 2010). Table 1.1presents various modes of support to elderly people by region and cities. It is evident that in rural area a significant portion of elderly (51.3 percent) depend on their own working and earnings followed by 40.5 percent getting supports from other family members. This is mainly because of access, rural people lack access to pension program and only 4.1 percent of the rural elderly populations can rely on pension support. Similarly an even smaller portion (2.4 percent) of the old age people depends on the welfare support.

What's worse, it is believed that old-age poverty goes hand in hand with the shortage of elderly support. According to estimation, over half of elder people worldwide lack income security, and this figure could grow to 1.2 billion by 2050 (Kidd 2009; Evans 2007; Gasparini 2007; Harding 2008). In China, it was estimated that there were more than 18 million older people over 60 years living under the poverty line in 2011, and 14 million were in rural areas (Lu 2012; Sun 2015). And these are those poor rural residents with least pension support.

As indicated in the Table 1.1, a vast majority of the rural elder depends on the own working and savings. This has created an alarming situation for observers in and out of the country particularly the elderly people in rural China. Due to decline in fertility and small family size and migration of young people to urban areas, it is likely to create problems in household old age supports. Although this is a legal obligation that young children will support the elderly but this law is hard to enforce by taking into account family socioeconomic characteristics (Bloom et al. 2010).

The vulnerabilities are more sever when looking into the perspective of gender inequality in China. Women are more likely to create burden on the younger population during their old age when they are widows hence depends more on the family support compared to their male counterparts. According to the population census of China (2010), almost 53

percent of female depends on the family support, 21.9 percent depends on their working and earnings. The ratio is higher for widowed who have 66.1 percent dependency on their family support and 10.9 percent on their own working and earnings. Therefore gender perspective in the public pension and benefits is crucial as their dependency on the family support is much higher than male (Chen and Turner 2015).

## 1.3  NRP's main principles and phase-in design

With the announcement of Doc.32 "Guiding Principle on the Development of the New Rural Pension Pilot" (State Council of China, 2009), the reform on rural pension was initiated as new Rural Pension Pilot Program (NRPP) for rural residents in 2009 which was transformed into new Rural Pension Scheme (NRP henceforth, full name being *New Rural Social Pension Insurance*) later. The guiding principle of the pilot is basic insurance and wide coverage with flexibility and sustainability[4]. The main target of NRP includes "accelerating the construction of a social security system covering both urban and rural residents", "expanding domestic consumer demand", "gradually narrowing the rural-urban gap, transforming dualistic structure and promoting equalization of basic public service" and "achieving old-age support for vast of rural residents, promoting family harmony and increasing farms income".

### 1.3.1 ORP versus NRP

Unlike the old pension scheme, the source of contribution was made more dynamic in NRP. The source of contribution includes subsidy from central and local governments, collective subsidy and individual contribution. From individual accounts only in the old pension system,

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[4] The corresponding expression of these basic principle is documented as "保基本、全覆盖、多层次、可持续" in Chinese.

the NRPS was comprised of both individual account as well as basic pension account. The basic pension benefits to be paid by the central government while premium subsidy to be provided by the local government. Central government subsidy of 55RMB is guaranteed to be provided in the form of pension benefits which is to be adjusted according to the inflation rate in the country.

There are two main differences between old and new rural pension. First, the source of contribution is different. Old rural pension mainly rely on individual contribution by rural residents themselves, which is in fact self-saving. New rural pension will have multiple sources, including central and local government subsidy, collective subsidy and individual contribution. Second, structure of payment is different. Old rural pension uses only individual pension accounts while the payment of new rural pension combines a basic pension account with individual accounts. And payment from basic pension account is guaranteed by state financing.

Besides these major differences, NRP keeps the setting of voluntary participation of individuals which is distinct from the mainstream mandatory public pension system. Individuals not only choose whether to participate NRP but also choose their preferred premium level if participating.

The detailed summary of the comparisons between the old and new rural pension can be found in Table 1.2.

## 1.3.2 Institutional arrangements for NRPS scheme

The New Rural Pension (NRP) is divided into main parts, (i) individual premium and (ii) government subsidy. The individual premium is comprised of five categories including 100RMB, 200RMB, 300RMB, 400RMB, and 500RMB per year. Government subsidy consists

of two main sources, local government and central government. Local government is required to provide no less than 30RMB per year to individual fund while central government subsidy is guaranteed to provide 55RMB to basic pension benefits per month. Individual premium and local government subsidy is accumulated into individual account according to one year deposit rate. Central government subsidy of 50RMB will be provided as basic pension benefits to individuals. Therefore one of the good features in the new pension scheme will be that an individual can be benefitted local government subsidy and individual premium which will be accumulated to individual account as well as basic pension benefits. The procedures of this institutional arrangement is illustrated in Table 1.3.

Some main contents of NRP are reported below, for more detailed description is also provided in Appendix 1.1.

- *Eligibility: Any rural residents, who are aged 16 or above and not participate in the Basic Pension of the Firms, can voluntarily participate. Students are excluded.*

- *Fund constitutes of individual contributions, collective benefits and government subsidies.*

    - ✓ *Individual premium is comprised of five categories including 100RMB, 200RMB, 300RMB, 400RMB, and 500RMB per year. Participants can freely choose the premium category. And the premium level can be modified as with economic growth.*

    - ✓ *Collective benefits are encouraged if the local collective group is affordable.*

    - ✓ *Government subsidy: The full amount of basic pension benefit should be insured by central government. Local government should set subsidize no less than 30 RMB per person per year.*

- *Pension benefit: The basic pension benefit from central government is 55 RMB per month. Local government can increase the basic benefit using local fiscal budget. Individual account will refund 1/139 of the accumulation at age 60.*

- *Pension benefit eligibility: Elders who are aged more than 60 and do not participate the Basic Pension of the Firms can receive the pension benefits on a monthly basis.*

When the beneficiary turns age 60, he/she can avail the benefits of the pension. He/she can get 1/139 of the total accumulation from the individual accounts up to 139 months as well as basic pension benefits of 55 RMB per month. Furthermore, the benefits are inheritable only from the accumulated individual funds and the government subsidy. The new pension system has incorporated many good aspects that could actually contribute in mitigating the risk of aging population in China. With higher responsibility from the government individual benefits are maximized from sources that include local and central government subsidy and of course individual premium. The financing means seems more durable than the old pension system where the source of operating expenses was the pension benefits. In the new pension system it is allocated into local fiscal budget which shows government will and commitment for supporting old age population in China.

Apart from the many positive aspects that have been incorporated into the new pension system, there are, however, some critics in the literature about this new pension system (Feng 2010; Feng & Dong 2010; Zhang 2010; Zhang J 2010; Lei et al. 2011; Song et al. 2015; Chen and Turner 2015). One major concern of the NRP is that the low premium and benefit level may not be generous enough to potentially change behaviors of the NRP participants. Some argues that the current pension system don't provide incentives for people particularly peasants and younger that actually questions the effectiveness of the new pension system (Feng and Dong 2010; Zhang 2010). In their findings they suggested that those who participate usually select the lowest payment standard and some others have a wait and see attitude because they may jump in if they actually see materializing the benefits of the pension on grounds. Furthermore there are constraints for enrollment into

the pension system for people who are approaching to age 60. Some researchers observe challenges in implementation of the current pension system in the view of demographic transition, rural to urban migration and fast wage growth (Song et al. 2011; Song et al. 2015). By constructing overlapping generation model, Song et al. (2015) suggested that delaying the implementation of the current pension system can bring larger gains for the current generation and reduce burden on the future generation. They concluded in their findings that although public pension has largely been used as an instrument for welfare enhancement in the past, but keeping in view the demographic transition in China, this could challenge and harm the fiscal sustainability. Targeting gender is also one of the most fundamental issue surrounding aging population and dependency on the younger people. As we discussed above, women mostly depends on support from the family which could create even more pressure for the younger. Therefore keeping women at the forefront of the new pension system could significantly contribute to the government efforts in establishing pathways for a dividend.  Chen and Turner (2015) suggest that gender equality in the new pension system would actually increase their contribution and help them independent of the family support.

### 1.3.3 Phase-in design in NRP

Unlike the general policy change process in China which is implemented in a nationwide scope all at one time, New Rural Social Pension Insurance (NRP henforce) is implemented in a pilot scope.

After announcement of the NRP scheme in 2009, it started in 10 percent of counties nationwide in late 2009, with 24 percent of counties to be included by the end of 2010, which followed by over 60 percent of counties covered by early 2012. And by the end of

2012, full coverage by all counties are achieved which is far earlier than expected (originally finalized as 2020).

Therefore, taking advantage of the phase-in implementation scheme of NRP, it can be viewed as a quasi-experiment and evaluate the effect of the NRP scheme on elders well-being in rural China.

It is necessary to highlight here once again that the NRPS is designated for residents who hold the Agricultural *Hukou* (referred as "rural residents"), not only for those who currently live in rural areas. Considering the existence of large amount of migrant workers in urban cities who are with Agricultural *Hukou*, the NRP expansion would gradually cover both rural and urban areas instead of only being limited to rural counties. And this is what we mean by achieving full geographical coverage of NRP.

## 1.4  Public Pensions in developing countries

Although all countries have government provision in the shape of social welfare in one form or the other. However, in practice, this has always been insufficient due to various socioeconomic and political reasons (ILO 2011). One of the most important challenges in implementing public pension programs is its coverage, access, benefits and services in a sustainable manner. The degree of these problems varies among regions and countries. In the OECD member countries this provision is both comprehensive and universal in most cases. The coverage is comprehensive in terms of old age, disability, maternity, work injury, unemployment, medical benefits and long term care. This is universal because the public pension covers almost 100 percent of the target population. On the other extreme there are lower income countries, for instance, sub-Saharan African and South Asian countries where pension coverage is limited to less than 10 percent of the population and offers limited

number of benefits. Majority of the countries are facing and some of them soon will face the problem of ageing, and addressing the risks associated with the old age, public financial constraints, changing labor markets and family structures, a comprehensive public pension is both crucial and challenging (Bloom and McKinnon 2010; Bloom et al. 2011).

Developing countries are facing additional challenges in the shape of old age population and in some cases it is taking place more rapidly before they are rich (Bloom et. al 2011; Bloom et al. 2012). These challenges are coupled mostly with increasing share of rural population, informal sector, migration (both internal and external) and poor governance systems. More specifically these challenges varies to various degrees in developing world. One of the element concerned is redistribution i.e. transfer from richer to poor and from younger who are relatively more productive to older people who are relatively less productive. This results in producing winners and losers in the society which needs strong public support for mainstreaming public pension programs in such contexts.

Another challenge in public pension programs in developing countries is public financial constraints and capacities to administer, manage, implement and monitor these programs. Spending more on the elderly population will take place at the expense of fiscal burden and moving away expenditures on important social sector issues, for instance, education and health etc. Such issues may result in a trade-off between equity and efficiency and needs a people-centered approach to address them.

A public pension program has multiple objectives, for instance, consumption smoothing, redistribution and poverty reduction etc. But these objectives are faced with multiple constraints i.e. social, fiscal and political constraints etc. For instance, the design of the pension system and the responsiveness of labor supply may be different in different contexts (Barr and Diamond 2010). Examining the South African old age program, Ranchhod

(2006) findings suggest the withdrawal of labor force. Similarly in another study by Carvalho Filho (2008) in Brazil, the findings suggest that access to old age benefits reduces work by roughly 38 percentage points and working hours by 22 hours per week.

## Tables

**Table 1.1 Source of Support of China's older population aged 60 and above(percent)**

| AREA | Own labor income | Family support | Pension support | Welfare support | Other |
|---|---|---|---|---|---|
| China | 36.7 | 35.7 | 23.1 | 2.4 | 2.1 |
| Cities | 6.9 | 20.5 | 68.4 | 2.1 | 2.1 |
| Towns | 31.7 | 41 | 21.4 | 3.1 | 2.9 |
| Rural | 51.3 | 40.5 | 4.1 | 2.3 | 1.8 |

Source: China Population and Employment Statistics Yearbook 2009.

**Table 1.2 Comparison between old and new rural pension program**

| No. | Aspect | Old Rural Pension | New Rural Pension |
|---|---|---|---|
| 1 | History | 1992, the Ministry of Civil Affairs, Basic Program for County-level Rural Social Pension Insurance (trial edition) | 2009, the State Council, Guiding Principle on the Development of the New Rural Pension Pilot (Doc.32) |
| 2 | Source of contribution fund | Individual contribution | Central and local government subsidy, collective subsidy and individual contribution |
| 3 | Government subsidy | None | - basic pension benefits paid by the central government (55 RMB per month); <br> - premium subsidy provided by the local government |
| 4 | Operating expenses | Covered by the pension funds, which would attenuate pension benefits | Earmarked into local fiscal budget |
| 5 | Participation | Voluntary participation with choice of premium | |
| 6 | Eligibility for pension benefit | Aged 60 or above with at least 15 years of contribution | |
|  |  | | Special provision for transition: <br> - Age over 60, family binding <br> - Age 45-59, lump-sum contribution |

**Table 1.3 Institutional arrangements for the new rural pension scheme**

## Insitutional arrangements for NRPS

| | | |
|---|---|---|
| **Fund** | Individual premium<br>5 categories: 100, 200, 300, 400, and 500 RMB per year per | Government subsidy |

Local government
No less than 30 RMB per year per person

Central government
55 RMB per month per person

*Accumulated* — — — — — — — — — — — — — — — — — — — — — — — —

| | | |
|---|---|---|
| **Account** | Individual Account | Basic pension benefits |

*Beneficiary age≥ 60* — — — — — — — — — — — — — — — — — — — —

| | | |
|---|---|---|
| **Pension benefits** | 1/139 of the total accumulation, up to 139 months | 55 RMB per month |

| Accumulated individual funds | Local government subsidy | Local government subsidy |
|---|---|---|

\* If died within 139 months:

         Inheritable    |    not inheritable

# *Appendices*

**Appendix 1.1 Main content of NRP (Doc. 32, 2009)**
**Guiding Principle on the Development of the New Rural Pension Pilot**

- *Eligibility: Any rural residents, who are aged 16 or above and not participate in the Basic Pension of the Firms, can voluntarily participate. Students are excluded.*
- *Fund constitutes of individual contributions, collective benefits and government subsidies.*
  - ✓ *Individual premium is comprised of five categories including 100RMB, 200RMB, 300RMB, 400RMB, and 500RMB per year. Participants can freely choose the premium category. And the premium level can be modified as with economic growth.*
  - ✓ *Collective benefits are encouraged if the local collective group is affordable.*
  - ✓ *Government subsidy: The full amount of basic pension benefit should be insured by central government. Local government should set subsidize no less than 30 RMB per person per year.*
- *Pension benefit: The basic pension benefit from central government is 55 RMB per month. Local government can increase the basic benefit using local fiscal budget. Individual account will refund 1/139 of the total accumulation at age 60.If the pension beneficiary died, funds remaining in the individual account, excluding government subsidy, can be inherited according to law. The remaining government will be used to pay for other beneficiaries' pension.*
- *Pension benefit eligibility: Elders with Agricultural hukou who are aged more than 60 and do not participate the Basic Pension of the Firms can receive the pension benefits on a monthly basis. Once NRP is implemented,*
  - ✓ *Elders who were already more than 60 years old and do not participate the Basic Pension of the Firms can directly get monthly pension benefit without contribution given his/her child who are eligible for NRP should contribute.*
  - ✓ *Elders who have less than 15 years should contribute on a yearly basis in order to get benefit. Also repaying is allowed, but the cumulative contribution should not exceed 15 years.*
  - ✓ *For others who have more than 15 years to get benefit, he/she should contribute on a yearly basis, and the cumulative contribution should be at least 15 years.*
- *Convergence with ORP: For districts where Rural Social Pension System (short for Old Rural Pension, or ORP) -with main individual contribution and entirely individual account- had*

*implemented, it is essential to properly address the fund and debt issue and deal with the convergence with NRP. In NRP pilot areas,*

- ✓ *For ORP contributors who had started to receive pension, they can directly receive basic pension benefit as well.*
- ✓ *For ORP contributors who are less than 60 and did not start to receive benefit, the accumulative in individual account from ORP should be incorporated into the individual account in NRP, with further contribution referring to NRP standards. Contributors can receive pension benefit once the pension benefit eligibility is met.*

# Chapter 2.  Pension coverage and labor supply of rural residents

## 2.1  Introduction

During the last several decades, there has been an extensive literature documented on exploring the casual link between public pension programs and labor supply of the old age people in the developed countries (Auerbach and Kotlikoff 1987; De Nardi et al. 1999; Nishiyama and Smetter 2005; Conesa and Garriga 2008; Kitao 2014).  Most of the studies documented in the developed countries suggest positive incentives of social security programs for earlier retirement (see for instance the case of US, Gruber and Orszag, 2003; Hofer and Koman, 2006; Vere, 2011; Ortiz, 2014; and the case of Canada, Baker and Benjamin, 1999; and the case of UK, Disney and Tanner, 2000). It was found that the differences in social security programs could account for 35-40% differences in aggregate working hours between the U.S., and Belgium, France, and Germany (Wallenius 2009). Previous studies explained this link through the substitution effect of pension benefit to wage earnings for elder people (Gruber and Wise 1999, 2004; Lumsdaine and Wise 1994). This is mainly because the presence of pension system particular in developed countries contributes to early retirement and lower labor force participation (Bosworth and Burtless 1998; Kinsella and Velkoff 2001). The distortions in labor supply could be large enough to erase much of the welfare gains from the pension programs (Bagchi 2015). However, majority of these studies have been conducted in the developed countries and the generalizability of these results to developing countries may be limited. Public pension programs have been recently established in the developing countries and are more prone to shocks and are comparatively more costly to adjust compared to developed countries

(Barrientos 2006; Holzman et al. 2009). At the same time, the norms about work and retirement differ because of limited income to meet basic livelihood needs in developing countries, and the rural households are more vulnerable to this tradeoff.

It may be less likely that public pensions would lead to adverse labor supply responses in developing countries because many of the developing countries feature relatively young population, high presence of poverty, multigenerational family structure and scarce government security programs (Barrientos 2009). However, the existing studies depicted ambiguous relationships between labor supply and public pension programs in developing countries. The effect of a public pension program does not only limit to pension recipients alone. It could lead to the changes of labor supply in the households with multi-generation. The old age program in South Africa suggested a decreased employment rate and labor supply amongst the elderly African subpopulation (Miller et al. 2003; Ranchhod 2006) while it increased the employment of prime-aged adults in the household primarily through labor migration (Ardington et al. 2009). Having access to old age benefits in Brazil reduced the possibility of work by roughly 38 percentage points and working hours by 22 hours per week among rural workers (Carvalho Filho 2008). The expansion in India's National Old Age Pension Scheme had a modestly negative effect on the employment of elderly man who are with low level of education (Kaushal 2014). The generous Mexican demogrant did not change the labor market behavior of pensioners but there was a decline in the employment of non-elderly adults living in households (Juarez 2010). A cross-country study of 51 low and middle income countries showed a modest effect of pension on employment (Bloom et al. 2007).

The pattern of retirement systems differs among rural and urban population in China mainly under the existence of the dual-track system. Urban residents have relatively more

access to formal employment, leave work at relatively young age according to mandatory retirement policy and thus benefit from pension support (Giles, Wang and Cai 2012). On the other hand, rural residents are mostly associated with agriculture and self-employment jobs, have limited access to formal employment, and essentially not exposed to mandatory retirement policy. Therefore labor supply decisions may not follow the same pattern as exhibited by the urban residents. Deborah Davis-Friedmann (1991) described the "retirement" pattern of the Chinese elderly as "ceaseless toil": lacking sufficient means of support, the elderly have to work their entire lives. In other words, rural residents tend to work until they are physically incapable of continue working. And this description was still an accurate depiction of the elderly rural residents' work pattern even after 10 years (Benjamin, Brandt and Jia 2003). It is expected that the rural elderly would work even more in the future as with the relaxed rule of flow of labor and rapid growth of migration (Pang, Brauw and Rozelle 2004; Qian, Wang and Zheng 2016).

## 2.2 Data

In this chapter, we evaluate individual behavioral effects in labor supply induced by the NRP using a panel data collected on approximately 18,000 individuals being followed by the CHARLS (China Health and Retirement Longitudinal Study).

The China Health and Retirement Longitudinal Study (CHARLS) aims to collect a high quality nationally representative sample of mid-aged and elderly Chinese residents and their spouses to serve the needs of scientific research on the elderly (Zhao et al. 2013). The CHARLS sample is representative of Chinese residents aged 45 and above, living in households, while institutionalized mid-aged and elderly are not included in the sample. But respondents who are sampled in Wave 1 and later enter into any institution will still be

followed. It provides a wide range of information about households and individuals including demographics, family structure/transfer, health status and functioning, health care and insurance, work, retirement and pension, income and consumption. And community level information is also provided by the first wave of survey.

As the NRPS reform mainly implemented in a phase-in mode between 2009 and 2013, CHARLS first two waves data (2011 and 2013) can well catches the progress of NRP expansion in villages as well as household and individual behavior changes. Thus, it offers a good opportunity with rich information to explore the impact of the New Rural Pension Program on the behavior effects of pension coverage in China's context, especially the effects on elderly rural residents.

As a result, only first two waves of CHARLS data are used for analyzing the behavioral effects of pension coverage. The baseline national wave of CHARLS (Wave 1, 2011) is being fielded in 2011 and includes 10,251 households and 17,705 individuals in 126 counties/districts and 450 villages/resident committees. The Wave 2 of CHARLS (Wave 2, 2013) is fielded in 2013 and includes about10,822 households and 18,605 individuals in 126 counties/districts and 448 villages/resident committees, which contains 15,770 follow-up interviews and 2,834 new interviews.

While studying the behavioral effects induced by the NRP, we specifically focus on individuals who are aged at least 40[5], reside in rural villages and hold agricultural *hukou*. The main reason for this data restriction is that these are actually the exact targets of the NRP reform. Furthermore, to balance the data, only individuals who exist in both waves are

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[5]In CHARLS, the respondent-level sampling is randomized in the households which have members older than 40 and meet the residence criterion. "If the chosen person is 45 or older, then he/she becomes the main respondent and spouse is also interviewed. If the chosen person is between ages 40 and 44, he/she is reserved as a refresher sample for future rounds of survey. (Zhao et al., 2013)" In order to collect as large samples as possible, this paper uses samples who are aged no less than 40 if meeting other sample restrictions.

selected for analysis. Eventually, the selected sample contains 17,818 observations in 2 waves of survey which are formed by 8,909 individuals from 5382 households, 236 villages, and 115 counties. Throughout the paper, all the analysis is done based on this restricted sample.

## 2.2.1 Labor supply measures

To capture the behavior changes in labor supply of rural residents, this paper uses three sets of different measures including work status, labor supply and offspring's labor supply. The first two measures are for respondents themselves which is supposed to describe the direct change in labor supply differed by NRP participation choice. The third measure are for the offspring who are actually the "adult children" of respondents in the household. Since the age of respondents in CHARLS sample is at least 40, if we assume the average age of parents at first birth are 20[6], then offspring of the respondents aged at least 20 and above can be considered adults who are able to join labor force potentially. Therefore, the third measure is supposed to capture the intertemporal change in labor supply of the younger generation conditional on the elder generation's pension participation choice.

To measure work status, four indicators are used including current work status, willingness to work beyond statutory retirement age, willingness to keep working until physically able, and expected retirement age. Among these four indicators, the former three are dummy variables where 1 means yes and 0 means no, and the last one is a continuous variable indicating an age respondent is expecting to stop working. As there is no statutory retirement age for rural residents who work in agricultural jobs or self-employed jobs, this

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[6] The average age of woman at first birth in China are far beyond 20 since 1970 and reached 26.2 in 2010 (National Bureau of Statistics of China, 2002, 2005, 2012; Raymo et al., 2015; Jones and Yeung, 2014; Lu and Wang, 2013; Zhang 2008; Guo 2003; Pan 2003; Zhuang and Zhang, 2003; Jiang 1995; Chen 1991; Liang and Chen 1990; Li 1985). Therefore, the assumption of age 20 is very easy to be satisfied.

paper use age 60 as the reference to construct the indicator willingness to work beyond statutory retirement age. It is reasonable to refer 60 as the rural "statutory retirement age" based on the following two reasons. For one thing, NRP assign age 60 as the cutoff to define a pension recipient and this policy is well informed through public advocates. For another, it is also widely recognized that 60 is the statutory retirement age for male urban residents who work in formal wage jobs. The same problem goes to the definition of retirement for the indicator expected retirement age because there is no formal procedure to declare retirement for agricultural jobs or self-employed jobs. To clarify the term retirement in this paper, we follow the definition used in CHARLS which is "having stopped all income-related activities, unpaid family business, and having no intention in engaging in any more serious than small part time work" (CHARLS questionnaire, 2011 and 2013). At the same time, to address the data censoring issue in expected retirement age, healthy life expectancy (HALE) is used to proxy the censored observations[7].

Respondents' labor supply is measured by total hours of working in the past year. Furthermore, the total working hours is disaggregated into four according to the work type i.e. farm employed, household agricultural work, employed jobs, and non-farm self-employed and unpaid family business. In the later analysis, all these variables are taken logarithm transformation.

The ideal measure of offspring's labor supply would be the working hours counted both in total and in every job type for each of the offspring of the respondents. However, CHARLS did not have a detailed household member survey which would be able to offer this

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[7] In CHARLS survey, expected retirement age is coded as value 0 if one plans to keep working until physically able, which forms a typical censoring case. To partially tackle the censoring issue, value 0 is replaced with China's healthy life expectancy (HALE) by gender and by age calculated by WHO 2015. If respondents are less than 60 years old, HALE at birth are used which is 68 and 70 for male and female respectively. If respondents are at least 60 years old, HALE at age 60 are used which is 75 and 77 for male and female respectively.

information. As an alternative, this paper use the number of offspring currently working and the number of offspring work in agricultural jobs to capture the younger generation's labor supply. It is not a perfect measure, but it can somehow depict division of labor among different type of jobs within the household.

Table 2.1 presented the summary statistics for the outcome variables used in this chapter, including four measures of work status, three measures of labor supply and two measures of offspring's labor supply. Columns 1-3 reported number of observations, mean and standard deviation for the full sample while columns 4-6 and columns 7-9 are the same set of information but for subsamples who did not join NRP and who joined NRP. In the full sample, 77.4 percent of respondents were currently working and 91.8 percent of them were willing to work beyond statutory retirement age while 77.9 percent were willing to keep working until physically able. The expected retirement age was averaged around 70.5.The mean of total working hours was 1135.8 hours while the mean of working hours in farm employed jobs, household agricultural work, employed jobs, and non-farm self-employed and unpaid family business were 38.3 hours, 1045.9 hours, 939.8 hours and 621.0 hours respectively. The number of offspring currently working was 2.47 on average and 0.887 were doing agricultural which accounted for around 1/3 of the working "adult children" in the household. One surprising fact from the summary statistics was that rural residents tended to work a lot and they were willing to keep working until a very late age.

Since the difference in means between two subsamples would capture both the effect of pension coverage and any trends in socio-economic changes, t-test results for comparing their difference are not given to avoid misleading information.

### 2.2.2 Control variables

The set of control variables consist of indicators measuring individual demographics, individual health and family characteristics.

Individual demographics are represented by gender, age and its squared item, education, marital status. Gender is a dummy indicator where 1 is for male and 0 is for female. Education is also simplified as a dummy indicator with value 1 means attained at least secondary education and value 0 means attained less than secondary level education. Marital status is indicated as a group of dummy variables (married, divorced and widowed) while single is eliminated as the reference group.

Individual health indicators include measures on any disability, any chronic, incidence of ADL and incidence of IADL. Any disability is a dummy variable with value 1 means respondents have any of the five listed disabilities[8] while value 0 means no incidence of any listed disabilities. Similarly, any chronic is also a dummy variable indicating if having any of the fourteen listed chronic diseases[9]. ADL (Activities of daily living) and IADL (Instrumental activities of daily living) measure the incidence of difficulty for respondents maintaining the corresponding daily living activities[10]. Both ADL and IADL take values from 0 to 1, where value 0 means have no difficulty in any of the listed activities, and value 1 means having difficulty in all listed activities.

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[8] The listed disabilities in CHARLS questionnaire are (1) physical disabilities, (2) brain damage or mental retardation, (3) vision problem, (4) hearing problem, and (6) speech impediment.

[9] The listed chronic diseases in CHARLS questionnaire are (1) hypertension, (2) dyslipidemia, (3) diabetes or high blood sugar, (4) cancer of malignant tumor, (5) chronic lung diseases, (6) liver disease, (7) heart problems, (8) stroke, (9) kidney disease, (10) stomach or other digestive disease, (11) emotional, nervous or psychiatric problems, (12) memory-related disease, (13) arthritis or rheumatism, and (14) asthma.

[10] There are six listed activities for calculating ADL and five listed activities for calculating IADL. Activities of daily living (ADL) are the least basic activities one should perform every day, such as eating, bathing, dressing, toileting. For people who have difficulty in ADL, they are in need help in order to cope their life. Instrumental activities of daily living (IADL) are the activities that people do once they are up, dressed, put together. These tasks support an independent life style. Many people can still live independently even though they need help with one or two of these IADL's. More overview of ADL and IADL can be found in Wiener (1990).

Family characteristics are log of household income, number of offspring alive, number of siblings alive, and number of parents alive. Household income is the aggregated income last year from individual wage income, individual-based transfer, agricultural net income, self-employed activities net income and household-based public transfer but excluding social donations and compensations. The family member composition is measured by the number of children, sibling and parents of the respondents excluding dead members.

Table 2.2 reported the summary statistics of control variables. Similar to the structure of Table 2.1, number of observations, mean and standard deviation were provided in columns 1-9 for the full sample, subsample who did not join NRP, and subsample who joined NRP. Apart from these, a two-sample t-test was performed comparing the differences between the two subsamples assuming unequal variance. Results for tested difference and its standard error were given in column 10 and column 11.

In the full sample, 47 percent of respondents were male with the average age of 60. The proportion who attained at least secondary education was only 23.2 percent. Most of the respondents were married (85.8 percent) or widowed (12.1 percent) leaving no more than 2.1 percent remaining single or divorced. Regarding health status, 25.4 of respondents had some disabilities and 67.4 percent had some chronic diseases. The average difficulty in ADL and IADL were 0.02 and 0.175 respectively. Average total household income was 35,805 RMB (equivalent to 5,665 US dollars[11]). Finally, a respondent would have 3 offspring, 3 siblings and 1 parent alive in his family.

Given NRP is a voluntary pension scheme, one interesting question is that how different it would be between respondents who joined NRP and those who did not join. Referring to

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[11] Taking exchange rate between RMB and USD as 632 which is the average of annual exchange rate in 2011-2013. Source from China Statistical Yearbook 2015.

the t-test results in columns 10-11 in Table 2.2, rural residents who joined NRP were slightly elder and they were married with more offspring and less parents alive. Also, they would have weaker health as is shown by higher incidence in any disability and chronic diseases as well as more difficulty in IADL. Meanwhile, there was no significant difference in gender, education and number of siblings.

## *2.3  Empirical strategy*

There are many reasons to suspect a link between coverage of NRP and individual labor supply outcomes. To test the relationship between labor supply outcomes and individual NRP participation, we first start with the straightforward OLS specification with a bunch of control variables.

$$y_{ijt} = \beta_0 + \beta_1 NRPpar_{ijt} + \gamma X_{ijt} + \delta F_{jt} + \eta_k + \lambda_t + u_{ijt} \quad (1)$$

Where $y_{ijt}$ is the outcomes for individual $i$ in household $j$ and village $k$ at year $t$. Outcome variables include respondents' work status and labor supply, and offspring's labor supply. The detailed descriptions for each of the outcome variables are given in section 2.1. Individual's pension participation status is represented by $NRPpar_{ijt}$, which is an dummy variable taking value 1 if one participate in NRP and 0 otherwise. $X_{ijt}$ is a vector of individual covariates including gender, age and age squared, marital status, heath indicators such as disability and chronic disease, ADL and IADL index. $F_{jt}$ is a vector of household character covariates, including log of household income, number of children, number of siblings, and number of parents alive. Details of $X_{ijt}$ and $F_{jt}$ are given in section 2.2. In addition, county dummy ($\eta_k$) and year dummy ($\lambda_t$) are also controlled in the equation.

The coefficient $\beta_1$ of $NRPpar_{ijt}$ is the parameter of our key interest as it explores the relationship between individual's labor supply outcomes with NRP participation. If the

introduction of NRP could increase rural residents' expectation on future income, a negative and significant estimates $\beta_1$ would be observed for outcomes i.e. current work status, willingness to work, expected retirement age, total working hours. On the contrary, if participating NRP imposed budget constraint on rural residents, a positive and significant estimates $\beta_1$ would be observed for the same sets of outcomes mentioned above.

However, there may be potential bias on estimation of $\beta_1$ using the OLS specification in equation (1). First, the individual NRP participation is likely to be endogenous. This endogeneity issue arises from the institutional setting of NRP with the voluntary participation rule. NRP aims to achieve full geographic coverage across the nation while leaving the decision to rural residents whether they want to participate in NRP and with which premium level to contribute. Therefore, individual NRP participation will be jointly determined by the availability of NRP program as well as individual, household and even village level characteristics. Second, there may exists unobserved omitted variables that may affect both labor supply outcomes as well as NRP participations.

Taking advantage of the phase-in implementation scheme of NRP, it can be viewed as a quasi-experiment to evaluate the effect of the NRP scheme on individual behavioral in rural China. At initial thought, geographical expansion of NRP on the village level can be a good instrument for predicting individual NRP participation. If the village is not covered by NRP yet, none of the rural residents in this village could join NRP. Not until NRP covered the village can its residents voluntarily join NRP or reject NRP.

$$NRPc^* = \begin{cases} 1 & , if\ village\ covered\ by\ NRP \\ 0 & , if\ village\ not\ covered\ by\ NRP \end{cases}$$

While, the indicator of village level NRP expansion may not be the suitable instrument in this paper for the following three reasons. First, there is time mismatch between NRP

expansion and CHARLS survey. According to the arrangement of NRP expansion on the national level during 2009-2012, the list of newly covered counties was announced around September or October of each year, while CHARLS was normally fielded during July and August of the survey year. Therefore, using a village level NRP coverage indicator made by NRP expansion timeline would not fit in the individual NRP participation status in the CHARLS survey simply because at the time of survey, some villages had not been covered by NRP yet although it was scheduled to be covered later in that year. Second, for confidential purpose and to sustain the panel survey, CHARLS does not reveal the county name to the public. The confidential county information makes it impossible to match official NRP expansion progress with the individuals in the CHARLS data. Third, although CHARLS fielded a one-time community survey in Wave 1 which covers questions about ORP and NRP coverage in the village, unfortunately it is not complete and has a lot of missing values. Thus, it will take a cost of dropping at least 1,674 observations from 44 villages in one wave, which accounts for 19 percent of samples in the restricted sample, if using the NRP coverage status from the community survey.

As an alternative, this paper used the village level NRP participation rate among respondents in the data as the instrument. The village level NRP participation rate (noted as $NRPpr$) is formed as:

$$NRPpr = \frac{number\ of\ respondents\ who\ joined\ NRP\ within\ the\ village}{number\ of\ respondents\ within\ the\ village} \times 100$$

Since NRP participation is based on *hukou* registered location, and the analysis sample has been restricted to local residents holding agricultural *hukou*, the village level NRP participation rate calculated about could be a good estimates of the participation among mid-age and old-age rural residents.

Regarding instrumental relevance, the rationale of using village level NRP participation rate is that individual NRP participation should be correlated with village level NRP participation. This is simply because village level NRP participation rate is calculated by aggregating individual participation together. Viewing this from another angle, within a village with a high NRP participation rate, individuals pretend to be more likely to join NRP due to externality or peer effect within the village. One evidence that the peer effect would exist within the village is that, local government would set a targeted participation rate at the time NRP is introduced in the county. Apparently, these targets would differ by counties. Meanwhile, how the targets to be achieved would also differ by local governments' ability in implementation. For one thing, local government could provide additional local subsidy, considering its fiscal accountability, to increase rural residents' incentive to join NRP. For another, the motivation and ability the village head could have to advocate the policy and to mobilize his residents is also an essential factor in encouraging people's NRP participation.

And the main reason for holding the exclusion restriction is that village level NRP participation should not directly affect individual's work and labor supply outcomes, nor should it affect any other unobserved factors that may affect these outcomes either. For instance, a village head's work ability may affect his resident's NRP participation decision, but he can hardly affect the labor supply of an individual directly. The same works for the local government's NRP subsidies. Even though the exclusion restriction may not fully valid, this paper would first start the analysis using village level NRP participation rate as instrument. More discussion on the validity of the instrument will be presented in section 2.4.3 using different measures of village or district level of NRP participation rate.

Taking this village level NRP participation rate as instrument, instrumental variable (IV) method is then introduced in the analysis where the second stage model takes the form of equation 1 and the first stage model is formed as:

$$NRPpar_{ijt} = \theta_0 + \theta_1 rNRP_{jt} + \gamma X_{ijt} + \delta F_{jt} + \eta_k + \gamma_t + v_{ijt} \quad (2)$$

Apart from IV method, fixed effect model can also be used as a good attempt to control the unobserved factors that can be correlated to both labor supply outcomes and individual NRP participation. One of the drawback of CHARLS data is that it lacks of village level variations as community survey is only collected in Wave 1. And it is highly likely that there is distinctive variations among villages which may distinguish individuals' characteristics as well as their NRP participation decisions. For instance, villages located in eastern China are normally considered as more developed rural areas with larger village population, far higher GDP per capita, better collective subsidy and with more equipped infrastructures, while villages located in central and western China are commonly viewed as poor and less developed areas which are the main targets of government poverty alleviation policies. And fixed effect can work well particularly for controlling these kind of unobserved time-invariant factors given village characters usually do not vary much over time. Not only for the concern of village level unobserved factors, fixed effect can also control for household and individual level unobserved time-invariables at the same time.

Since we are only using two-period data for analysis, fixed effect will be estimated by first-differencing instead of demeaning method. The coefficients estimation will be equivalent for two-period panel data using either first-differencing or demeaning method. But first-differencing can facilitate our later estimation when combining IV method and fixed effect together. The estimation equation of the fixed effect model using first-differencing method could be described as:

$$\Delta y_{ij} = \beta_0 + \beta_1 \Delta NRPpar_{ij} + \Gamma \Delta X_{ij} + \delta \Delta F_j + u_{ij} \quad (3)$$

Finally, to address the endogeneity concern on individual NRP participation ($NRPpar_{ijt}$), instrument variable method and fixed effect model are combined jointly in the empirical analysis. We consider IV is better at predicting individuals' endogenous decision in NRP participation while fixed effect model can control for omitted variable issue on unobserved time-invariant variables. The full model for IV-FE setting would be explained as:

$$\Delta y_{ij} = \beta_0 + \beta_1 \Delta \widehat{NRPpar}_{ij} + \Gamma \Delta X_{ij} + \delta \Delta F_j + u_{ij} \quad (4)$$

$$\Delta NRPpar_{ij} = \theta_0 + \theta_1 \Delta rNRPpar_j + \tau \Delta X_{ij} + \varphi \Delta F_j + u_{ij} \quad (5)$$

## *2.4 Main results*

### 2.4.1 Individual pension program participation

Before moving forward to analyze rural residents' behavioral change in labor supply in response to their NRP participation, this section tried to illustrate the changes in individual pension program participation along with the expansion of NRP.

Recall that according to NRP national agenda, around 60 percent of counties were covered by NRP by 2011 and all counties were fully covered (100 percent) by 2012. In the analysis sample, if defining NRP coverage in village as village level participation rate being positive, 55.1 percent of villages were covered by NRP in wave1 (2011) while 99.6 percent of village were covered by NRP in wave2 (2013). The NRP's geographic expansion could be well caught by the CHARLS data considering the time lag between agenda announcement (at the end of the year) and CHRLS survey (in the middle of the year).Therefore, the analysis sample could be a representative to depict rural residents' participation in various available pension programs. What's more, as the analysis sample was a fully balanced panel data, we were able to observe their switch between pension programs from 2011 to 2013.

Table 2.3 presented the individuals pension participation in various kinds of the pension programs. Column 1 and column 2 reported the mean and standard deviation for the full sample. Columns 3-6 reported both mean and standard deviation for wave1 and wave2 respectively. Finally, the program switch was shown in the last two columns using two-sample t-test to compare the difference in participation rates between waves. The mean difference and its standard error were reported in column 7 and column 8 respectively.

In Table 2.3, ten different programs are listed apart from the reserved choice of "other" and "none". The first four programs are the three major public pension programs in China which have been introduced in Chapter 1 section 1. To recognize the NRP reform, the rural pension system is clarified as ORP and NRP separately. Programs 5-10 are supplemental pension programs offered by either government or private sectors. While the participation in the major public pension programs 1-4 should be mutually exclusive that one cannot join two programs at the same time, there could be overlaps in participating supplemental pension programs.

In general (taking the full sample), the majority of rural residents could either participate in rural pension program (6.31 percent remained in *ORP* and 49.38 percent newly joined *NRP* since 2009) or stay uninsured (36.88 percent remained in *None*). At the same time, among the three major public pension programs, rural residents had very limited access to *Pension Program for the Government or Institution* and *Basic Pension of the Firms*, with only 0.46 percent and 0.45 percent participation on average in each respectively. This extremely low participation rate confirmed the existing barriers for rural residents to join the pension programs designed for government officers and urban formal employees. The total participation rate remained low in all kinds of supplemental pension programs with less than 1 percent of share.

When furtherly divided the full sample into wave1 and wave2, the patterns of program switch were much clear. Although there are significant changes in pension participation for many of the programs, according to the t-test result in column 7, two program shared the major changes. One major change was that individual participation in NRP was almost triple sized from 26.68 percent in 2011 to 72.08 percent in 2013. In contrast, the proportion of individuals who are not covered by any pension programs dropped drastically from 59.32 percent in 2011 to 14.43 percent in 2013.Apart from major changes, there was also a moderate level change in ORP participation as it gradually decreased by 4.19 percentage points. All these changes could be contributed to the fast geographical expansion of NRP from 2011 to 2013 because there were no sizable changes in any other programs. This trend was better presented in Figure 2.1 when only focus on major public pension programs and uninsured group while unifying all supplemental pension programs into "other"[12].As was shown in Figure 2.1, as well as Table 2.3, it manifested the fact that the substantial increase in NRP participation mainly came from the new entries of uninsured rural residents as well as program shifts[13] from ORP incumbents.

One more thing to mention was that there were also very few changes in the participation of program1 and program2 during the study periods. This is important because the benefits are generally much higher in these two programs compared with rural pension program, no matter before or after the NRP reform. If rural residents could be eligible for these programs, they will not choose rural pension program at all. Therefore, any institutional change in

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[12] The proportion of "other" in Figure 2.1 was calculated as the remaining part other than the major public pension programs and uninsured group.

[13] In the guideline of NRP reform, it is specially mentioned how to properly address the fund and debt issue when converting from ORP to NRP (Doc.32, 2009). For details, please refer to the Appendix 1.1 main content of NRP.

these two programs will not affect the participation decision in NRP as long as the setting of eligibility does not change.

Therefore, the direct and immediate effect by introducing NRP was that it achieved wider coverage of rural residents' old-age welfare, particularly for those individuals who were lack of any pension cares before the reform. And this is going to the first step in enhancing social welfare service, reducing poverty and narrowing the gap between rural and urban areas in China.

Although it was recognized that NRP did not provide much incentives for people particularly peasants and younger generation in rural areas (Feng and Dong 2010; Zhang 2010), our analysis showed that NRP created great incentives of participation among mid-age and old-age rural residents. However, further investigation is needed to explore the mechanism on rural residents' high incentives in voluntarily joining NRP.

## 2.4.2 Labor supply response to pension coverage

### Main results

Table 2.4 and Table 2.5 presented the main estimates on work status and labor supply outcome respectively. For each of the outcome variables, coefficients of individual NRP participation estimated by four estimation methods are reported. These four methods are pooled OLS, (pooled) IV, fixed effect and IV with fixed effect, detailed model specifications could be found in section 3 empirical strategy. Estimates from IV fixed effect would be the main one that we were referring to as this is the most preferred method. Both IV and IV with fixed effect use village level NRP participation rate ($NRPpr$) as instrument.Cluster standard errors are given in the parenthesis with clustering at the individual level.

Table 2.4 reported results of work status outcomes in response to NRP coverage. There is no significant changes in current work status, but the coefficient showed a positive sign. However, the results suggested that being covered by NRP leads to a higher willingness to work. Rural residents are more willing to work beyond statutory retirement age or even keep working until physically able with the marginal effects increased by 3.9 percentage points and 5.3 percentage points respectively. And the expected retirement age was supposed to extend by 0.47 years. The coefficient for NRP participation are all significant at 0.05 level, except that current work status is insignificant.

Apart from NRP participation, the major matter for individual's work participation decision is heath status which is represented by IADL. And household income also matters for work status. As is expected, worsen health status discourage people from working. And IADL matters most for variable decision of work and willingness to keep working until physically able. 1 more incidence of difficulty in IADL (IADL increased by 0.2) would decrease the probability of working by 3.84 percentage points and drop the probability of work for full lifetime by 1.02 percentage points. Comparatively speaking, the effect of household income is much weaker. 1 percent increase in household income would increase the probability of working by 1.1percentage points while decrease the willingness to work for full lifetime by 1.1percentage points.

Table 2.5reported results of labor supply outcomes in response to NRP coverage. The results indicated that being covered by NRP leaded to a higher work supply as individuals tended to work longer than before. By joining NRP induced23.8 percent increase in total working hours throughout whole year. Most importantly, labor supply response differed in different type of works for rural residents. For one thing, labor supply in employed jobs rose up by 81.7 percent. Meanwhile, there is no significant changes in working hours in

household agricultural work, farm employed jobs, and non-farm self-employed and unpaid family business while estimates for household agricultural jobs showed a positive sign and estimates for the latter two work showed a negative sign.

These differential labor supply behavior may suggest the sectoral labor migration from household agricultural jobs or self-employed jobs to employed jobs. Another phenomenon need to be emphasized was that there is no significant decrease in working hours in any type of jobs and it is contradict to the normal situation when a public pension is introduced.

## Heterogeneity in effects of joining NRP

### Contributors versus pensioners

Remembering that depends on age, individuals have different roles after joining NRP because NRP is a contributory pension scheme. Before age 60, individuals are pension contributors who need to pay yearly premium for at least 15 years; after reaching age 60, they turn to be pensioners who receive pension from both individual accumulation account and government guaranteed basic pension benefit. Therefore, their labor supply may respond differently to NRP enrollment status as being a pension contributor (those who aged 40-59) or being a pensioner (those who aged 60 and above).

In this section, we divided the sample into two age groups accordingly. In age group 40-59, respondents are either NRP contributors or non-NRP participants while in age group 60 and above, they are NRP pensioners and non-NRP participants. Therefore, within each age group, we can test the behavioral effects of joining NRP at different stage. All the labor supply outcomes will be used to investigate the existence of any potential heterogeneity effects. Table 2.6 reported the estimates on work status outcomes and labor supply outcome for each age group in panel A and panel B respectively. Only estimates from IV with fixed effect

were reported and each cell accounted for the coefficient of individual NRP participation estimated from an independent regression.

In Table 2.6 panel A presented the estimates for individual work status using IV with fixed effect among different age groups. Age group 40-59 responded positively and significantly to pension coverage by showing higher probability of being at work and much stronger willingness to work. Generally, for age group 40-59, contributing in NRP made individuals increase the probability of working by 4.6 percentage points, increase the willingness of working beyond statutory retirement age or even willingness to work for full lifetime by 5.5 percentage points and 7.1 percentage points respectively. Meanwhile, their expected retirement age extended by 0.70 years. For age group 60 and above, as being pensioners in NRP, there was no significant change in any work status except that willingness to work beyond statutory retirement age increased by only 1.3 percentage points with 0.10 significance level.

Table 2.6 panel B presented the estimates for individual labor supply using IV with fixed effect among different age groups. Within age group 40-59, becoming a pension contributor by joining NRP significantly stimulated more individual labor supply with total working hours increased by 35.2 percent. Specifically, the raised labor supply mainly came from more working hours in employed jobs with 62.2 percent increase while there is no significant change in other type of jobs. On the contrary, within age group 60 and above, there is no significant changes on any labor supply outcomes for being a NRP pensioner, compared with the rest of uninsured group. Although it showed a week significance in increased working hours in employed jobs, one should be more conservative for the large estimates considering its small sample size. Meanwhile, it was a little bit surprising that even for the pensioner groups, there was no sign of decreased labor supply both in total and in

household agricultural jobs considering the facts that the pensioners were old-age rural residents who are at least 60 years old and were eligible to get pension benefits every month.

In this section, we found that the changes in individual labor supply are mainly driven by pension contributors who are around 40-59 years old. On the contrary, there is no significant change in pensioners' individual labor supply. This was confirmed from Table 2.6as all the coefficients for NRP participation are insignificant for age group 60 and above and all are significant for age group 40-59.

**Pension history: ORP or None**

Recalling the discussion about individual pension program participation in section 4.1, the substantial increase in NRP participation could have attributed to two main sources: one was the new entries of rural residents who were uninsured previously, the other was the ORP incumbents who switched to NRP. This inspired us to check another pair of heterogeneity that whether rural residents' pension history would distinguish their labor supply choice even after joining NRP.

In this section, we first restricted the samples to individuals who were either in category *ORP* or *None* in wave1 (henceforth as pension history). Then, we further divided the sample into two subsample groups according to this pension history. In subgroup *ORP*, respondents were ORP participants in wave1 and they could decide whether to switch to NRP or stay in ORP in wave2. In subgroup *None*, respondents had no pension security in wave1 and they could decide whether to join NRP or remain uninsured in wave2. Therefore, within each pension history group, we can test their behavioral effects of joining NRP. Again, all the labor supply outcomes will be used to investigate the existence of any potential heterogeneity effects. Table 2.6 reported the estimates on work status outcomes and labor

supply outcome for each age group in panel A and panel B respectively. Only estimates from IV with fixed effect were reported and each cell accounted for the coefficient of individual NRP participation estimated from an independent regression.

For rural residents who were ORP participants in wave1, switching to NRP had limited effect in reshaping their labor supply behaviors. It was associated with a much higher probability (29.2 percentage points) of currently at work at 0.01 significance level. Their willingness to work beyond statutory retirement age was also 19.9 percentage points higher at only 0.10 significance level. However, there were no further significant changes in other labor supply outcomes although the sign of estimates for working hours in all types of jobs showed negative signs. The interpretation of estimates in the ORP group in Panel B should be with cautions due to the small sample size.

For rural residents who were previously uninsured by any pension programs in wave1, newly entries in NRP changed their labor supply while holding their work status unchanged. Their total working hours increased by 42 percent mainly through increasing working hours in household agricultural jobs as well as employed jobs by 70.1 percent and 231.7 percent respectively. On the contrary, they were not intended to prolong lifetime work as there were no significant changes in willingness to work and expected retirement age.

What made respondents with different pension history react differently to NRP participation? As far as we concerned, this could be attributed to at least two reasons. First, the cost for ORP incumbents to join NRP is much lower than uninsured respondents. According to the NRP scheme, ORP contributors could incorporate their contributions in ORP directly into NRP[14] while uninsured respondents had to start contributing from the time

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[14] Detailed rules for *ORP* transition to *NRP* can be found in Chapter 1 Appendix 1.1.

they join NRP. Second, given ORP is also a voluntary pension scheme, the socio-economic status as well as other characteristics may also be different between them so that they would hold different preference towards labor supply.

In order to address this second concern, the full sets of background characteristics were reviewed using two approaches to compare their differences. First, the two-sample t-test was performed to describe the differences in means for each of the characteristics. Second, a binary dependent variable, whether respondent is in *ORP* (value 1) or *None* (value 0), was regressed directly on the full set of background characteristics to test the difference between groups using both OLS and Logit regression. Samples were still restricted to individuals who were either in pension category *ORP* or *None* in wave1. The results were presented in Table 2.8. In columns 1-6, basic summary statistics for each subgroup were reported including number of observations, mean and standard deviation. The differences in means tested by two-sample t-test were presented in columns 7-8. The results from OLS and Logit regression were reported in columns 9-12.

As shown in Table2.8, both mean comparison and regression approach confirmed that respondents with different pension history were identical in terms of gender, education level, and marital status. There was also some evidence from mean comparison that ORP incumbents were around 1.4 years older than the other group. Their health condition as well as family structure was also slightly different. Compared with uninsured respondents, *ORP* incumbents had fewer incidences of disabilities but more difficulty in ADL and they had fewer offspring than their counterparts while there was no significant difference in the number of siblings and parents alive. However, the major difference between these two groups was income. There was huge income gap between these two groups as the total household income for ORP incumbents were 30 percent higher than uninsured respondents.

## Intertemporal labor supply response to pension

To make it one step further, we also tried to capture any intertemporal changes i.e. how the pension coverage would affect the labor supply of younger generation in the family as a whole. As is mentioned in previous section, given the main respondents of CHARLS were particularly mid-age and old-age rural residents who aged at least 40, we were also interested in work status of their offspring by counting the number of offspring who are currently working and the number of offspring doing agricultural work in the household.

The same estimation strategy was applied here and results were shown in Table 2.9 panel A. Given the respondents joined NRP, the number of offspring who were currently at work increased by 0.075 while the number of offspring who works in agricultural jobs decreased by 0.148. This opposite trend in labor supply indirectly confirmed the incidence of labor migration in the younger generation as they had actually shifted to work in non-agricultural sectors if their parents joined NRP. However, given the average number of children in a household was 2.96[15], the magnitude of effect on offspring's labor supply because of NRP coverage is small.

Table 2.9 panel B presented the estimates among different age groups. It showed that, if respondents became pension contributors, it did not affect total number of offspring who were at work significantly, while the number of offspring working in agriculture decreased by 0.148 at 0.001 significance level. If respondents became pensioners, it stimulated more offspring (0.123) went to work without affecting the number of offspring working in agriculture.

Although both age groups showed signs of labor migration, the differential structural change would imply two different stories. For age group 40-59, offspring's labor migration

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[15]The average number of children can be found in Table 2.2 summary statistics.

came from job switch from agricultural jobs to non-agricultural jobs. This may imply that having pension contributors in the household imposed budget constraint and household reacted by increase more off-farm working in order to cover the spending. For age group 60 and above, offspring's labor migration came from extra member's joining off-farm jobs. This may imply that having pension recipients in the household may bring more protection to the insured person so that household could get away to look for jobs instead of taking care of parents at home.

## What lies behind the scene?

We are surprised at the results that being covered by NRP actually increases elderly rural residents' incentives of work in many regards, including increased work willing, extended working hours and even offspring's labor supply. And these results are mainly driven by the mid-age rural residents who joined NRP as pension contributors and who were not insured before NRP reform. There is also some evidence of "encouraged" labor migration among both respondents and their offspring.

However, these labor supply responses are in contrast with those results found in the study of pension reform in some other countries. For instance, South African old age program suggest the withdrawal of labor force (Ranchhod, 2006) and having access to old age benefits reduces work by roughly 38 percentage points and working hours by 22 hours per week in Brazil's case (Carvalho Filho, 2008).

In this sector, we are trying to offer some potential explanations to this distinctive case that how China's fast expansion of NRP are linked to the boosted labor supply even at a late age stage.

The first perspective we hold is that NRP contribution imposes an immediate budget constraint on rural residents. This perspective stems from the realization that widespread credit and risk-market failures can entail efficiency enhancing functions for a well-designed safety net. With limited access to credit, or other forms of (formal or informal) insurance, a household will suffer from a transient shock — an unexpected but short-lived drop in income (Jalan et al. 2001). However, it is also possible in theory that such a shock can cause a previously non-poor family to become poor indefinitely; or cause a moderately poor family to fall into persistent destitution.

Our argument of household budget constraint comes from four points. First, there is huge disparity in rural household income which is reported by summary statistics in Table2.2. If taking China's poverty line in 2013 as standards, which is 2,433 RMB for household income per capita, the proportion of poor households would take a share of in 47.22 percent in wave1 sample and 53.05 percent in wave2 sample. With an average of 1,762 RMB monthly household expenditure, these families could hardly cover the pension contribution if without addition source of income. Second, the top reasons for "why respondent did not join NRP" turn out to be (a) NRP has not been introduced in my local area, (b) I lack money, (c) other, which accounts for 51 percent, 25 percent and 15 percent respectively among 9,503 responses[16]. No access to NRP tops the reason indicates the popularity of NRP among mid and old age rural residents. Despite of availability of NRP, lack of money is the main reason why rural residents do not join NRP. Third, among 5,396 observations in the data who reported their pension contribution, 75 percent chooses the lowest premium level[17]

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[16] In the analysis sample, 8,800 observations answered this question with 647 offering multiple answers. Each of these answers will be counted when calculating the share.

[17] Under NRP scheme, the initial premium levels are available for five categories including 100RMB, 200RMB, 300RMB, 400RMB, and 500RMB per year. And this is subject to update in accordance with local economic development and government subsidy.

which is 100 RMB per year. Given the high NRP participation rate, along with the large proportion of poor rural households, the main reason to low premium should be budget constraint instead of the commonly believed low incentives to pay. Last, individual labor supply is found to increase working hours mainly through employed (refer to Table 2.5) while offspring's labor supply is also proved to increase mainly in off-farm jobs (refer to Table 2.9). This reveals the fact that households are using selective strategy to choose jobs which could bring more income. And it, in return, supports the idea that household is in short of income which may highly likely due to NRP enrollment and its requirement for pension contribution.

On the other hand, some may argue whether pension contribution would be a burden to the NRP participants. The pension premium in the initial years, namely 2009-2013, varies from 100 RMB to 600 RMB per participant per year. Most of the NRP participants would choose the lowest level of premium which is 100 RMB per year. Comparing to an average of monthly household expenditure, which is 1,762 RMB, the one year contribution of NRP would account for around 5 percent of a month's expenditure. Although it seems like that it is not that a big burden for a typical pension participant to meet the minimum pension requirement, this actually does not reveal the whole picture. For one thing, it is highly likely there will be multiple NRP participants because NRP is open for any rural residents who are over 16 and have not join any other pension program. Under this perspective, if there are multiple household members joining NRP, the burden of total pension contributions would be much higher in the household level and it may generate a multiplier effect on short-term household disposable income. Second, the burden of pension contribution could be higher for some group of rural residents during the reform transition. For example, if rural residents are aged 45-59 at the time NRP was introduced, they have to make lump-sum

contribution before reaching age 60 in order to meet the requirement of a 15-year contribution.

The second explanation may be the side effect of labor migration. The basic idea is that pension coverage leads to labor migration of household members which made the pension participants become the left-behind member in the household. Being left-behind imposes responsibility to take care of farm work and other non-paid household works.

For one thing, the presence of NRP offers a promising chance of better old age security which allows prime-aged adults to look for jobs elsewhere. Other study on China's new rural pension program captures its effect on promoting migration of labor that reveals the adult children with a parent just attaining the pension-eligibility age are more likely to be labor migrants and have off-farm jobs (Eggleston et al. 2016). Similar story can also be found in the case of South African old-age social pension that large cash transfers to the elderly lead to increased employment among prime-aged adults, which occurs primarily through labor migration (Ardington et al. 2009). Miller et al. (2003) used a nationally representative cross sectional data from South Africa argued that pension program contributed to a reduction of labor supply of prime aged population. However these authors linked their argument with the fact that this effect may potentially arise from the credit constraints or look after the elder that prevent the prime aged adults to migrate for work.

However, it is important to understand the logic of staying in rural areas and factors preventing people to find better job in urban areas. In the case of China, there could be various reasons. First, in the presence of older people, it is difficult for the younger to migrate mainly in case to take care of the older people who are more likely need social and financial support. Second is the wage disparities that persist between rural and urban population. Rural population is offered jobs that urban population is not willing to do (Zhao

2000; West and Zhao 2000; Meng 2000; Meng and Manning 2010). Third is the social protection entitlement that is difficult for the rural residents to be entitled with (Meng 2012).

Besides, here are a few cases on impacts of China's labor migration. The migration of household members would increase the time spent on farm work and domestic work by the left-behind elderly and children (Chang et al. 2011). And women left behind are doing more farm work than would have otherwise been the case which may be a persistent effect other than just temporary re-allocation (Mu et al. 2006).

### 2.4.3 Instrument validity

### Can participation rate ($NRPpr$) substitute coverage status ($NRPc$)?

Recall that the definition we make for village level NRP participation rate ($rNRP$) is the ratio between number of respondents who joined NRP and number of respondents in the village, which is:

$$NRPpr = \frac{number\ of\ respondents\ who\ joined\ NRP\ within\ the\ village}{number\ of\ respondent\ within\ the\ village} \times 100$$

And the definition of village NRP coverage status ($NRP2$) is a dummy indicating whether the village is introduced with NRP using community survey information, which is:

$$NRPc = \begin{cases} 1 & ,if\ village\ covered\ by\ NRP \\ 0 & ,if\ village\ not\ covered\ by\ NRP \end{cases}$$

The underlying assumption by using village NRP participation rate as instrument is that there are only compliers and never-takers in the program. If the village is not covered by NRP, the village NRP participation rate should be equal to zero as no one can participate NRP without accessibility. If the is not covered by NRP, the village NRP participation rate

should range between 0 to 100 as some individuals join NRP while some do not under the "volunteer participation" rule.

Table 2.10 illustrated the relationship between village level participation rate and village level NRP coverage status to support our assumption. During wave1, villages not covered in NRP maintained participation rate as zero, while villages covered in NRP had an average level of participation rate as 31.48 percent. During wave2, since all the villages are covered under NRP[18], the average participation rate among these villages[19] was then 71.65 percent. It was noted that $NRPpr$ and $NRPc$ were highly correlated with a correlation of 0.7303.

Given the validity of our assumption as well as the high correlation between $NRPpr$ and $NRPc$, here are some more advantages of using $NRPpr$ as instrument instead of $NRPc$: First, $NRPpr$ contained more variations between villages and between waves compared with $NRPc$. Therefore, it is more suitable for IV with fixed effect model specifications. Second, $NRPc$ cannot not be fully identified for all villages because the community data has a lot of missing values. Thus using $NRPc$ as instrument would face a loss of 3,348 observations from 44 villages while the sample loss will even be doubled when doing first-differencing while $NRPpr$ does not need to face the sample loss.

**Robustness of instrument**

In order to check the robustness of the instrument, we created several alternative measures of village level NRP coverage and participation rate.

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[18] As announced by central government, NRP achieved full geographic coverage by the end of 2012. CHARLS Wave 2 is collected in 2013 and thus all the villages should have been covered by NRP already.

[19] To ease comparison between waves, only villages whose NPR coverage status in Wave 1 can be identified is counted in the Wave 2 summary.

Considering the missing information in community survey, a second measure of village NRP coverage status ($NRPc2$) was made from individual data based on the village level participation rate ($NRPpr$), which was defined as

$$NRPc2 = \begin{cases} 1 & , if\ rNRP > 0 \\ 0 & , if\ rNRP = 0 \end{cases}$$

Two more measures of village level participation rate were also generated using slightly different definition. First, we considered a village level NRP participation rate excluding respondent himself ($NRPpr2$). It was defined as the ratio between number of respondents who joined NRP and number of respondents in the village while excluding the respondent himself in both nominator and denominator.

$$NRPpr2 = \frac{\#(respondents\ who\ joined\ NRP\ in\ the\ village) - I\{NRPpar\}}{\#(respondents\ in\ the\ village) - 1} \times 100$$

Second, we calculated the NRP participation rate at the county level instead. It was the ratio between number of respondents who joined NRP and number of respondents in the county.

$$NRPpr3 = \frac{\#(respondents\ who\ joined\ NRP\ in\ the\ county)}{\#(respondents\ in\ the\ county)} \times 100$$

Appendix 2.1 reported the results in IV with fixed effect model specification with different combinations of these instruments. Results for both first and second stage are reported for full set of outcome variables. In the first stage, for all instrument combinations, the coefficients for instrument were highly significant and robust, the F statistics indicated a strong instrumental relevance. In the second stage, coefficients for individual NRP participation were robust with similar magnitude across all instrument combination as well as full set of outcome variables.

### 2.4.4 Further discussion

In this section, two more concerns regarding the NRP implementation are furtherly discussed. One is the lump-sum contribution rule designed for initial transition, another is the heterogeneous local subsidy plan in each province. Both of these two issues may affect rural residents' incentives of joining NRP and thus change their labor supply behaviors. Meanwhile, we would also like to offer to more comprehensive discussion regarding the puzzling finding of work and leisure in the context on rural China.

### Lump-sum contribution

In order to meet all special conditions of potential NRP participants at the initial stage of reform, the NRP scheme specifically designed two rules for transition which were known later as "family-binding" and "lump-sum contribution".

Since NRP requires at least 15 years of contribution, new participants aged 45-60 cannot meet this requirement if contributing only on a yearly basis. Therefore, lump-sum contribution rule allow them to repay the "gap" with the upper limit of equivalent accumulation for no more 15 years before they reach age 60. Lump-sum contribution rule applies only to pension participants who were between 45 and 60 at the time NRP was first introduced to the local counties. Even after the NRP scheme achieved full geographic coverage in the whole nation, this rule still persists until now.

Due to this rule, NRP participants who joined NRP at the age of 45-60 would have different expectations on their cost and associated benefits. In one condition, participants could give up repaying the missed years and end up contribution with less total accumulation in individual account, compared to a standard 15 years accumulation. Thus, they should also expect less pension benefit after age 60. In another condition, participants could choose to

repay all the missed years' premium in lump-sum form to get the equivalent 15 years contribution. Thus, they should contribute more money in a short periods but can receive standard amount of pension benefits. In either case, it is relatively more costly and less beneficial compared to normal participants. Therefore, it is suspected that lump-sum contribution would attenuate rural residents' incentives to join NRP.

Taking the age as exogenous variation at the time NRP was introduced to the village, we tried to apply regression discontinuity design (RDD) to check rural residents' incentives of participating NRP due to the lump-sum payment rule. Age 45 was taken as the cutoff for the discontinuity analysis.

We start with RDD using all available samples after restricting to respondents who aged 40-60 and resided in NRP eligible village in each wave. It ended up with 149 and 6,968 observations on both sides of the cutoff. Therefore, 10 bins and 50 bins were selected accordingly on each side. We tried different estimation functions setting, including linear function, quadratic function, 3rd polynomial function and 4th polynomial function. Estimations were illustrated in Figure 2.2. There is no clear evidence of discontinued NRP participation around age 45.

To get rid of the potential influence of family binding, the above sample was further restricted to respondents who did not have any parents alive. After applying this additional restriction, less than 1/3 of the sample was available with 24 and 2,312 observations on both sides of the cutoff. Then 3 bins and 50 bins were selected accordingly. Results were illustrated in Figure 2.3. Interpretations should be made with cautions considering the limited sample size.

Considering the limited sample size, it is not possible to bring further analysis in labor supply behaviors using the current data set.

## Heterogeneous local subsidy plan

Apart from the basic pension benefits guaranteed by central government, local governments could design their own local subsidy plans according to their fiscal affordability because they can secure budgets from provincial and local governments. Current available local subsidy plans include, but not limited to the following four designs. First, local government can offer additional basic pension benefit ranging from 45 RMB to 65 RMB per pensioner per year. Second, to encourage participants contribute more than minimum required 15 years, local government could offer progressive benefits for every additional year on contribution made by participants. Third, local government could offer basic subsidy covering partial monthly contribution, ranging from 20 RMB to 60 RMB per contributors per year. Fourth, to encourage higher premium, local government would provide progressive subsidy matching the level of premium participants choose other than the minimum level. The former two designs are offering subsidy for pension benefits while the latter two are targeting contribution which would be accumulated in the individual account. Therefore, we could expect various local subsidy plans across provinces, and even across counties, that would create differential incentives on rural residents' NRP participations.

Tracing the exact local subsidy plans implemented in each county is difficult. And matching it to the CHARLS data is also impossible because the county information is not revealed. To partially control this potential concern, several macroeconomic indicators on the provincial level are introduced to reflect socio-economic development as well as pension scale in each province. Three socio-economic development indicators were collected including regional GDP per capita, rural household expenditure and rural population. Two indicators describing pension scale were also introduced including per capita NRP revenue and per capita NRP

expenses[20]. All these variables would take logarithm transformation and then add to the main estimation equation additionally. Results were reported in Appendix 2.2, Appendix 2.23 and Appendix 2.4 for work status outcomes, individual labor supply outcomes, and offspring's labor supply outcomes respectively. Even after controlling for the macro indicators, estimations for individual NRP participation were still robust for all variables.

## Response to the puzzling work and leisure in rural China

Following the discussion of the potential channels of increased labor supply, this section would like to have further discussion on the puzzling finding why NRP participants had such a high willingness to work and some of them had even increased labor supply in actual while there is no sign of increased leisure.

From theoretical perspective, the joining NRP could help rural residents save more for future old-age support. This saving come from their own contribution, as well as, central and local government subsidies. Taking the extra support from government subsidies into account, rural residents should be richer (as pensioner) or expect to be richer later (as contributor). Therefore, the pension participants should demand more leisure instead of increasing work willing and labor supply.

I could think about three potential responses. Firstly, although the analysis results showed an increased willingness work, it is still skeptical whether the stated willingness would turn to be actual behavior. For instance, old-age rural residents are very vulnerable to health shocks which is another essential factor for work and labor supply decisions. An unexpected change in health condition would deteriorate their work and retirement plan at all.

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[20] From the perspective of an individual, per capita NRP revenue reflects average level of contribution made by NRP participants while per capita NRP expenses reflects average level of benefits pensioners could receive.

Second, given the weak evidence of sectoral labor migration in my results, joining NRP would increase labor migration in the household. In the sense that the respondent become the migrant workers, his actual labor supply as well as willingness to work should increase because off-farm jobs will require more intensive working schedule then agricultural work at home. In the sense that respondent become the left-behind member due to other household member's (spouse or offspring) labor migration, he has to take the responsibility to look after the land and housework at the domestic. In this sense, left-behind member may also likely to higher willingness to work while the actual labor supply remained constant, though not increasing but at least non-decreasing.

Third, the relationship between work and leisure in rural China may not apply to normal economic theory where work and labor are considered as substitutions when income increase. In rural China, what the residents and household usually may face are poor income or even under poverty, less access to infrastructure and public service. If it is the case, leisure should be less than a normal good. And referring to my latter discussion on household consumption allocation in chapter3, rural household would only spent an average of 13 RMB (equivalent to 2 US dollars) on leisure (i.e. entertainment, travel and beauty) each month which accounts merely less than 1 percent of total expenditure. At the same time, as mentioned above, around half of the individuals in my sample were below the poverty line. This fact would definitely reflect a very high marginal rate of substitution in preference of work to leisure, which is just as the old saying in China, "Work is the best leisure".

## 2.5 Conclusion

Evaluating the behavioral effects of a large scale policy reform such as China's new rural pension reform quantitatively is attractive and meaningful. This paper tries to contribute to the existing studies on China's NRP reform in the perspective of labor supply. The results can also contribute to further comparative studies on the labor supply responses to social security reform in developing countries such as China, South Africa and Brazil etc.

This paper takes the NRP reform's gradual geographical expansion as a quasi-experiment to evaluate the effect of pension reform on rural residents' labor supply behaviors. By constructing a two-period panel data from CHARLS wave 1 and wave 2 study, we mainly targeting the rural residents who are in their mid-age and old-age. And IV with fixed effect model is estimated to capture the changes in labor supply of rural residents along with the pension coverage in China.

First, the fast geographic expansion of NRP is followed by a significant expansion in rural pension coverage, even under the institutional setting of voluntary participation. And NRP is successful in motivating individuals' participation especially among rural residents who were not covered by any pension programs before. This change is essential for achieving universal pension coverage, narrowing rural-urban gap and promoting social equality.

Second finding is a little bit surprising. In Theory, without cash constraint, households are supposed to work less due to available public pension programs. And similar changes are observed in the case of social security reforms in South Africa and Brazil. In contrast, a modest increase in rural residents' willingness to work with longer working hours among NRP participants is observed. This means NRP participation dose hurt people's incentives for labor supply. Meanwhile, some indirect evidences of labor migration is found here as both rural residents and their offspring tend to work more in non-agricultural jobs if joined NRP.

Third, all the main changes in labor supply are driven by age group 40-59 who are actually pension contributors in the NRP.

We believe that the channels behind these major changes in rural residents' labor supply is resulted in household budget constraint and side effect of labor migration.

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# Tables

**Table 2.1 Summary statistics of the main outcome variables**

| Variable name | Full sample | | | Not in NRP | | | Joined in NRP | | |
|---|---|---|---|---|---|---|---|---|---|
| | Obs. | Mean | Std. Dev. | Obs. | Mean | Std. Dev. | Obs. | Mean | Std. Dev. |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| **a. Work status:** | | | | | | | | | |
| =1 if currently working* | 17,805 | 0.774 | 0.418 | 9,007 | 0.774 | 0.418 | 8,798 | 0.775 | 0.418 |
| =1 if willing to work beyond statutory retirement age* | 12,760 | 0.918 | 0.274 | 6,325 | 0.914 | 0.281 | 6,435 | 0.923 | 0.266 |
| =1 if willing to keep working until physically able* | 12,760 | 0.779 | 0.415 | 6,325 | 0.771 | 0.420 | 6,435 | 0.787 | 0.410 |
| Expected retirement age | 12,760 | 70.50 | 5.30 | 6,325 | 70.31 | 5.34 | 6,435 | 70.69 | 5.26 |
| **b. Labor supply:** | | | | | | | | | |
| Total working hours | 16,836 | 1135.8 | 1232.0 | 8,434 | 1189.2 | 1271.2 | 8,402 | 1082.3 | 1189.0 |
| Total working hours in farm employed jobs | 12,614 | 38.3 | 235.5 | 6,292 | 42.4 | 256.0 | 6,322 | 34.3 | 213.1 |
| Total working hours in household agricultural jobs | 12,608 | 1045.9 | 1005.5 | 6,288 | 1092.8 | 1048.9 | 6,320 | 999.2 | 958.2 |
| Log of total working hours in employed jobs | 3,493 | 939.8 | 1174.4 | 1,832 | 978.8 | 1205.4 | 1,661 | 896.9 | 1138.1 |
| Total working hours in non-farm self-employed and unpaid family business | 3,493 | 621.0 | 1250.7 | 1,832 | 599.1 | 1252.3 | 1,661 | 645.1 | 1249.0 |
| Log of total working hours in farm employed jobs | 12,614 | 0.36 | 1.43 | 6,292 | 0.37 | 1.46 | 6,322 | 0.36 | 1.41 |
| Log of total working hours in household agricultural jobs | 12,608 | 5.74 | 2.48 | 6,288 | 5.68 | 2.61 | 6,320 | 5.80 | 2.34 |
| Log of total working hours in employed jobs | 3,493 | 3.98 | 3.57 | 1,832 | 4.00 | 3.60 | 1,661 | 3.95 | 3.55 |
| Log of total working hours in non-farm self-employed and unpaid family business | 3,493 | 2.31 | 3.39 | 1,832 | 2.25 | 3.35 | 1,661 | 2.38 | 3.42 |
| **c. Offspring's labor supply:** | | | | | | | | | |
| Number of offspring currently working | 17,812 | 2.47 | 1.51 | 9,014 | 2.39 | 1.53 | 8,798 | 2.56 | 1.47 |
| Number of offspring doing agricultural jobs | 17,812 | 0.887 | 1.31 | 9,014 | 0.887 | 1.33 | 8,798 | 0.888 | 1.29 |

Note: The unit of observation is an individual. Variables marked with * are dummies. Variable willingness to work more than statutory retirement age used age 60 as the reference age. The term "retirement" used in variable expected retirement age should refer to having stopped all income-related activities, unpaid family business, and having no intention in engaging in any more serious than small part time work (CHARLS questionnaire, 2011 and 2013).

## Table 2.2 Summary statistics of the control variables

| Variable name | Full sample | | | Not in NRP | | | Joined in NRP | | | NRP - No NRP | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Obs. | Mean | Std. Dev. | Obs. | Mean | Std. Dev. | Obs. | Mean | Std. Dev. | Diff. | Std.Err. |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| **Individual demographics:** | | | | | | | | | | | |
| =1 if male* | 17,818 | 0.470 | 0.499 | 9,018 | 0.473 | 0.499 | 8,800 | 0.466 | 0.499 | -0.006 | (0.007) |
| age | 17,818 | 59.93 | 9.75 | 9,018 | 59.52 | 9.97 | 8,800 | 60.35 | 9.49 | 0.831*** | (0.146) |
| =1 if attained at least secondary education | 17,748 | 0.232 | 0.422 | 8,972 | 0.230 | 0.421 | 8,776 | 0.234 | 0.423 | 0.004 | (0.006) |
| =1 if married* | 17,816 | 0.858 | 0.349 | 9,016 | 0.853 | 0.355 | 8,800 | 0.863 | 0.344 | 0.010* | (0.005) |
| =1 if divorced* | 17,816 | 0.010 | 0.099 | 9,016 | 0.011 | 0.105 | 8,800 | 0.009 | 0.093 | -0.002 | (0.001) |
| =1 if widowed* | 17,816 | 0.121 | 0.326 | 9,016 | 0.123 | 0.329 | 8,800 | 0.118 | 0.323 | -0.005 | (0.005) |
| **Individual health:** | | | | | | | | | | | |
| =1 if has any disabilities* | 17,799 | 0.254 | 0.435 | 9,004 | 0.235 | 0.424 | 8,795 | 0.273 | 0.445 | 0.038*** | (0.007) |
| =1 if has any chronic diseases* | 17,799 | 0.674 | 0.469 | 9,004 | 0.663 | 0.473 | 8,795 | 0.684 | 0.465 | 0.021** | (0.007) |
| ADL | 17,801 | 0.020 | 0.097 | 9,005 | 0.019 | 0.093 | 8,796 | 0.021 | 0.101 | 0.002 | (0.001) |
| IADL | 17,801 | 0.067 | 0.175 | 9,005 | 0.060 | 0.169 | 8,796 | 0.073 | 0.181 | 0.013*** | (0.003) |
| **Household characteristics:** | | | | | | | | | | | |
| Log of household income | 16,139 | 8.81 | 1.79 | 8,077 | 8.83 | 1.83 | 8,062 | 8.78 | 1.75 | -0.051 | (0.028) |
| Number of offspring alive | 17,811 | 2.96 | 1.45 | 9,013 | 2.93 | 1.48 | 8,798 | 2.98 | 1.42 | 0.050* | (0.022) |
| Number of siblings alive | 17,774 | 3.24 | 1.97 | 8,989 | 3.25 | 1.98 | 8,785 | 3.22 | 1.95 | -0.026 | (0.029) |
| Number of parents alive | 17,818 | 0.76 | 1.02 | 9,018 | 0.80 | 1.05 | 8,800 | 0.72 | 0.99 | -0.086*** | (0.015) |

Note: The unit of observation is an individual. Variables marked with * are dummies. ADL and IADL measures the incidence of difficulty among listed activities of daily living or instrumental activities of daily living, both of which range from 0 to 1.Household income mainly consists of individual wage income and individual-based transfer, agricultural net income, self-employed activities net income and public transfer. The two-sample t-test was performed under the assumption of unequal variance and the results were given in columns 10-11.The differences between the two subsample groups are presented on last two columns. It is tested by two-sample t-test with unequal variance assumption. The significance level is presented as * 0.05, ** 0.01, *** 0.001.

Table 2.3 Individuals Pension Program Participation

| Pension Programs | Full sample | | Wave1 (2011) | | Wave2 (2013) | | Wave 2 - Wave1 | |
|---|---|---|---|---|---|---|---|---|
| | Mean | Std. Dev. | Mean | Std. Dev. | Mean | Std. Dev. | Diff. | Std. Err. |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| **Major public pension programs:** | | | | | | | | |
| 1.Pension Program of the Government or Institution | 0.0046 | 0.0677 | 0.0072 | 0.0845 | 0.0020 | 0.0449 | -0.0052*** | (0.0010) |
| 2. Basic Pension of the Firms | 0.0045 | 0.0669 | 0.0030 | 0.0550 | 0.0059 | 0.0769 | 0.0029** | (0.0010) |
| 3.Rural Pension (ORP) | 0.0631 | 0.2432 | 0.0841 | 0.2775 | 0.0422 | 0.2011 | -0.0419*** | (0.0036) |
| 4.New Rural Social Pension Insurance (NRP) | 0.4938 | 0.5000 | 0.2668 | 0.4423 | 0.7208 | 0.4486 | 0.4540*** | (0.0067) |
| **Supplemental pension programs:** | | | | | | | | |
| 5.Supplemental Pension Insurance of the Firms | 0.0021 | 0.0455 | 0.0019 | 0.0436 | 0.0022 | 0.0473 | 0.0003 | (0.0007) |
| 6.Commercial Pension | 0.0066 | 0.0808 | 0.0057 | 0.0754 | 0.0074 | 0.0858 | 0.0017 | (0.0012) |
| 7.Residents' Pension | 0.0140 | 0.1176 | 0.0064 | 0.0797 | 0.0217 | 0.1456 | 0.0153*** | (0.0018) |
| 8.Urban Residents' Pension | 0.0027 | 0.0518 | 0.0017 | 0.0410 | 0.0037 | 0.0608 | 0.0020** | (0.0008) |
| 9.Old Age Pension Allowance | 0.0381 | 0.1915 | 0.0132 | 0.1143 | 0.0630 | 0.2429 | 0.0497*** | (0.0028) |
| 10.Other | 0.0282 | 0.1656 | 0.0055 | 0.0740 | 0.0510 | 0.2199 | 0.0455*** | (0.0025) |
| **Uninsured:** | | | | | | | | |
| 11.None | 0.3688 | 0.4825 | 0.5932 | 0.4913 | 0.1443 | 0.3515 | -0.4489*** | (0.0064) |
| Obs. | 17818 | | 8909 | | 8909 | | | |

Note: The unit of observation is an individual. Pension participants count both contributors and pensioners. The differences of participation rates between two waves in each pension program are presented on last two columns. It is tested by two-sample t-test with unequal variance assumption. The significance level is presented as * 0.05, ** 0.01, *** 0.001.

<div align="center">**Table 2.4 Main results for work status outcomes**</div>

| | =1 if currently working | Obs. | =1 if willing to work beyond statutory retirement age | Obs. | =1 if willing to keep working until physically able | Obs. | Expected retirement age | Obs. |
|---|---|---|---|---|---|---|---|---|
| | (1) | Obs. | (2) | Obs. | (3) | Obs. | (4) | Obs. |
| **Pooled OLS** | 0.015* | 16,032 | 0.013* | 11,770 | 0.032*** | 11,770 | 0.253** | 11,770 |
| | (0.007) | | (0.006) | | (0.009) | | (0.098) | |
| **Pooled IV** | 0.015 | 16,032 | 0.045*** | 11,770 | 0.075*** | 11,770 | 0.515* | 11,770 |
| | (0.012) | | (0.012) | | (0.018) | | (0.180) | |
| **FE** | 0.017* | 7,331 | 0.020* | 4,629 | 0.052*** | 4,629 | 0.465*** | 4,629 |
| | (0.008) | | (0.009) | | (0.014) | | (0.132) | |
| **IVFE** | 0.019 | 7,331 | 0.039** | 4,629 | 0.053* | 4,629 | 0.474* | 4,629 |
| | (0.012) | | (0.014) | | (0.021) | | (0.206) | |

Note: The table reports estimates of NRP participation from pooled OLS, Pooled IV, fixed effect and IV with fixed effect. Each coefficient is estimated from an independent regression. The unit of observation is an individual. Cluster standard errors are provided within the parenthesis with clustering at the individual level. Significance levels are given by + 0.10 * 0.05 ** 0.01 *** 0.001. In pooled OLS and pooled IV, covariates are controlled for including individual demographics (gender, age and squared, education, marital status), individual health (any disability, any chronic, ADL, IADL), and family characteristics (number of offspring alive, number of siblings alive, number of parents alive, and log of household income). Also, county dummies and year dummies are included in pooled OLS and pooled IV. In FE and IVFE, village level NRP participation rate serves as instrument. Coefficients estimated by IVFE should be referred as the main results.

Table 2.5 Main results for labor supply outcomes

| | Log of total working hours | | Log of total working hours in farm employed jobs | | Log of total working hours in household agricultural jobs | |
|---|---|---|---|---|---|---|
| | (1) | Obs. | (2) | Obs. | (3) | Obs. |
| Pooled OLS | 0.174** | 15,180 | -0.006 | 11,630 | 0.144* | 11,625 |
| | (0.054) | | (0.033) | | (0.058) | |
| Pooled IV | 0.163+ | 15,180 | -0.029 | 11,630 | 0.180+ | 11,625 |
| | (0.096) | | (0.063) | | (0.108) | |
| FE | 0.197** | 6,578 | -0.025 | 4,728 | 0.117 | 4,723 |
| | (0.063) | | (0.046) | | (0.080) | |
| IVFE | 0.238* | 6,578 | -0.065 | 4,728 | 0.193 | 4,723 |
| | (0.097) | | (0.074) | | (0.122) | |

| | Log of total working hours in employed jobs | | Log of total working hours in non-farm self-employed and unpaid family business | |
|---|---|---|---|---|
| | (4) | Obs. | (5) | Obs. |
| Pooled OLS | -0.091 | 3,246 | 0.290* | 3,246 |
| | (0.156) | | (0.146) | |
| Pooled IV | 0.254 | 3,246 | 0.073 | 3,246 |
| | (0.291) | | (0.279) | |
| FE | 0.158 | 829 | 0.105 | 829 |
| | (0.204) | | (0.184) | |
| IVFE | 0.817* | 829 | -0.041 | 829 |
| | (0.325) | | (0.303) | |

Note: The table reports estimates of NRP participation from pooled OLS, Pooled IV, fixed effect and IV with fixed effect. Each coefficient is estimated from an independent regression. The unit of observation is an individual. Cluster standard errors are provided within the parenthesis with clustering at the individual level. Significance levels are given by + 0.10 * 0.05 ** 0.01 *** 0.001. In pooled OLS and pooled IV, covariates are controlled for including individual demographics (gender, age and squared, education, marital status), individual health (any disability, any chronic, ADL, IADL), and family characteristics (number of offspring alive, number of siblings alive, number of parents alive, and log of household income). Also, county dummies and year dummies are included in pooled OLS and pooled IV. In FE and IVFE, village level NRP participation rate serves as instrument. Coefficients estimated by IVFE should be referred as the main results.

**Table 2.6 Heterogeneity in effects among different age groups**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| **Panel A: Work status outcomes** | =1 if currently working | =1 if willing to work beyond statutory retirement age | =1 if willing to keep working until physically able | Expected retirement age | |
| age 40-60 (pension contributors) | 0.046** | 0.055* | 0.071* | 0.700* | |
| | (0.014) | (0.023) | (0.028) | (0.290) | |
| Obs. | 4,207 | 2,995 | 2,995 | 2,995 | |
| age ≥60 (pension recipients) | -0.013 | 0.013+ | 0.024 | 0.106 | |
| | (0.020) | (0.007) | (0.032) | (0.257) | |
| Obs. | 3,124 | 1,634 | 1,634 | 1,634 | |
| **Panel B: Labor supply outcomes** | Log of total working hours | Log of total working hours in farm employed jobs | Log of total working hours in household agricultural jobs | Log of total working hours in employed jobs | Log of total working hours in non-farm self-employed and unpaid family business |
| age 40-60 (pension contributors) | 0.352** | -0.059 | 0.217 | 0.622+ | -0.043 |
| | (0.127) | (0.105) | (0.157) | (0.359) | (0.343) |
| Obs. | 3,770 | 3,019 | 3,016 | 693 | 693 |
| age ≥60 (pension recipients) | 0.117 | -0.071 | 0.158 | 1.563+ | 0.226 |
| | (0.148) | (0.093) | (0.196) | (0.793) | (0.722) |
| Obs. | 2,808 | 1,709 | 1,707 | 136 | 136 |

Note: The table reports IVFE estimates of NRP participation. Each coefficient is estimated from an independent regression using the same set of control variables in Table 2.5 while restricting samples to the sub age groups of interest. The unit of observation is an individual. Cluster standard errors are given in the parenthesis with clustering at the individual level. The significance level is presented as + 0.10 * 0.05, ** 0.01, *** 0.001. The instrument used in IVFE is village level participation rate. Age group is defined based on respondents' age in wave1.

Table 2.7 Heterogeneity in effects by pension history

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| **Panel A: Work status outcomes** | =1 if currently working | =1 if willing to work beyond statutory retirement age | =1 if willing to keep working until physically able | Expected retirement age | |
| ORP | 0.292** | 0.199+ | 0.237 | 2.142 | |
| | (0.103) | (0.105) | (0.165) | (1.527) | |
| Obs. | 630 | 376 | 376 | 376 | |
| None | -0.025 | 0.035 | 0.023 | 0.331 | |
| | (0.030) | (0.036) | (0.053) | (0.509) | |
| Obs. | 4378 | 2,800 | 2,800 | 2,800 | |
| **Panel B: Labor supply outcomes** | Log of total working hours | Log of total working hours in farm employed jobs | Log of total working hours in household agricultural jobs | Log of total working hours in employed jobs | Log of total working hours in non-farm self-employed and unpaid family business |
| ORP | 0.753 | -0.276 | -1.598 | -0.511 | -1.223 |
| | (0.850) | (0.650) | (1.004) | (1.319) | (2.347) |
| Obs. | 576 | 373 | 373 | 75 | 75 |
| None | 0.420+ | -0.003 | 0.701* | 2.317*** | -0.414 |
| | (0.242) | (0.173) | (0.320) | (0.685) | (0.550) |
| Obs. | 3,929 | 2,866 | 2,863 | 473 | 473 |

Note: The table reports IVFE estimates of NRP participation. Each coefficient is estimated from an independent regression using the same set of control variables in Table 2.5 while restricting samples to the sub pension history groups of interest. The unit of observation is an individual. Cluster standard errors are given in the parenthesis with clustering at the individual level. The significance level is presented as + 0.10 * 0.05, ** 0.01, *** 0.001. The instrument used in IVFE is village level participation rate. Pension history group is defined based on respondents' pension participation history in wave1, which is indicated as *ORP* and *None* in the table. The interpretation of estimates in the ORP group in Panel B should be with cautions due to the small sample size.

**Table 2.8 Comparison on background characteristics by different pension histories**

| Variable name | ORP | | | None | | | ORP - None Two-sample t-test | | Dependent variable: =1 if ORP in wave1 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | OLS | | Logit | |
| | Obs. | Mean | Std. Dev. | Obs. | Mean | Std. Dev. | Diff. | Std. Err. | Coef. | Std. Err. | Coef. | Std. Err. |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| **Individual demographics:** | | | | | | | | | | | | |
| =1 if male* | 749 | 0.475 | 0.500 | 5,421 | 0.465 | 0.499 | -0.010 | (0.019) | -0.007 | (0.009) | -0.059 | (0.087) |
| Age | 749 | 60.07 | 9.92 | 5,421 | 58.64 | 9.64 | -1.429*** | (0.385) | 0.003 | (0.005) | 0.059 | (0.046) |
| Age squared | 749 | 37.07 | 12.44 | 5,421 | 35.32 | 11.92 | -1.750*** | (0.483) | 0.002 | (0.004) | -0.009 | (0.036) |
| =1 if attained at least secondary education | 747 | 0.225 | 0.418 | 5,395 | 0.227 | 0.419 | 0.002 | (0.016) | 0.008 | (0.011) | 0.089 | (0.105) |
| =1 if married* | 749 | 0.849 | 0.358 | 5,420 | 0.856 | 0.351 | 0.007 | (0.014) | 0.024 | (0.041) | 0.231 | (0.379) |
| =1 if divorced* | 749 | 0.013 | 0.115 | 5,420 | 0.012 | 0.110 | -0.001 | (0.004) | 0.016 | (0.057) | 0.105 | (0.495) |
| =1 if widowed* | 749 | 0.124 | 0.330 | 5,420 | 0.119 | 0.324 | -0.005 | (0.013) | 0.017 | (0.043) | 0.170 | (0.394) |
| **Individual health:** | | | | | | | | | | | | |
| =1 if has any disabilities* | 749 | 0.170 | 0.375 | 5,420 | 0.213 | 0.409 | 0.043** | (0.015) | -0.038*** | (0.011) | -0.359** | (0.114) |
| =1 if has any chronic diseases* | 749 | 0.677 | 0.468 | 5,419 | 0.662 | 0.473 | -0.015 | (0.018) | 0.010 | (0.010) | 0.091 | (0.089) |
| ADL | 749 | 0.025 | 0.117 | 5,420 | 0.017 | 0.087 | -0.008 | (0.004) | 0.173* | (0.071) | 1.341** | (0.475) |
| IADL | 749 | 0.058 | 0.174 | 5,420 | 0.056 | 0.165 | -0.001 | (0.007) | -0.053 | (0.033) | -0.453 | (0.314) |
| **Household characteristics:** | | | | | | | | | | | | |
| Log of household income | 714 | 9.12 | 1.53 | 4,894 | 8.82 | 1.83 | -0.301*** | (0.063) | 0.014*** | (0.002) | 0.130*** | (0.023) |
| Number of offspring alive | 749 | 2.79 | 1.43 | 5,416 | 2.95 | 1.46 | 0.165** | (0.056) | -0.018*** | (0.004) | -0.163*** | (0.035) |
| Number of siblings alive | 748 | 3.32 | 2.15 | 5,399 | 3.31 | 1.93 | -0.018 | (0.083) | 0.004 | (0.003) | 0.035 | (0.023) |
| Number of parents alive | 749 | 0.81 | 1.05 | 5,421 | 0.86 | 1.08 | 0.049 | (0.041) | 0.003 | (0.005) | 0.025 | (0.045) |

Note: The sample used in this table is restricted to individuals who were either in category *ORP* or *None* in wave1. The unit of observation is an individual. Basic summary statistics for each group are presented in columns 1-6. The differences in means are presented in column 7, which is tested by two-sample t-test by assuming unequal variances. Standard errors are provided in column 8. Another way to check the group difference is using OLS and Logit regression taking respondent is in ORP or None as binary dependent variable. Results are reported in columns 9-12. The coefficient for constant is

omitted and number of observation for regression is 5,565. Cluster standard errors are provided within the parenthesis in column 9 and column 12 with clustering at the individual level. The significance level is presented as + 0.10 * 0.05, ** 0.01, *** 0.001.

**Table 2.9 Results for offspring's labor supply**

| | Number of offspring currently working | | Number of offspring doing agricultural jobs | |
|---|---|---|---|---|
| | (1) | Obs. | (2) | Obs. |
| **Panel A: Main results** | | | | |
| Pooled OLS | 0.029+ | 16,037 | -0.063*** | 16,037 |
| | (0.015) | | (0.018) | |
| Pooled IV | 0.056* | 16,037 | -0.130*** | 16,037 |
| | (0.028) | | (0.033) | |
| FE | 0.042* | 7,333 | -0.053* | 7,333 |
| | (0.020) | | (0.021) | |
| IVFE | 0.075* | 7,333 | -0.119*** | 7,333 |
| | (0.031) | | (0.033) | |
| **Panel B: Heterogeneity in effects among age groups** | | | | |
| age 40-60 | 0.036 | 4,209 | -0.148*** | 4,209 |
| (pension contributors) | (0.040) | | (0.037) | |
| age ≥60 | 0.123* | 3,124 | -0.082 | 3,124 |
| (pension recipients) | (0.049) | | (0.058) | |

Note: The panel A reports estimates of NRP participation from pooled OLS, Pooled IV, fixed effect and IV with fixed effect. The panel B reports IVFE estimates of NRP participation. Each coefficient is estimated from an independent regression. The unit of observation is an individual. Cluster standard errors are provided within the parenthesis with clustering at the individual level. Significance levels are given by + 0.10 * 0.05 ** 0.01 *** 0.001. In pooled OLS and pooled IV, covariates are controlled for including individual demographics (gender, age and squared, education, marital status), individual health (any disability, any chronic, ADL, IADL), and family characteristics (number of offspring alive, number of siblings alive, log of household income). Also, county dummies and year dummies are included in pooled OLS and pooled IV. In FE and IVFE, village level NRP participation rate serves as instrument. Coefficients estimated by IVFE should be referred as the main results.

**Table 2.10 Village level NRP coverage status and participation rate**

| | Number of villages covered by NRP | NRP participation rate (percent) | | Number of villages not covered by NRP | NRP participation rate (percent) | |
|---|---|---|---|---|---|---|
| | | Mean | Std. Dev. | | Mean | Std. Dev. |
| Wave1 (2011) | 105 | 47.86 | 31.48 | 87 | 0.00 | 0.00 |
| Wave2 (2013) | 192 | 71.65 | 22.60 | 0 | - | - |

Note: The unit of observation is a village. To make the average participation rate comparable between waves, only villages whose NPR coverage status in Wave 1 can be identified is counted.

0.72  0.3

8.41

26.68

59.32

4.57

Wave1
(2011)

0.59  0.2

4.22

14.43

8.48

72.08

Wave2
(2013)

- 1.Pension Program of the Government or Institution
- 2.Baisic Pension of the Firms
- 3.Rural Pension (ORP)
- 4.New Rural Social Pension Insurance (NRP)
- 5.Other
- 6.None
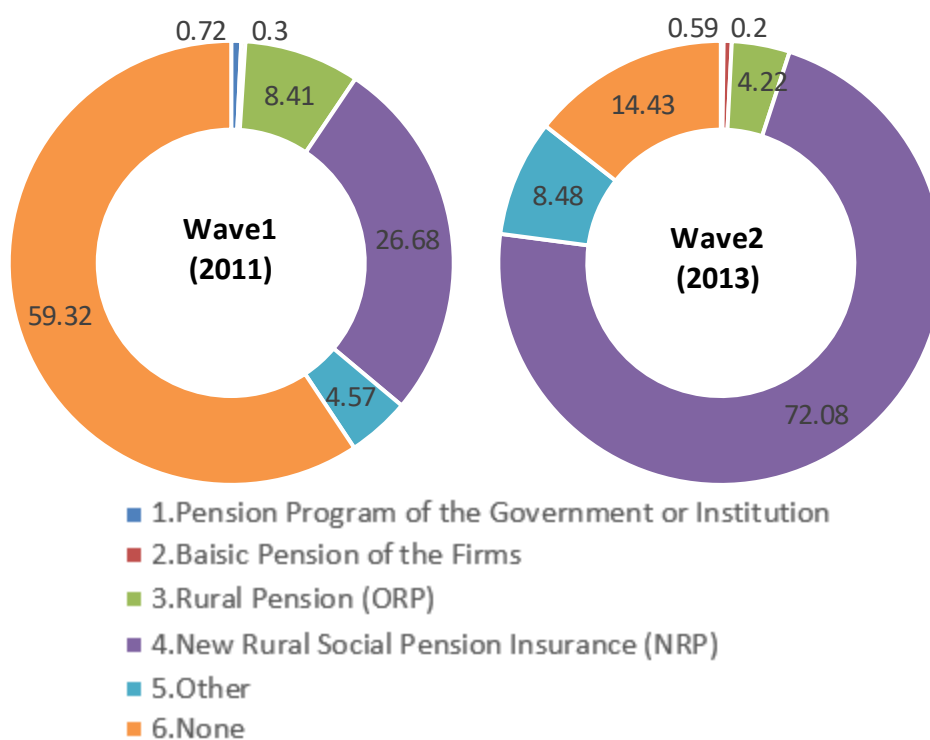
Note: The proportion of "other" was calculated as the remaining part other than the major public pension programs and uninsured group.

**Figure 2.1 Individuals pension programs participation (percent)**
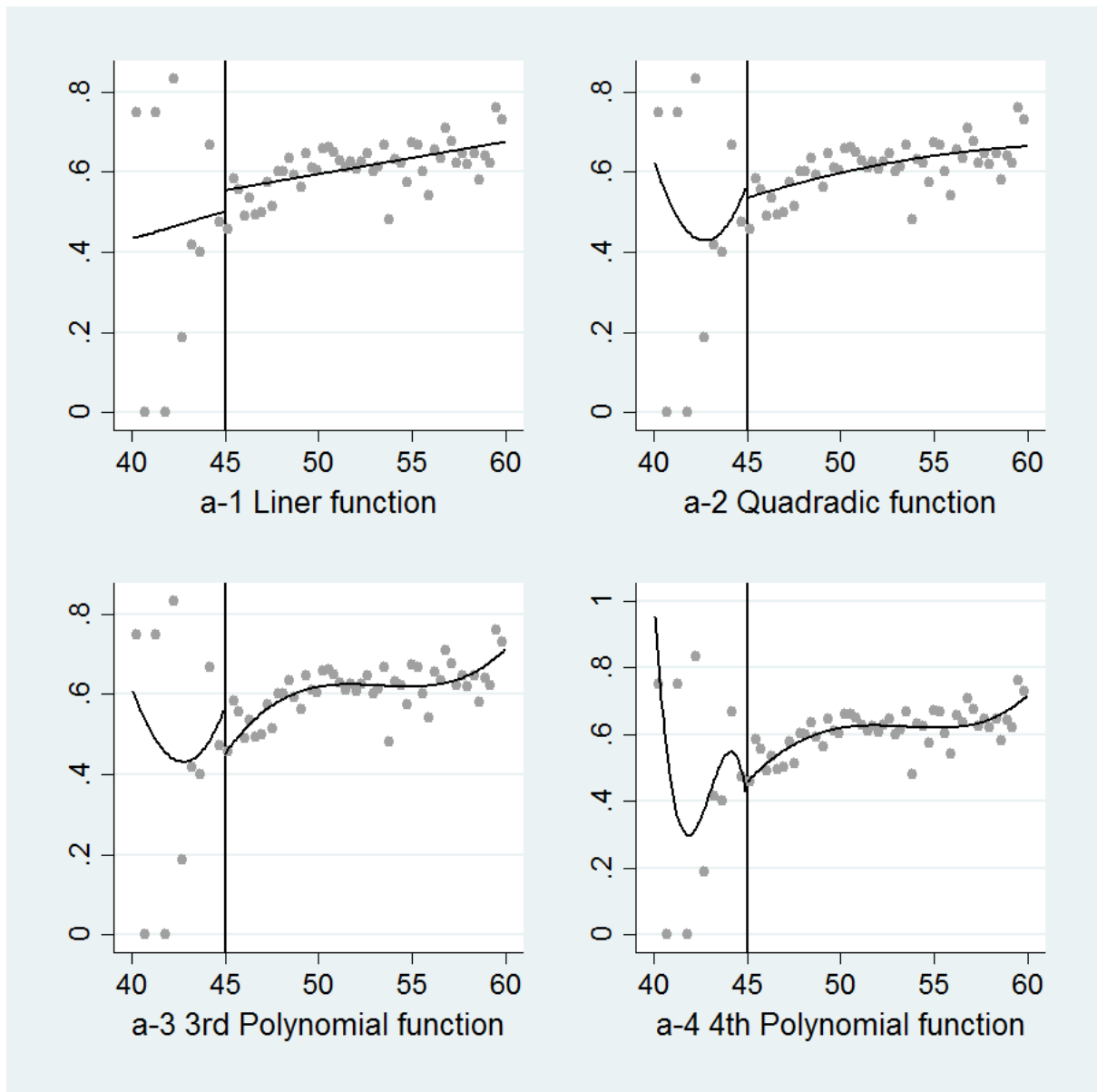
Note: Sample is restricted to respondents aged 40-60 who resided in the village covered by NRP at each wave. Dependent variable is whether an individual join NRP or not with value 1 indicating yes. Age 45 is taken as the cutoff for the discontinuity analysis. Since there are 149 and 6,968 observations on both sides of the cutoff, we select 10 bins and 50 bins respectively.

**Figure 2.2 Discontinuity in incentives of participating NRP due to lump-sum contribution: all available samples**
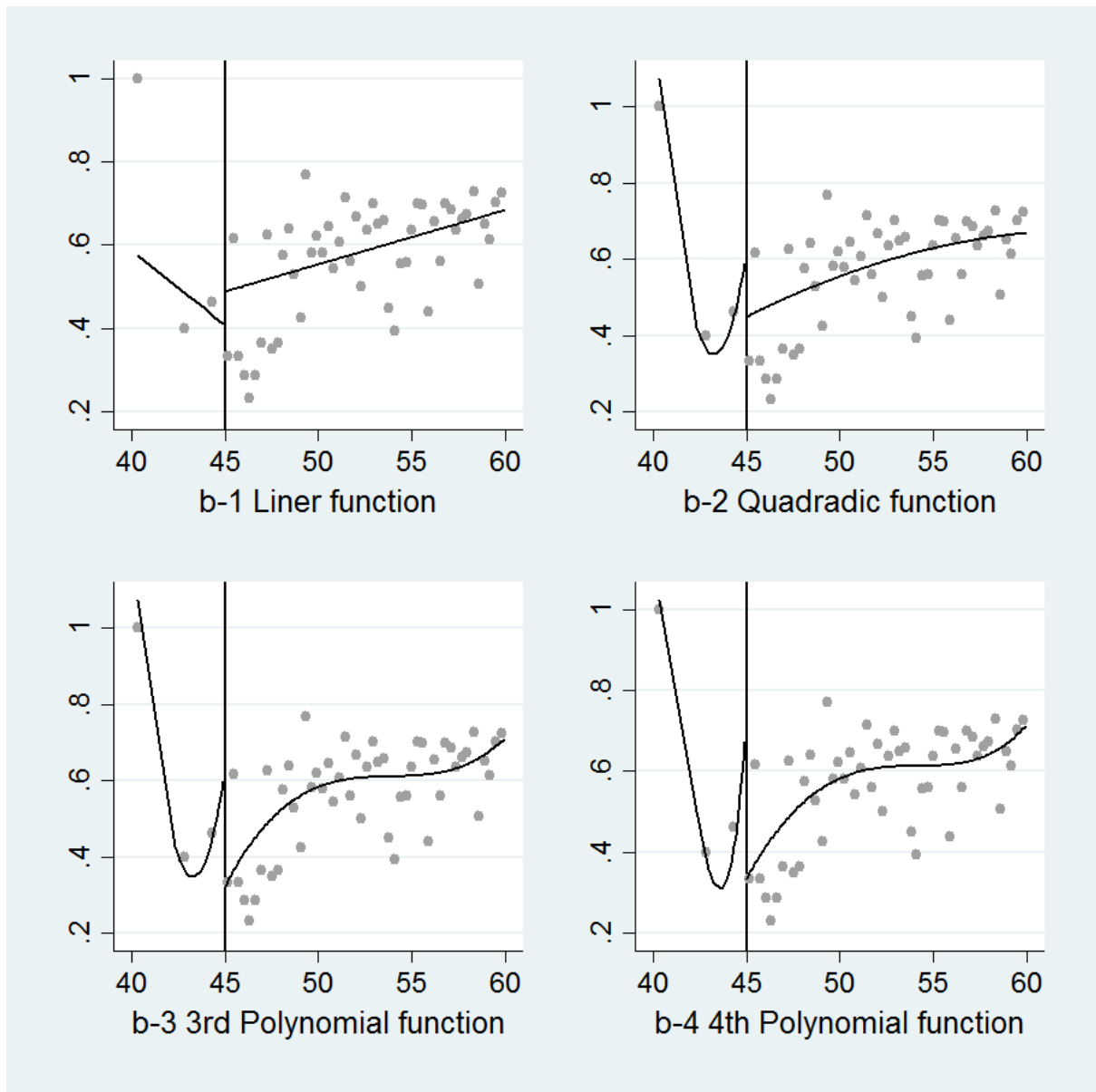
Note: Alongside restriction that respondents aged 40-60 who resided in the village covered by NRP at each wave, sample is further restricted to respondents who did not have any parents alive. Dependent variable is whether an individual join NRP. Age 45 is taken as the cutoff for the discontinuity analysis. Since there are 24 and 2,312 observations on both sides of the cutoff, we select 3 bins and 50 bins respectively. Interpretations should be made with cautions considering the limited sample size.

**Figure 2.3 Discontinuity in incentives of participating NRP due to lump-sum contribution: restricted samples**

# *Appendices*

**Appendix 2.1 Robustness of Instrument using different measures (example)**

| Instruments | (1) $NRPpr$ | (2) $NRPc$ | (3) $NRPc2$ | (4) $NRPpr, NRPc$ | (5) $NRPpr, NRPc2$ | (6) $NRPpr2$ | (7) $NRPpr3$ |
|---|---|---|---|---|---|---|---|
| | | | | **Dependent variable: 1 if currently work** | | | |
| **Panel A: second stage** | | | | | | | |
| Individual NRP participation | 0.031* | 0.024 | 0.036* | 0.027* | 0.031* | 0.031* | 0.032* |
| | (0.012) | (0.018) | (0.018) | (0.013) | (0.012) | (0.012) | (0.013) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Panel B: first stage** | | | | | | | |
| $NRPpr$ | 0.0101*** | | | 0.0102*** | 0.0101*** | | |
| | (0.0001) | | | (0.0002) | (0.0002) | | |
| $NRPc$ | | 0.5459*** | | -0.0083 | | | |
| | | (0.0126) | | (0.0173) | | | |
| $NRPc2$ | | | 0.4916*** | | 0.0019 | | |
| | | | (0.0116) | | (0.0143) | | |
| $NRPpr2$ | | | | | | 0.0097*** | |
| | | | | | | (0.0001) | |
| $NRPpr3$ | | | | | | | 0.0101*** |
| | | | | | | | (0.0001) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Obs. | 8,041 | 6,527 | 8041 | 6527 | 8041 | 8041 | 8041 |
| **Weak instrument test** | 651.98 | 213.55 | 203.59 | 514.92 | 587.28 | 550.709 | 523.91 |
| **Overidentification test** | | | | 0.052 | 0.153 | | |
| | | | | [0.819] | [0.696] | | |

Note: Robust standard errors are given in the parenthesis. The significance level is presented as + 0.10 * 0.05, ** 0.01, *** 0.001. For each outcome, both first and second stage results estimated by IVFE are reported. The instruments used in each column are different combinations of measures on village level

NRP coverage/participation. And the instrument used is reported on top of each column. At the bottom of table, results from weak instrument test and overidentification test are reported with F statistic and Hensan J statistic respectively. P-value of overidentification test is given in the brackets. For more robustness test results using all the other outcome variables can be provided upon request.

**Appendix 2.2  Estimates of work status outcomes using additional macro variables**

| | =1 if currently working | | | =1 if willing to work beyond statutory retirement age | | | =1 if willing to keep working until  physically able | | | Expected retirement age | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| Individual NRP participation | 0.012 | 0.016 | 0.012 | 0.044** | 0.037* | 0.041** | 0.054* | 0.054* | 0.055* | 0.580** | 0.494* | 0.559** |
| | (0.012) | (0.012) | (0.012) | (0.015) | (0.014) | (0.015) | (0.021) | (0.021) | (0.021) | (0.210) | (0.207) | (0.210) |
| Log of regional GDP per capita | 0.369** | | 0.307* | 0.022 | | 0.004 | 0.561* | | 0.523* | -2.125 | | -1.446 |
| | (0.125) | | (0.132) | (0.144) | | (0.150) | (0.223) | | (0.235) | (2.174) | | (2.262) |
| Log of rural household consumption | -0.132 | | -0.128 | -0.245+ | | -0.234+ | -0.761*** | | -0.759*** | -1.257 | | -1.266 |
| | (0.111) | | (0.111) | (0.128) | | (0.127) | (0.198) | | (0.198) | (1.911) | | (1.905) |
| Log of rural population | 1.239** | | 0.999* | -1.370* | | -1.619** | -1.897* | | -1.985* | -23.461** | | -22.481** |
| | (0.449) | | (0.482) | (0.573) | | (0.607) | (0.852) | | (0.903) | (8.006) | | (8.495) |
| Log of per capita NRP revenue | | 0.014 | 0.010 | | -0.025 | -0.024 | | 0.022 | 0.014 | | -0.360 | -0.337 |
| | | (0.016) | (0.016) | | (0.016) | (0.017) | | (0.028) | (0.028) | | (0.255) | (0.259) |
| Log of per capita NRP expenses | | -0.038* | -0.024 | | 0.016 | 0.007 | | -0.023 | -0.019 | | 0.549+ | 0.375 |
| | | (0.018) | (0.019) | | (0.018) | (0.018) | | (0.032) | (0.033) | | (0.282) | (0.295) |
| Other controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Obs.** | 7,331 | 7,331 | 7,331 | 4,629 | 4,629 | 4,629 | 4,629 | 4,629 | 4,629 | 4,629 | 4,629 | 4,629 |

Note: The table reports IVFE estimates of NRP participation as well as macroeconomic indicators. Each column is estimated from an independent regression using the same set of control variables in Table 2.5. The unit of observation is an individual. Cluster standard errors are given in the parenthesis with clustering at the individual level. The significance level is presented as + 0.10 * 0.05, ** 0.01, *** 0.001. The instrument used in IVFE is village level participation rate.

**Appendix 2.3 Estimates of individual labor supply outcomes using additional macro variables**

| | Log of total working hours | | | Log of total working hours in household agricultural jobs | | | Log of total working hours in employed jobs | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Individual NRP participation | 0.177+ | 0.249* | 0.199* | 0.152 | 0.177 | 0.133 | 0.804* | 0.948** | 0.898** |
| | (0.099) | (0.098) | (0.099) | (0.125) | (0.123) | (0.125) | (0.324) | (0.332) | (0.329) |
| Log of regional GDP per capita | 2.553** | | 2.582* | 1.842 | | 2.396+ | -1.274 | | 1.810 |
| | (0.986) | | (1.043) | (1.255) | | (1.341) | (3.548) | | (3.763) |
| Log of rural household consumption | -0.222 | | -0.279 | -0.151 | | -0.152 | 1.693 | | 1.834 |
| | (0.894) | | (0.897) | (1.085) | | (1.088) | (2.570) | | (2.578) |
| Log of rural population | 11.309** | | 12.762*** | 4.269 | | 4.911 | -0.433 | | 13.956 |
| | (3.634) | | (3.871) | (4.641) | | (4.901) | (10.945) | | (11.602) |
| Log of per capita NRP revenue | | 0.243+ | 0.200 | | -0.229 | -0.286+ | | 0.530 | 0.528 |
| | | (0.130) | (0.133) | | (0.169) | (0.174) | | (0.387) | (0.393) |
| Log of per capita NRP expenses | | -0.244+ | -0.094 | | 0.194 | 0.309 | | 0.072 | 0.170 |
| | | (0.146) | (0.155) | | (0.184) | (0.198) | | (0.426) | (0.443) |
| Other controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Obs.** | 6,578 | 6,578 | 6,578 | 4,723 | 4,723 | 4,723 | 8,29 | 8,29 | 8,29 |

Note: The table reports IVFE estimates of NRP participation as well as macroeconomic indicators. Each column is estimated from an independent regression using the same set of control variables in Table 2.5. The unit of observation is an individual. Cluster standard errors are given in the parenthesis with clustering at the individual level. The significance level is presented as + 0.10 * 0.05, ** 0.01, *** 0.001. The instrument used in IVFE is village level participation rate.

**Appendix 2.4 Estimates of offspring's labor supply outcomes using additional macro variables**

| | Number of offspring currently working | | | Number of offspring doing agricultural jobs | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Individual NRP participation | 0.089** | 0.061+ | 0.081* | -0.122*** | -0.119*** | -0.118*** |
| | (0.032) | (0.032) | (0.032) | (0.034) | (0.033) | (0.034) |
| Log of regional GDP per capita | -1.281*** | | -1.465*** | 0.247 | | 0.239 |
| | (0.328) | | (0.346) | (0.332) | | (0.354) |
| Log of rural household consumption | 0.034 | | 0.066 | -0.709* | | -0.718** |
| | (0.266) | | (0.267) | (0.278) | | (0.279) |
| Log of rural population | 3.303** | | 2.077+ | 2.976* | | 3.193* |
| | (1.186) | | (1.219) | (1.225) | | (1.274) |
| Log of per capita NRP revenue | | -0.090* | -0.049 | | 0.029 | 0.039 |
| | | (0.037) | (0.037) | | (0.035) | (0.035) |
| Log of per capita NRP expenses | | 0.017 | -0.031 | | -0.036 | -0.023 |
| | | (0.044) | (0.046) | | (0.043) | (0.046) |
| Other controls | | | | | | |
| **Obs.** | 7,333 | 7,333 | 7,333 | 7,333 | 7,333 | 7,333 |

Note: The table reports IVFE estimates of NRP participation as well as macroeconomic indicators. Each column is estimated from an independent regression using the same set of control variables in Table 2.5. The unit of observation is an individual. Cluster standard errors are given in the parenthesis with clustering at the individual level. The significance level is presented as + 0.10 * 0.05, ** 0.01, *** 0.001. The instrument used in IVFE is village level participation rate.

# Chapter 3. Pension coverage and well-being of rural residents in China

## 3.1 Introduction

Happiness is increasingly catching space in the spheres surrounding public policy discussions. Since the first world happiness report published in 2012 and subsequent reports have one very common association that financial capital is necessary but not a sufficient condition for people wellbeing (Easterline 1974, 1994). For instance in US and Japan, real income has increased over time without changing the status of happiness in these two countries (Knight and Gunatilaka 2010). In 2016, OECD committed itself in bringing people's well-being at the forefront of government policies. In a recent speech by the head of United Nations Development Program (UNDP) called for inclusive growth where people's happiness should be integral part of our efforts to achieve desired human and sustainable development. Happy people create society/nations that nurture well-being and in turn such societies transform and create environments for development. This is one of the reasons that people-centered or community driven interventions sustain longer mainly because it develops from the inclusion of the people, their voices are heard, respected and brought at the forefront of policy making. These inclusive strategies in return promote social capital, build trust among themselves and in the state and contribute to inclusive growth and shared prosperity.

What defines well-being has been a central debate in the literature concerning happiness. Two approaches in the well-being has been studied and investigated widely. First is the objective well-being (OWB henthforth) theories explain minimum requirements that need to be satisfied for a good life. In other words OWB is associated with factors that are

external to individuals, for instance, income, residence, opportunity to education, health, safety and security and social and civil rights. On the other hand subjective well-being (SWB hereinafter) theories provide well-being in a way that human beings are the best to judged their lives and this information can be collected by asking them about the quality of their life. In other words SWB is associated with factors that internal to individuals, for instance, their self-reported responses about wellbeing.

China has experience a remarkable growth in the last few decades. On the same time, China is facing severe problems and challenges including but not limited to inequality and rural-urban divide. Easterline (2012) in a recent study from 1990-2010 found a U-shaped pattern in life satisfaction in China. He argued that the declining trend is mainly through growing unemployment and inequality that started from 1990 in China. China unprecedented economic growth and demographic and social changes over time present a good case for evaluation of life satisfaction (SWB and OWB).

There is an extensive literature documented on determinants of life satisfaction (Frey and Stutzer 2002; Frey and Stutzer 2005; Dolan et al. 2008). These researchers make important contribution by exploring factors associated with life satisfaction. Of these factors the most commonly explored are relative and absolute income, health, education, employment and other factors related to social, political and economic spheres. Apart from studies in developed countries, there are growing number of studies conducted in developing countries. For instance, Graham and Pettinato (2001) studying 17 Latin American countries investigated the life satisfaction by exploring changes in macroeconomic conditions and people attitude towards market and democracy on happiness and the results obtained were similar as in developed countries. Some studies undertaken in Asian countries explored the determinants of life satisfaction and their results suggest that although the factors

influencing life satisfaction is almost similar as in the developed world however the effect of cultural factors such as marital status and role of government play bigger role compared to income on the life satisfaction.

Studies on happiness are growing in China. There are a number of studies documented on happiness in China in the last few years (Appleton and Song 2008; Knight et al. 2009; Knight and Gunatilaka 2010; Chyi and Mao 2012). Appleton and Song (2008) findings based on their study on components and determinants of life satisfaction suggest that determinants of life satisfaction in China is similar as documented in the previous literature. Another study in China explored the determinants of life satisfaction in rural China suggest that despite of rural-urban divide life satisfaction in rural china doesn't show a picture of dissatisfaction. Another study on the determinants of happiness among the elderly population investigated traditional family norms and its effect on the elderly population (Chyi and Mao 2012). Their finding suggest that having grandchildren have a positive effect on the elder people happiness compared to their own children. Another important issue which has been the central focus of policy discussions is the rural-urban migration in China which has attracted wider range of research interest particularly in the perspective of happiness and its determinants (Ding 2017). The unprecedented economic growth of China has resulted widespread migration from rural to urban. On the other hand, the China's *hukou* system constraining migrant workers from enjoying benefits that are in place for the urban residents, for instance, welfare services, education and job opportunities (Chan & Zhang, 1999). According to Knight and Gunatilaka (2010) one among the reasons of lower than average happiness level of rural migrants in urban areas is income, unstable employment opportunities and absence of family. There are some other studies who found that remittances has a positive and significant effect on the rural-urban migrants (Akay et al.

2014). Some other studies investigated the effect of social and environment problems including inequality and pollution on Chinese subjective well-being (Smyth et al. 2008; Lu and Sato 2012; Wang et al. 2015).

## 3.2  Data

In this paper, the induced effect of pension coverage on two major components of well-being are analyzed using a panel data collected by the CHARLS. One is the individuals' perceptual change on views of subjective well-being aspects. The other is households' financial behavior changes. Measures including general satisfaction with life, CES-D (known in full as the Center for Epidemiological Studies – Depression). And households' financial behavior is measured by expenditure allocations, savings and financial wealth.

Same as the previous sample restriction criteria, CHARLS survey samples are restricted to individuals who are aged at least 40[21], reside in rural villages and hold agricultural *hukou*. Furthermore, to balance the data, only individuals who exist in both waves are selected for analysis. In total, the restricted sample contains 17,818 observations in 2 waves of survey which are formed by 8,909 individuals from 5382 households, 236 villages, and 115 counties.

Detailed explanation on outcome variables are provided in the following contents.

## 2.1 Subjective well-being measures

The first measure for subjective well-being is general satisfaction with life. In this paper we specifically focus on the general life satisfaction in the context of China. This issue has attracted renewed interest in the literature based on the arguments that China despite of its

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[21] In CHARLS, the respondent-level sampling is randomized in the households which have members older than 40 and meet the residence criterion. "If the chosen person is 45 or older, then he/she becomes the main respondent and spouse is also interviewed. If the chosen person is between ages 40 and 44, he/she is reserved as a refresher sample for future rounds of survey. (Zhao et al., 2013)" In order to collect as large samples as possible, this paper uses samples who are aged no less than 40 if meeting other sample restrictions.

remarkable progress in income per capita, life satisfaction didn't improve mainly because of dissolution of social safety nets and growing inequality (Easterline 2012).

In this paper, general satisfaction with life is derived from following survey question: "Please think about your life-as-a-whole. How satisfied are you with it? Are you completely satisfied, very satisfied, somewhat satisfied, not satisfied, or not at all satisfied? (CHARLS questionnaires, 2011 and 2013)" Contrary to the descending values assigned in the survey, we convert the values to ascending assignment which follows: 1=not at all satisfied, 2=not satisfied, 3=somewhat satisfied, 4=very satisfied, and 5=completely satisfied.

Figure 3.1 presented the distribution of general satisfaction with life according to responses in each wave of survey. In wave1, 83 percent of respondents were generally satisfied with life. The largest proportion lied in the middle rank who are somewhat satisfied with life generally, while the share of very satisfied respondents was merely one-third of it. However, there was very few reports (around 1.7 percent) of completely satisfaction. On the other end of the distribution, 2.85 percent of respondents were not satisfied with life at all, which is almost two times of the complete satisfaction. In wave2, the distribution of general life satisfaction is very similar to the previous wave. Nonetheless, some structural change could still be observed. On both ends of the satisfaction distribution, there was an increased share of respondents while the positive end increased relatively more. Both complete dissatisfaction and complete satisfaction accounted for 3 percent. Besides, respondents who were not very satisfied decreased by 2.5 percentage points and those who were very satisfied increased by 0.5 percentage points. In general, the level of general life satisfaction raised between the two waves. These findings are aligned with the recent world happiness report (2017) that showed a decline from 1990 to 2005 and substantial recovery

that has been attributed to changes in social safety nets particularly a rise in pension and health care coverage.

It is found that life satisfaction could vary by country and age. Deaton (2008) observed that lift satisfaction declines with age in a cross-country study. However, he also acclaimed that very highest-income countries, namely the U.S., the U.K., Canada etc., are the exceptions where life satisfaction is U-shaped with age throughout lifetime. In the case of urban China, the similar U-shape between satisfaction and age was also observed with age of early 40s serving as turning point using a purposely designed module on subjective well-being which had been incorporated into the 2002 Chinese Household Income Project (CHIP,2002) (Appleton and Song 2008). When focusing on the elderly population alone, Zhang and Liu (2007) noted that elderly who aged 65 and above are happier with their lives as they are getting even older in the case of China using 2002 wave of the Chinese Longitudinal Healthy Longevity Survey (CLHLS).

Table 3.1 illustrated the distribution of general satisfaction with life among age groups across NRP participation status. In general, the average of general life satisfaction increased as the rural respondents are getting older. It started with a mean of 2.91 in the early 40s and reached an average of 3.20 when above 80s. When diving the sample into groups according the respondents pension participation status, the positive relationship between general life satisfaction and age still held within each group. However, there was a clear gap in general life satisfaction throughout all age groups between the pension participants and non-participants with an average difference of 0.07 as a whole. Figure 3.2 depicted this gap in a much clear way. Despite the youngest age group (40-45 years old), the average life satisfaction is all the way along higher among pension participants than those of non-participants.

The second measure adopted is an index for depressive symptoms, known in full as the "Center for Epidemiological Studies - Depression" (CES-D). It is originally developed by Radloff (1977) with a 20-item based rating on how often the respondents experienced symptoms associated with depression over the past week. However, instead of the original CES-D form, CHARLS fielded a 10-item based CES-D scale with a response card to measure the depression in elderly (Zhao et al. 2013).[22] The properties of the 10-item CES-D was proved to be excellent for use as a screening instrument for identifying major depression in the older adults (Irwin et al. 1999). The list of the 10-item version CES-D in CHARLS is given in Appendix 3.1. According to the guidance of standard CES-D[23], response options of each item is valued by a scale of 0-3 which follows: 0=rarely or none of the time (<1 day), 1=some or a little of the time (1-2 days), 2=Occasionally or a moderate amount of the time (3-4 days), and 3=Most or all of the time (5-7 days). In return, the scores would range from 0 to 30, with high scores indicating greater depressive symptoms. As there is no recommended cutoff scores for 10-item CES-D, it will be standardized for analysis purposed.

Table 3.2 and Figure3.3 presented the distribution of CES-D (before standardization) among age groups and across NRP participation status. Overall, the average score of CES-D is 8.76 (out of a total of 30) in all samples, while it is reported as 8.94 and 8.57 respectively for NRP participants and non-participants. Again, a clear gap of depression level between NRP participants and non-participants was observed among all age groups. It also showed

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[22]Irwin et al. (1999) pointed out that the original CES-D could be problematic for the older adults who may be not familiar with a multiple item, forced choice scale because the questions are emotionally stressful and the time to complete it is burdensome. Kohout (1993) also found that the CES-D response format is confusing for the elderly respondents.

[23] Center for Epidemiological Studies-Depression. American Psychology Association. retrieved from: http://www.apa.org/pi/about/publications/caregivers/practice-settings/assessment/tools/depression-scale.aspx.

that depression symptoms generally increased with the age and peaked at age 65-70 with an average of 9.45.

Considering CES-D score is not a commonly used indicator, it would be difficult to understand the meaning of its scale. According to Andersen et al. (2013) the possible range of 10-item scale is 0 to 30 and a cut off score of 10 or higher indicates the presence of significant depressive symptoms. Although there are several suggested cutoff scores, mainly following Andresen et al. (1994, 2013), we consider cutoff score for clinical depression as CES-D≥10[24]. Thus the generated binary indicator could clearly identify the incidence of being at risk of clinical depression. Compared with cutoff score 10, almost 40 percent of the rural residents in the analysis sample were actually at the risk of clinical depression.

Apart from theses major subjective measures, we further consider the three subjective feeling of depression symptoms, which are "I felt depressed", "I felt fearful", and "I was happy". Both feeling of depression and fear are in scale of 0 to 3 with higher values indicating more presence of this feeling. Feeling of happy is in scale of 0 to 3 with higher values indicating less presence of this feeling.

The full set of summary statistics for all subjective well-beings can be found in the top section of Table 3.3.

## 2.2 Objective well-being measures

Unlike subject well-beings which are measured on individual level, measures for objective well-being will be created on household level. The intuition behind is that household should be considered as the relevant decision-making unit on issues such as consumption and

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[24] There is no commonly recognized cutoff for CES-D 10-item questionnaires. Commonly suggested cutoff values include 8 and 10 by Andresen et al. (1994), or 15 by Björgvinsson et al. (2013). It has been proved that previously suggested cutoff scores could resulted in good sensitivity (Andresen et al., 1994; Andresen et al., 2013; Björgvinsson et al., 2013).

savings rather than individuals (Davis 1970, 1971; Spiro 1983). Major expenses such as food, housing and transportation are often jointly "consumed" while individual consumptions (e.g. tobacco) should only accounts for a very small portion (Davis 1976).

Thus, a household's objective well-being is measured in the following three dimensions: expenditure allocations, savings and financial wealth. All of them are derived from the income and expenditure module in CHARLS. In general, information of income and expenditure is provided by the "financial respondent" who is considered as the most knowledgeable family member (including the main respondent and spouse) about these matters (Zhao 2013).

In CHARLS survey, expenditures were recalled into weekly, monthly and annual expenditure to ensure the accuracy of measurement and analysis. These levels of measurements can be well utilized to represent different needs with various frequency occurrence. In order to capture the induced impact of joining NRP due to expansion of pension coverage, the total household expenditure was categorized into eleven categories i.e. (1) food, (2) smoking and drinking, (3) daily goods, (4) leisure, (5) communication and transportation, (6) utilities, (7) clothes, (8) education, (9) medical and fitness, (10) durable goods, and (11) other. The definition of each categories, with mean and share in total expenditure, were listed in Table 3.4[25]. On average, a typical rural household would spend a total of 1762 RMB on the whole package of commodities. The top three items were ranked as food, communication and transportation, and medical and fitness, with each of them accounting for 36.25 percent, 13.35 percent and 10.66 percent respectively.

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[25] To fully capture how a rural household allocate expenditure on different sub categories, only households who answered all of the expenditure questions were counted in this table. On the other hand, all available samples will be used in regression analysis to maximize the sample size of each dependent variable.

In latter columns of Table 3.4, the expenditure was furtherly reported for households with different NRP participation status. In general, households with at least some member joined NRP would spend approximately 20 percent (found by (1927.7-1596.5)/1596.5) more than households who did not join NRP. It also showed briefly that households covered by pension tended to spend more on all categories compared to their counterparts, but their allocation of spending on each type of expenditures were different.

The "extra" expenditures made by households joined NRP may come from two possibilities. On one hand, joining NRP will induce a fixed amount of yearly contribution because NRP is still a contributory pension scheme. Recalling that the premium one NRP participants would contribute may vary from 100 to 500 RMB per year in initial several years. As NRP is available for all rural residents who has aged 16 and over and not yet been covered by any other public pension scheme, if households would have more than only one participants, joining NRP will impose a large of amount of expenses on the household. On the other hand, joining NRP would change people's expectation on current and future income and thus change the structure of household consumption. More discussion on how households may change their expenditure allocations will be followed in later section.

Given the information of yearly household income and monthly expenditure, savings were first calculated as the household total income minus total expenditure adapted to yearly basis. However, the calculated savings should be used with great cautions. Among all available household samples, more than 60 percent of household has negative savings in a single survey year while there is huge dispersion in the savings data. This is mainly because of the low income level of households. As a result, one cannot perform logarithm transformation in regression analysis. As is confirmed in Appendix 3.2 figure a, the original saving data seems to follow a normal distribution shape but with very long tails at both ends.

The histogram of savings after removing the bottom and top 2 percent of samples can be found in Appendix 3.2 figure b and figure c, which would approximately lead to 400 and 1000 observations dropped respectively. It showed that dropping small portion of outliers in savings can effectively reduce the dispersion while keeping a normally distributed shape. This property also inspired us to have further robustness check using various outlier filtering strategies.

Considering the large variations in household income as well as savings. We did not use the typical definition as mentioned above. Instead, this paper used an alternative measure of household saving rate which defined local saving rate as the difference between log of household income and log of household expenditures (Wei and Zhang 2011; Chamon and Prasad 2010). It is suggested that this definition is less susceptible to extreme values and can make the error term more likely to satisfy the normality assumption (Wei and Zhang 2011).

Since a large proportion of negative savings was observed in rural households, it is necessary to have a look on how household would respond in order to "compensate" declined savings. The potential response household could have may include reduce expenditure, increase cash flow, decrease deposit, or increase loans and borrowings. For this purpose, two components will be discussed as well. One is expenditure and its allocation. Another is financial wealth, including the amount of cash and loan in a rural household.

The full set of summary statistics for household financial behaviors can be found in the top section of Table 3.5.

## 2.3 Independent variables

To analyze the difference in individuals' subjective well-being measures as well as households' objective well-being measures among those who participated NRP and or not, the independent variable of interest here is the NRP participation status. Given subjective well-being are measured on individual level and objective well-being are measured on household level, the NRP participation status will be defined accordingly, as well as control variables.

For subjective well-being, individual NRP participation is defined by a dummy variable: whether the respondents participated in NRP or not.

$$NRPpr_{ij} = \begin{cases} 1 & , if\ i\ joined\ NRP \\ 0 & , if\ i\ did\ not\ join\ NRP \end{cases}$$

where both contributing pension premium and receiving pension benefit are considered as participation for any individual $i$ from household $j$.

Control variables for subjective well-being include individual demographics (gender, age and squared, education, marital status), individual health status (any disability, any chronic, ADL, IADL), and family characteristics (number of offspring, number of siblings alive, number of parents alive, log of household income).

For objective well-being, household NRP participation is defined as a dummy variable by counting how many respondents in the household have joined NRP. It equals to 1 if there is at least one individual in household $j$ who has participated in NRP while it equals to 0 if no one in household participated NRP.

$$hhNRP_j = \begin{cases} 1 & , if\ \#\big(NRPpar_{ij} = 1\big)_j \geq 1 \\ 0 & , if\ \#\big(NRPpar_{ij} = 1\big)_j = 0 \end{cases}$$

By the definition, an alternative measure of household NRP participation can be defined by the number of respondents in household *j* who join NRP directly. Since each household would have only one (main respondents only) or two respondents (main respondents and spouse), the second indicator of household NRP participation will take value 0, 1 and 2.

$$hhNRP_j numhhNRP_j = \#\left(NRPpar_{ij} = 1\right)_j$$

and

$$hhNRP_j \in \{0, 1, 2\}$$

Control variables for objective well-being would be slightly different from the control variables used in individual data. First, family characteristics like number of offspring, number of siblings alive, number of parents alive, log of household income would still be included. In addition, number of family member who eat at home recently (last week) is also included as the change in it will be very sensitive to expenditures. Considering health status (any disability, any chronic, ADL, IADL) among respondents within the same household could vary a lot, heath status indicators will be taken its mean values to capture average of the health status within the household. However, it is impossible to take average of the individual demographics (gender, age and squared, education) like what has been done to individual health status. Only the individual demographics of the main respondent in the household will be controlled. Number of respondents interviewed in a household will be controlled as well to replace individual's marital status.

## 3.3 *Empirical strategy*

To answer the question raised at the beginning of this paper that how does NRP participation affect people's well-being, and to establish the causal link between NRP

participation and rural residents' well-being, the same identification strategy that is adopted in previous chapter can still be applied here.

The potential endogeneity in NRP participation is still a big concern because NRP is a voluntary and contributory public pension scheme. Individuals and households who can afford the contribution or who can directly benefit from the pension (mainly through family binding policy) are more likely to participate in NRP. Therefore, a combined estimation strategy is used here to address our concern of endogeneity, which is instrument variable method along with FE effects model (name as IVFE for short). It is supposed that instrument variable method could well predict individuals and households' endogenous decision on NRP participation while fixed effect model could control for household and individual level unobserved time-invariables. Village level NRP participation rate serves as instrument in the IV estimations.

For individuals' subjective well-being measures, the model is constructed the same as for individual labor supply outcomes in previous chapter, which is

$$\Delta y_{ij} = \beta_0 + \beta_1 \Delta \widehat{NRPpar}_{ij} + \Gamma \Delta X_{ij} + \delta \Delta F_j + u_{ij}$$

$$\Delta NRPpar_{ij} = \theta_0 + \theta_1 \Delta rNRPpar_k + \tau \Delta X_{ij} + \varphi \Delta F_j + u_{ij}$$

For households' objective well-being measures, the model is constructed as follows:

$$\Delta y_j = \beta_0 + \beta_1 \Delta \widehat{hhNRP}_j + \delta \Delta F_j + \Phi \Delta H_j + \Gamma \Delta R_j + u_{ij}$$

$$\Delta hhNRP_j = \theta_0 + \theta_1 \Delta rNRPpar_k + \varphi \Delta F_j + \phi \Delta H_j + \tau \Delta R_j + u_{ij}$$

Apart from IVFE, estimation results from OLS, pooled IV and FE will also be provided for reference.

## 3.4 Main results

### 4.1 Does NRP make participants "happier"?

Before answering the question that how does NRP participation affect rural residents' happiness which is measured by three subjective well-being measures, here are some descriptions on the general pattern of happiness among rural residents who aged 40 and above. This was done by a multiple linear regression to simply regress each of these happiness measures on a group of control variables including individual demographics, individual health and household characteristics. In addition, year fixed effect and county fixed effect will also be considered.

The results can be found in Appendix 3.3. Remembering that the target population here are rural residents who have aged at least 40. Generally speaking, male rural residents are less depressed and more satisfied with life compared to their gender counterparts. As people are becoming older, they feel less depressed and have higher life satisfaction. More education also links with less depression and higher life satisfaction. Compared to people who are single or divorced, people stay in marriage or become widowed also feel better with their life. More presence of health issues decrease their subjective well-being. Household income are positively related to the feeling of happiness. Having more offspring also make people happier while the number of sibling and parents who are still alive do not affect much.

In this section, the effects of NRP participation on rural residents' subjective well-being are evaluated. Table 3.6 presented the main results for all subject well-being measures using both fixed effect and IV with fixed effect estimations. Estimations from IV with fixed effect model was the main results that we referred to. Cluster standard errors were given in the

parenthesis with clustering at the individual level. Participating in NRP significantly reduced rural residents' depression symptoms with less incidence of clinical depression and increased their general life satisfaction. Joining NRP could lead to a 0.68 points decrease in CES-D index out of the total 30 points, which was equivalent to a 0.1092 standard deviation change. What's more, it significantly reduced the incidence of clinical depression by 12.7 percent. At the same time, the rating for general satisfaction with life raised by 0.05 points out of the 5-point scales.

Apart from NRP, rural residents' subjective well-being would be affected by health conditions. As there is more presence of disability, chronic, ADL and IADL symptoms along with aging, they would feel more depressed and less satisfied with life. On the contrary, the change in household income did not matter much for their level of depression or life satisfaction.

Table 3.7 reported the effect of participating NRP on subjective feelings of depression. The structure of the table was the same as Table 3.6. It showed that the negative feeling of depressed or fearful were eased by 0.091 points and 0.087 points respectively if rural residents joined NRP, which were equivalent to 0.084 and 0.1088 standard deviation change. But there is no significant effect in boosting the positive feeling of happiness.

Furthermore, Table 3.8 denoted the heterogeneity in effects of introducing NRP. The heterogeneity between age groups and between gender groups are discussed separately in panel A and panel B.

As discussed in previous chapter, according to age, pension participants would have different role under NRP scheme. For pension participants in age 40-60, they are pension contributors who have to pay for premium. For pension participants in age 60 and above, they are considered as pension recipients who have got rid of the obligation of contribution

and start to receive pension benefits. This different role under NRP scheme would perhaps lead to the heterogeneity in the effects of joining NRP on participants' happiness levels.

Table 3.8 panel A illustrated the difference between different age groups and its corresponding roles. The good news was that NRP had positive effects rural residents' subjective well-being on both of the age groups while the magnitude would be different. Becoming pension contributors made respondents have less depression symptoms as their CES-D scores decreased by 0.1021 standard deviation and the incidence of clinical depression was reduced by 9.6 percentage points. Pension contributors would also reported less negative feelings of depressed or fearful. Meanwhile, becoming pensioners had even stronger effect in reducing the incidence of clinical depression (14.9 percentage points), increasing general life satisfaction (0.1267 standard deviation change), and making respondents feel happier (0.1125 standard deviation change).

The difference of NRP's effects between male and female was another matter of our interest because different gender has proven to have different level of subjective well-being generally as is denoted in the Appendix 3.5. The heterogeneity in effects of NRP between gender groups was given in Table 3.8 panel B. Only female group, who were with lower level of happiness in general, had large and significant improvement in happiness measures through joining NRP. For a rural woman, joining NRP reduced her depression symptoms by 0.1146 standard deviation, general satisfaction with life recovered by 0.1267 standard deviation. The likelihood of being at risk of clinical depression had been decreased by 14.9 percentage points. On the contrary, there is no significant evidence that men's depression symptoms as well as general life satisfaction had been affected by their NRP participation despite men had 9.1 percent less incidence of clinical depression.

In addition, Table 3.9 presented the results for NRP participation on all subjective well-being measures using different combinations of instruments. Column 1 first repeated the main results of estimation using IV with fixed effect model using village level NRP participation rate as instrument. Column 2 used the same estimation strategy but taking the interactions between village level NRP participation rate and village size dummy[26] as the instruments. The instruments used in column 3 were the interactions between village level NRP participation rate and region dummies[27]. The instrument used in column 4 was county level NRP participation rate. Clustering standard errors were given in the parenthesis with clustering at the individual level. P-values from overidentification test were given in the brackets when multiple instruments were used for estimation.

The estimates for individual NRP participation remained robust across all subjective well-being indicators even using different combination of instruments. Overidentification test supported exclusion restriction expect for the case when using participation rate and region interactions as instruments to estimate changes in risk of clinical depression.

## 4.2 Does NRP deteriorate participants' living standards?

Pension coverage has proved to bring good for rural residents' in the sense of improving their values of happiness. The concern is then whether NRP would still have some "side effect". Being a voluntary and contributory public pension scheme, NRP could have impose cash constraint on households in order to cover the required "extra" premiums if they want

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[26] Village size dummies are generated according to village population reported in wave1 community survey. A village is defined as small with less than 1,000 residents, median with 1,000-2,000 residents and large if having more than 2,000 residents. Dummy for small village was excluded in the estimation to serve as reference group.

[27] Regional dummies are generated according to the economic zone division announced by National Bureau of Statistics of China. All provinces are divided into four regions i.e. eastern region, central region, western region and northeast region. Dummy for central region was excluded in the estimation to serve as reference group.

to join NRP. This, in return, would affect households' decisions on how to manage their expenditures, savings and financial wealth. Would they choose to reduce consumption, cut down savings, withdraw deposits, or even turn to loans? In this section, the effects of NRP participation on rural residents' objective well-being are evaluated.

Table 3.10 presented the main results for households' savings and financial wealth, which is indicated by saving rate, cash at hand, and bank loan, using IV with fixed effect estimations. Cluster standard errors were given in the parenthesis with clustering at the individual level. Two different measures of household NRP participation status are used for each of the outcomes, which are a dummy indicating whether household has at least one respondents participated in NRP in the odd columns, and a continuous variable counting the number of respondents who joined NRP in the household in the even columns.

The results indicated that household tended to reduce saving rate and increase cash at hand if joining NRP. There was no significant evidence on bank loan changes. Compared with household with no NRP participants, household who joined NRP would keep saving rate 12.5 percentage points less and increase cash holding at hand by 56.6 percent. In addition, if one more household member joined NRP, it would decrease the household saving rate by 7.6 percentage points on average and increase cash holding by 34.4 percent further.

Considering the large disparity in household reported financial items, we performed several robustness checks using different subsamples. The main aim of changing different subsamples were to attempt to exclude potential outliers in the analysis sample. The strategy of data filtering followed the previous study on China's competitive saving motives (Wei and Zhang, 2011). First, we excluded samples who reported annual household income or expenditure less than 2,000 RMB. This resulted in a loss of approximately 1,000

observations. Second, we excluded households who were on bottom and top 2 percent regarding changes in saving rate between two waves. This deducted the around 200 observations. Third, we excluded households who were on bottom and top 5 percent of saving rate changes. This removed the almost 450 observations from the full analysis sample.

Table 3.11 presented this robustness check. Main results were illustrated first in column 1 as millstones. The estimates after applying the three data restriction strategies were then reported in the following three columns. Results remained robust with the same qualitative patterns preserved.

These changes in household wealth could imply a fact that household get to be in need of more financial mobility after joining NRP scheme. But the reason behind the demand of financial mobility was still ambiguous. It could be attributed to two penitential reasons. First, the contributory pension scheme could have imposed budget constraint to household who choose to join NRP because pension contribution became the extra expenses they should cover apart from daily consumptions. Second, joining NRP could have reshaped household's expectations toward higher future income so that they would like to increase or reallocate household expenditures to improve living quality.

It was still vague to distinguish which reason actually dominated the demand for financial mobility in the household. After reviewing the data availability in CHARLS survey, we were able to explore the detailed list of household consumptions, although there was very limited information on amount of individual pension contribution.

Table 3.12 then depicted how the households' expenditure allocation responds to NRP participation using IV with fixed effect estimations on household level constructed data. All the expenditure categories has taken the logarithm transformation. Cluster standard errors were given in the parenthesis with clustering at the individual level. Column 1-2 showed the

estimation results using all of the household samples using two different household pension participation indicators. Column 1 could be interpreted as, compared to households who did not join NRP, households who joined NRP would increase the total expenditure by 10.9 percent. This increase in consumption could then be translated into 18.7 percent increase in food consumption (including both eating at home and eating outside), 12.9 percent increase in daily goods, 25.7 percent increase leisure, and 16.5 percent increase in communication and transportation, and 38.4 percent increase in medical and fitness expenses. The rest of the consumption categories did not change significantly. Column 2 could then show the marginal effect of having one more household member joining NRP.

The changes in household expenses reallocation is partially consistent with the existing qualitative view declaring that having pension benefits could help old-age rural residents pay for living necessities such as food, medicine, clothing, and water and electricity (Shen and Williamson 2010). Our results showed the similar trend in increased expenditure on food, daily goods and medicine while there was no evidence of increased expenses on clothing and utilities. And these expenditures could help fulfill rural households' basic living necessities.

Despite changes on expenditure categories mentioned above, it was a little bit surprising to observe the significant increase in communication and transportation as well as leisure. The significantly increased expenditure in communication and local transportation may be linked with the increased off-farm labor supply in the households for both respondents themselves and their offspring. It should be aware that the large increase in leisure expenses was actually based on a very small amount of initial basis (around 11 RMB per month). Anyway, the increased expensed on leisure, along with fulfilled living necessities, could have contributed to the improved subjective well-being as is discussed in section 4.1.

## 3.5 Conclusion

This paper tries to contribute to the existing studies on China's NRP reform in the perspectives of its welfare effect represented by different measures in both rural residents' subjective well-being and rural households' objective well-being.

Similar to the previous chapter, this paper takes the NRP reform's gradual geographical expansion as a quasi-experiment to evaluate the effect of pension reform on rural residents' labor supply behaviors. By constructing a two-period panel data from CHARLS wave 1 and wave 2 study, we mainly targeting the rural residents who are in their mid-age and old-age. And IV with fixed effect model is estimated to identify the change in rural residents' subjective well-being and rural households' objective well-being along with the pension expansion in China.

First, the individual who participated in the pension program have significant improvement in their subject well-being which are represented by deceased depression symptoms along with less incidence of clinical depression, and recovered general satisfaction with life. Heterogeneity in effects existed between different age and gender groups as older people and women could have benefited more from the NRP participation.

Meanwhile, with the expansion of the pension program, we didn't find enough evidence of the deterioration of rural household's living standards. Although households seemed to fell in trouble with financial mobility as they had to reduce saving rate and were in great need of cash if joining NRP. This turned out to be related to shifted patterns in household consumptions. Households who joined NRP tended to increase total expenditures while diverting to categories like health care and durable goods other than the basic needs. In addition the increased expenses on communication and transportation could be explained by the increased off-farm labor supply by the household members.

In general, the expansion of the new rural public pension can be viewed successful trial in recovering the people life satisfaction which have been declined from 1990 till 2007 which is aligned with the ongoing research on happiness in China (Happiness report 2017). NRP could also lead to improved household consumption with higher ability to pay for basic living goods (such as food and daily goods) as well as more spending on health and work related expenditures.

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# *Tables*

**Table 3.1 General satisfaction with life among age groups**

| Age group | All samples | | Not join NRP | | Joined NRP | |
|---|---|---|---|---|---|---|
| | Mean | Obs. | Mean | Obs. | Mean | Obs. |
| 40-50 | 2.99 | 2,547 | 2.95 | 1,444 | 3.04 | 1,103 |
| 50-55 | 3.01 | 2,464 | 2.98 | 1,175 | 3.04 | 1,289 |
| 55-60 | 3.04 | 3,155 | 3.00 | 1,521 | 3.07 | 1,634 |
| 60-65 | 3.07 | 2,902 | 3.03 | 1,315 | 3.10 | 1,587 |
| 65-70 | 3.12 | 1,972 | 3.06 | 893 | 3.18 | 1,079 |
| 70-75 | 3.16 | 1,221 | 3.14 | 582 | 3.19 | 639 |
| 75 and above | 3.20 | 1,136 | 3.17 | 545 | 3.23 | 591 |
| **Total** | 3.06 | 15,397 | 3.02 | 7,475 | 3.10 | 7,922 |

Note: The unit of observation is an individual. Age group 40-45 and 45-50 are combined because there are very few observations (202 obs.) in the former group. The mean presented are values weighted by individual longitudinal weights. General satisfaction with life is measured as 1=not at all satisfied, 2=not satisfied, 3=somewhat satisfied, 4=very satisfied, and 5=completely satisfied.

**Table 3.2 CES-D among age groups**

| Age group | All samples | | Not join NRP | | Joined NRP | |
|---|---|---|---|---|---|---|
| | Mean | Obs. | Mean | Obs. | Mean | Obs. |
| 40-50 | 8.00 | 2,681 | 8.13 | 1,565 | 7.81 | 1,116 |
| 50-55 | 8.24 | 2,583 | 8.49 | 1,268 | 8.00 | 1,315 |
| 55-60 | 8.71 | 3,345 | 9.03 | 1,669 | 8.38 | 1,676 |
| 60-65 | 9.23 | 3,046 | 9.43 | 1,432 | 9.04 | 1,614 |
| 65-70 | 9.45 | 2,080 | 9.59 | 977 | 9.33 | 1,103 |
| 70-75 | 9.25 | 1,347 | 9.38 | 693 | 9.11 | 654 |
| 75 and above | 9.01 | 1,306 | 9.18 | 684 | 8.81 | 622 |
| **Total** | 8.76 | 16,388 | 8.94 | 8,288 | 8.57 | 8,100 |

Note: The unit of observation is an individual. Age group 40-45 and 45-50 are combined because there are very few observations (214 obs.) in the former group. The mean presented are values weighted by individual longitudinal weights. The Center for Epidemiological Studies - Depression (CES-D) scores range from 0 to 30, with high scores indicating greater depression symptoms.

**Table 3.3 Summary Statistics for individual subjective well-being and individual control variables**

| Variable | All sample | | | Not in NRP | | | Joined NRP | | |
|---|---|---|---|---|---|---|---|---|---|
| | Obs. | Mean | Std. Dev. | Obs. | Mean | Std. Dev. | Obs. | Mean | Std. Dev. |
| **Individual subjective well-being:** | | | | | | | | | |
| CES-D | 16,388 | 8.86 | 6.25 | 8,288 | 9.09 | 6.35 | 8,100 | 8.62 | 6.14 |
| =1 if being at risk for clinical depression (*CES-D≥10*) | 16,388 | 0.39 | 0.49 | 8,288 | 0.41 | 0.49 | 8,100 | 0.37 | 0.48 |
| General satisfaction with life | 15,397 | 3.06 | 0.75 | 7,475 | 3.03 | 0.75 | 7,922 | 3.10 | 0.75 |
| Felt depressed | 16,142 | 0.95 | 1.08 | 8,160 | 1.01 | 1.09 | 7,982 | 0.89 | 1.07 |
| Felt fearful | 16,309 | 0.35 | 0.80 | 8,248 | 0.39 | 0.82 | 8,061 | 0.32 | 0.77 |
| Felt happy | 16,273 | 1.34 | 1.20 | 8,229 | 1.26 | 1.17 | 8,044 | 1.41 | 1.22 |
| **Main respondent's demographics:** | | | | | | | | | |
| =1 if male* | 17,818 | 0.47 | 0.50 | 9,018 | 0.47 | 0.50 | 8,800 | 0.47 | 0.50 |
| age | 17,818 | 59.93 | 9.75 | 9,018 | 59.52 | 9.97 | 8,800 | 60.35 | 9.49 |
| =1 if attained at least secondary education | 17,748 | 0.23 | 0.42 | 8,972 | 0.23 | 0.42 | 8,776 | 0.23 | 0.42 |
| =1 if married* | 17,816 | 0.86 | 0.35 | 9,016 | 0.85 | 0.35 | 8,800 | 0.86 | 0.34 |
| =1 if divorced* | 17,816 | 0.01 | 0.10 | 9,016 | 0.01 | 0.11 | 8,800 | 0.01 | 0.09 |
| =1 if widowed* | 17,816 | 0.12 | 0.33 | 9,016 | 0.12 | 0.33 | 8,800 | 0.12 | 0.32 |
| **Household average heath status:** | | | | | | | | | |
| =1 if has any disabilities* | 17,799 | 0.25 | 0.44 | 9,004 | 0.24 | 0.42 | 8,795 | 0.27 | 0.45 |
| =1 if has any chronic diseases* | 17,799 | 0.67 | 0.47 | 9,004 | 0.66 | 0.47 | 8,795 | 0.68 | 0.46 |
| ADL | 17,801 | 0.02 | 0.10 | 9,005 | 0.02 | 0.09 | 8,796 | 0.02 | 0.10 |
| IADL | 17,801 | 0.07 | 0.18 | 9,005 | 0.06 | 0.17 | 8,796 | 0.07 | 0.18 |
| **Household characteristics:** | | | | | | | | | |
| Log of household income | 16,139 | 8.81 | 1.79 | 8,077 | 8.83 | 1.83 | 8,062 | 8.78 | 1.75 |
| Children alive | 17,811 | 2.96 | 1.45 | 9,013 | 2.93 | 1.48 | 8,798 | 2.98 | 1.42 |
| Siblings alive | 17,774 | 3.24 | 1.97 | 8,989 | 3.25 | 1.98 | 8,785 | 3.22 | 1.95 |
| Parents alive | 17,818 | 0.76 | 1.02 | 9,018 | 0.80 | 1.05 | 8,800 | 0.72 | 0.99 |

Note: The unit of observation is an individual. Variables marked with * are dummies. General satisfaction with life is measured as 1=not at all satisfied, 2=not satisfied, 3=somewhat satisfied, 4=very satisfied, and 5=completely satisfied. The Center for Epidemiological Studies - Depression (CES-D) scores range from 0 to 30, with high scores indicating greater depression symptoms. Both feeling of depression and fear is in scale of 0 to 3 with higher values indicating more presence of this feeling. Feeling of happy is in scale of 0 to 3 with higher values indicating less presence of this feeling. Following Anderson (1994), we use 10 as cutoff score to identify risk of clinical depression. ADL and IADL measures the incidence of difficulty among listed activities of daily living or instrumental activities of daily living, both of which range from 0 to 1. Household income mainly consists of individual wage income and individual-based transfer, agricultural net income, self-employed activities net income and public transfer.

**Table 3.4 Household expenditure allocation in a month by household pension participation**

| No. | Categories of expenditure | Descriptions | All households | | households not in NRP | | households in NRP | |
|---|---|---|---|---|---|---|---|---|
| | | | Mean | Percent | Mean | Percent | Mean | Percent |
| 1 | Food | Food consumed at home and eating out | 638.7 | 36.25 | 593.9 | 37.20 | 683.5 | 35.46 |
| 2 | Smoking and drinking | =Alcohol, and cigarettes | 157.0 | 8.91 | 154.0 | 9.65 | 160.0 | 8.30 |
| 3 | Daily goods | Household items and personal toiletries (detergent, soap, toothpaste, cosmetics, etc.) | 42.9 | 2.44 | 29.5 | 1.85 | 56.3 | 2.92 |
| 4 | Leisure | Entertainment, travel and beauty | 13.1 | 0.74 | 11.4 | 0.71 | 14.7 | 0.76 |
| 5 | Communication and transportation | Communication fees, local transportation, fuel, and vehicle (excluding automobiles) | 235.2 | 13.35 | 232.3 | 14.55 | 238.1 | 12.35 |
| 6 | Utilities | Water, electricity, central heating, and management fees | 75.2 | 4.27 | 71.2 | 4.46 | 79.2 | 4.11 |
| 7 | Clothes | Clothing and bedding | 74.1 | 4.20 | 73.2 | 4.59 | 74.9 | 3.89 |
| 8 | Education | Education and training (including tuition, training fees, etc.) | 51.1 | 2.90 | 21.8 | 1.37 | 80.4 | 4.17 |
| 9 | Medical and fitness | Both direct and indirect medical and fitness expenses | 187.8 | 10.66 | 102.8 | 6.44 | 273.0 | 14.16 |
| 10 | Durable goods | Furniture, consumption of durable goods and electronics, and Automobiles | 143.7 | 8.16 | 116.9 | 7.32 | 170.6 | 8.85 |
| 11 | Other expenses | The expenses not included in above categories | 143.2 | 8.12 | 189.4 | 11.86 | 97.0 | 5.03 |
| | **Total expenses** | | 1762 | 100 | 1596.5 | 100 | 1927.7 | 100 |
| | **Obs.** | | 8,470 | | 3,365 | | 1,245 | |

Note: The unit of observation is a household. For purpose of this paper, the data on expenditure has been adapted to the eleven categories accordingly. Expenditures in the table are measured in Chinese RMB on a monthly basis. Only households who had responses on all expenditure items were counted. Other expenses includes expenses on servants, taxes other than VAT, and donations. The household is defined as in NRP if at least one respondent in the household joined NRP.

**Table 3.5 Summary Statistics for household financial behaviors and household control variables**

| Variable Names | All households | | | Households not in NRP | | | Households in NRP | | |
|---|---|---|---|---|---|---|---|---|---|
| | Obs. | mean | Std. Dev. | Obs. | mean | Std. Dev. | Obs. | mean | Std. Dev. |
| **Household financial behaviors:** | | | | | | | | | |
| Saving rate | 9,590 | -0.63 | 1.93 | 7,050 | -0.59 | 1.95 | 2,540 | -0.77 | 1.87 |
| Log of cash at hand | 10,744 | 5.77 | 2.88 | 7,925 | 5.85 | 2.94 | 2,819 | 5.56 | 2.66 |
| Log of bank loan | 10,521 | 0.98 | 2.96 | 7,827 | 1.18 | 3.22 | 2,694 | 0.39 | 1.88 |
| **Household characteristics:** | | | | | | | | | |
| Log of household income | 9,626 | 8.74 | 1.81 | 7,068 | 8.87 | 1.86 | 2,558 | 8.37 | 1.60 |
| Number of respondents have any disability | 10,764 | 0.42 | 0.61 | 7,944 | 0.37 | 0.58 | 2,820 | 0.57 | 0.65 |
| Number of respondents have any chronic | 10,764 | 1.11 | 0.71 | 7,944 | 1.10 | 0.72 | 2,820 | 1.16 | 0.68 |
| Mean prevalence of difficulty in ADL | 10,755 | 0.02 | 0.08 | 7,937 | 0.02 | 0.07 | 2,818 | 0.03 | 0.10 |
| Mean prevalence of difficulty in IADL | 10,755 | 0.07 | 0.16 | 7,937 | 0.06 | 0.14 | 2,818 | 0.12 | 0.20 |
| Brother alive | 10,722 | 1.59 | 1.31 | 7,917 | 1.69 | 1.31 | 2,805 | 1.29 | 1.24 |
| Parent alive | 10,764 | 0.71 | 1.00 | 7,944 | 0.88 | 1.07 | 2,820 | 0.21 | 0.51 |
| Children | 10,757 | 3.00 | 1.51 | 7,938 | 2.78 | 1.41 | 2,819 | 3.64 | 1.59 |
| **Individual characteristics of main respondent:** | | | | | | | | | |
| =1 if male* | 10,764 | 0.45 | 0.50 | 7,944 | 0.46 | 0.50 | 2,820 | 0.42 | 0.49 |
| age | 10,764 | 60.81 | 10.24 | 7,944 | 58.14 | 9.74 | 2,820 | 68.34 | 7.49 |
| =1 if married* | 10,762 | 0.77 | 0.42 | 7,942 | 0.81 | 0.39 | 2,820 | 0.66 | 0.47 |
| =1 if divorced* | 10,762 | 0.01 | 0.12 | 7,942 | 0.01 | 0.12 | 2,820 | 0.01 | 0.11 |
| =1 if widowed* | 10,762 | 0.20 | 0.40 | 7,942 | 0.16 | 0.37 | 2,820 | 0.31 | 0.46 |
| =1 if attained at least secondary education | 10,720 | 0.22 | 0.41 | 7,909 | 0.26 | 0.44 | 2,811 | 0.09 | 0.29 |

Note: The unit of observation is a household. Variables marked with * are dummies. Saving rate is defined as log(income)-log(expenditure) following Wei and Zhang (2011) and Chamon and Prasad (2010). Household income mainly consists of individual wage income and individual-based transfer, agricultural net income, self-employed activities net income and public transfer. The household is defined as in NRP if at least one respondent in the household joined NRP.

**Table 3.6 Main results for individuals' subjective well-being**

| | CES-D | | =1 if being at risk of clinical depression (*CES-D≥10*) | | General satisfaction with life | |
|---|---|---|---|---|---|---|
| | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** |
| | **FE** | **IVFE** | **FE** | **IVFE** | **FE** | **IVFE** |
| **Panel A: Main results** | | | | | | |
| Individual NRP participation | -0.237+ | -0.683*** | -0.043*** | -0.127*** | 0.018 | 0.051+ |
| | (0.130) | (0.205) | (0.010) | (0.016) | (0.019) | (0.030) |
| Married | 2.625 | 2.740 | -0.176 | -0.155 | 0.132 | 0.118 |
| | (3.344) | (3.302) | (0.153) | (0.149) | (0.581) | (0.585) |
| Divorced | 2.273 | 2.450 | -0.349* | -0.316* | 0.243 | 0.225 |
| | (3.330) | (3.297) | (0.151) | (0.148) | (0.615) | (0.619) |
| Widowed | -0.878 | -0.726 | -0.539*** | -0.510*** | 0.326 | 0.309 |
| | (3.447) | (3.407) | (0.155) | (0.152) | (0.586) | (0.589) |
| Any disability | 0.127 | 0.127 | -0.135*** | -0.134*** | -0.012 | -0.012 |
| | (0.273) | (0.273) | (0.020) | (0.020) | (0.041) | (0.041) |
| Any chronic | 0.626** | 0.638** | 0.021 | 0.023 | -0.069* | -0.070* |
| | (0.221) | (0.221) | (0.016) | (0.016) | (0.032) | (0.032) |
| ADL | 3.133** | 3.096** | 0.005 | 0.003 | -0.287 | -0.283 |
| | (1.131) | (1.132) | (0.075) | (0.076) | (0.196) | (0.195) |
| IADL | 2.951*** | 2.958*** | 0.074+ | 0.075+ | -0.253** | -0.252** |
| | (0.608) | (0.607) | (0.042) | (0.042) | (0.094) | (0.094) |
| Log of household income | -0.020 | -0.020 | -0.001 | -0.001 | 0.010+ | 0.010+ |
| | (0.039) | (0.039) | (0.003) | (0.003) | (0.005) | (0.005) |
| Sibling | -0.008 | -0.010 | 0.001 | 0.000 | -0.002 | -0.002 |
| | (0.055) | (0.055) | (0.004) | (0.004) | (0.008) | (0.008) |
| Parents | 0.162 | 0.166 | -0.029* | -0.028* | -0.009 | -0.009 |
| | (0.159) | (0.158) | (0.012) | (0.012) | (0.023) | (0.023) |
| **Panel B: First stage for IVFE** | | | | | | |
| Village level NRP participation rate | | 0.0102*** | | 0.0102*** | | 0.0103*** |
| | | (0.000) | | (0.000) | | (0.000) |
| F statistics | | 459.73 | | 484.29 | | 420.79 |
| **Obs.** | 6,514 | 6,514 | 6,814 | 6,814 | 5,863 | 5,863 |

Note: The table reports FE and IVFE estimates. The unit of observation is an individual. Both dependent and independent variables are differenced. Cluster standard errors are given in the parenthesis with clustering at the individual level. The significance level is presented as + 0.10 * 0.05, ** 0.01, *** 0.001. The instrument used in IVFE is village level participation rate. Fixed effect is done by first differencing. CES-D is in scale of 0 to 30 with higher values indicating higher depression symptoms. General satisfaction with life is in scale of 1 to 5 with higher values indicating higher satisfaction level.

**Table 3.7 individuals' subjective feelings of depression**

| | Felt depressed | | Felt fearful | | Felt happy | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | FE | IVFE | FE | IVFE | FE | IVFE |
| **Panel A: Main results** | | | | | | |
| NRP participation | -0.054* | -0.091* | -0.028 | -0.087** | -0.000 | -0.074 |
| | (0.027) | (0.043) | (0.020) | (0.032) | (0.031) | (0.048) |
| Married | 0.381 | 0.391 | -0.150 | -0.135 | -0.042 | -0.026 |
| | (0.414) | (0.408) | (0.328) | (0.322) | (0.671) | (0.672) |
| Divorced | 0.266 | 0.281 | -0.218 | -0.195 | 0.015 | 0.042 |
| | (0.404) | (0.398) | (0.325) | (0.320) | (0.698) | (0.700) |
| Widowed | -0.178 | -0.165 | -0.256 | -0.236 | -0.639 | -0.617 |
| | (0.426) | (0.420) | (0.366) | (0.361) | (0.686) | (0.688) |
| Disability | 0.122* | 0.122* | -0.006 | -0.006 | -0.193** | -0.192** |
| | (0.057) | (0.056) | (0.045) | (0.045) | (0.062) | (0.062) |
| chronic | 0.108* | 0.109* | 0.013 | 0.014 | 0.022 | 0.025 |
| | (0.046) | (0.046) | (0.032) | (0.032) | (0.051) | (0.051) |
| ADL | 0.529* | 0.525* | 0.401* | 0.397* | 0.388 | 0.382 |
| | (0.227) | (0.228) | (0.199) | (0.199) | (0.239) | (0.239) |
| IADL | 0.418*** | 0.419*** | 0.296** | 0.297** | 0.169 | 0.170 |
| | (0.123) | (0.122) | (0.104) | (0.104) | (0.129) | (0.129) |
| Log of household income | 0.003 | 0.003 | 0.001 | 0.001 | 0.002 | 0.002 |
| | (0.008) | (0.008) | (0.006) | (0.006) | (0.009) | (0.009) |
| Sibling | -0.007 | -0.008 | -0.008 | -0.008 | 0.016 | 0.016 |
| | (0.011) | (0.011) | (0.008) | (0.008) | (0.013) | (0.013) |
| Parents | 0.045 | 0.046 | -0.004 | -0.003 | -0.010 | -0.009 |
| | (0.034) | (0.034) | (0.024) | (0.024) | (0.037) | (0.037) |
| **Panel B: First stage for IVFE** | | | | | | |
| Village level NRP participation rate | | 0.0103*** | | 0.0102*** | | 0.0102*** |
| | | (0.000) | | (0.000) | | (0.000) |
| F Statistics | | 457.81 | | 456.85 | | 458.35 |
| **Obs.** | 6,344 | 6,344 | 6,456 | 6,456 | 6,432 | 6,432 |

Note: The table reports FE and IVFE estimates. The unit of observation is an individual. Both dependent and independent variables are differenced. Cluster standard errors are given in the parenthesis with clustering at the individual level. The significance level is presented as + 0.10 * 0.05, ** 0.01, *** 0.001. The instrument used in IVFE is village level participation rate. Fixed effect is done by first differencing. Both feeling of depression and fear are in scale of 0 to 3 with higher values indicating more presence of this feeling. Feeling of happy is in scale of 0 to 3 with higher values indicating less presence of this feeling.

**Table 3.8 Heterogeneity in effects among different age and gender groups**

| | CES-D | =1 if being at risk of clinical depression (*CES-D≥10*) | General satisfaction with life | Felt depressed | Felt fearful | Felt happy |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| **Panel A: by age group** | | | | | | |
| age 40-60 | -0.638* | -0.096*** | 0.051 | -0.114+ | -0.117* | -0.004 |
| (pension contributors) | (0.302) | (0.023) | (0.042) | (0.063) | (0.048) | (0.072) |
| Obs. | 3700 | 3857 | 3382 | 3634 | 3675 | 3665 |
| age ≥60 | -0.404 | -0.149*** | 0.095* | -0.008 | -0.040 | -0.135+ |
| (pension recipients) | (0.311) | (0.024) | (0.046) | (0.066) | (0.048) | (0.074) |
| Obs. | 2814 | 2957 | 2481 | 2710 | 2781 | 2767 |
| **Panel B: by gender** | | | | | | |
| Male | -0.343 | -0.091*** | 0.035 | -0.086 | -0.066 | -0.076 |
| | (0.303) | (0.024) | (0.043) | (0.063) | (0.044) | (0.077) |
| Obs. | 3022 | 3176 | 2767 | 2976 | 3004 | 2991 |
| Female | -0.716* | -0.148*** | 0.108* | -0.049 | -0.097+ | -0.052 |
| | (0.310) | (0.023) | (0.045) | (0.065) | (0.051) | (0.069) |
| Obs. | 3,492 | 3,638 | 3,096 | 3,368 | 3,452 | 3,441 |

Note: The table reports IVFE estimates of NRP participation. Each coefficient is estimated from an independent regression using the same setting as is shown in Table 7 while restricting samples to the subgroup of interest. The unit of observation is an individual. Cluster standard errors are given in the parenthesis with clustering at the individual level. The significance level is presented as + 0.10 * 0.05, ** 0.01, *** 0.001. The instrument used in IVFE is village level participation rate. Age group is defined based on respondents' age in wave1.

**Table 3.9 Robustness using different instruments**

| Instruments | Village level NRP participation rate | Village level NRP participation rate and village size interaction | Village level NRP participation rate and region interaction | County level NRP participation rate |
|---|---|---|---|---|
| Dependent variable | (1) | (2) | (3) | (4) |
| CES-D | -0.683*** | -0.694** | -0.807** | -0.548* |
|  | (0.205) | (0.268) | (0.252) | (0.218) |
|  |  | [0.938] | [0.514] |  |
| =1 if being at risk of clinical depression ($CES\text{-}D \geq 10$) | -0.127*** | -0.149*** | -0.111*** | -0.123*** |
|  | (0.016) | (0.021) | (0.019) | (0.017) |
|  |  | [0.191] | [0.000]*** |  |
| General satisfaction with life | 0.051+ | 0.077+ | 0.080* | 0.073* |
|  | (0.030) | (0.039) | (0.037) | (0.031) |
|  |  | [0.119] | [0.112] |  |
| =1 if perceive pension as main source of old-age financial support | 0.085*** | 0.105*** | 0.063*** | 0.105*** |
|  | (0.014) | (0.018) | (0.016) | (0.014) |
|  |  | [0.108] | [0.101] |  |
| Felt depressed | -0.091* | -0.118* | -0.121* | -0.067 |
|  | (0.043) | (0.057) | (0.053) | (0.045) |
|  |  | [0.524] | [0.339] |  |
| Felt fearful | -0.087** | -0.096* | -0.117** | -0.082* |
|  | (0.032) | (0.041) | (0.041) | (0.034) |
|  |  | [0.63] | [0.099] |  |
| Felt happy | -0.074 | -0.111+ | -0.013 | -0.066 |
|  | (0.048) | (0.064) | (0.058) | (0.051) |
|  |  | [0.712] | [0.237] |  |

Note: The table reports IVFE estimates of NRP participation. Each coefficient is estimated from an independent regression using the same setting as is shown in Table 7 while using different instrument. The unit of observation is an individual. Cluster standard errors are given in the parenthesis with clustering at the individual level. The significance level is presented as + 0.10 * 0.05, ** 0.01, *** 0.001. P-values from overidentification test are given in the brackets for column 2 and 3. Column 1 instruments using village level NRP participation rate. Column 2 instruments using interactions between village level NRP participation rate and two village size indicators (small size village excluded). Column 3 instruments using interactions between village level NRP participation rate and three region indicators (central region excluded). Column 4 1 instruments using county level NRP participation rate.

**Table 3.10 Main results for household wealth**

| | Saving rate | | Log of cash at hand | | Log of loan | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| =1 if any respondents joined NRP | -0.125* | | 0.566*** | | -0.083 | |
| | (0.062) | | (0.138) | | (0.145) | |
| Number of respondents joined NRP | | -0.076* | | 0.344*** | | -0.051 |
| | | (0.038) | | (0.084) | | (0.088) |
| Log of household income | 0.944*** | 0.945*** | 0.114*** | 0.113*** | 0.032 | 0.032 |
| | (0.012) | (0.012) | (0.027) | (0.027) | (0.027) | (0.027) |
| Number of respondents have any disability | -0.017 | -0.013 | 0.336** | 0.315* | 0.125 | 0.128 |
| | (0.050) | (0.050) | (0.124) | (0.124) | (0.135) | (0.136) |
| Number of respondents have any chronic | -0.017 | -0.018 | -0.125 | -0.118 | 0.197+ | 0.196+ |
| | (0.038) | (0.038) | (0.101) | (0.101) | (0.106) | (0.106) |
| Mean prevalence of difficulty in ADL | -0.617 | -0.606 | 0.107 | 0.056 | 0.125 | 0.132 |
| | (0.390) | (0.389) | (0.807) | (0.803) | (0.689) | (0.689) |
| Mean prevalence of difficulty in IADL | -0.635* | -0.641* | 0.960* | 0.989* | 0.391 | 0.387 |
| | (0.264) | (0.263) | (0.461) | (0.459) | (0.408) | (0.408) |
| Brothers alive | -0.016 | -0.015 | -0.008 | -0.012 | 0.034 | 0.034 |
| | (0.018) | (0.018) | (0.051) | (0.051) | (0.059) | (0.059) |
| Parents alive | 0.034 | 0.033 | -0.055 | -0.048 | 0.143 | 0.142 |
| | (0.047) | (0.047) | (0.101) | (0.101) | (0.114) | (0.114) |
| Children in wave1 | 0.046** | 0.045** | 0.011 | 0.014 | 0.022 | 0.022 |
| | (0.017) | (0.017) | (0.037) | (0.037) | (0.033) | (0.033) |
| **Obs.** | 4,272 | 4,272 | 4,296 | 4,296 | 4,284 | 4,284 |

Note: The table reports IVFE estimates. The unit of observation is a household. Cluster standard errors are given in the parenthesis with clustering at the household level. The significance level is presented as + 0.10 * 0.05, ** 0.01, *** 0.001. The instrument used in IVFE is village level participation rate. Both dependent and independent variables are differenced except for children. The saving rate is defined as log(income)-log(expenditure) following Wei and Zhang (2011) and Chamon and Prasad (2010).

<div align="center">**Table 3.11 Robustness using different subsamples**</div>

| | Full sample (1) | Subsample excluded in order to remove potential outliers | | |
| --- | --- | --- | --- | --- |
| | | Income or Expenditure <2,000 RMB (2) | Bottom and Top 2% in saving rate change (3) | Bottom and Top 5% in saving rate change (4) |
| **Saving rate** | -0.125* | -0.130+ | -0.115** | -0.110** |
| | (0.062) | (0.068) | (0.043) | (0.042) |
| Obs. | 4,272 | 3,249 | 4,099 | 3,842 |
| **Log of cash at hand** | 0.566*** | 0.594*** | 0.586*** | 0.539*** |
| | (0.138) | (0.154) | (0.142) | (0.145) |
| Obs. | 4,296 | 3,266 | 4,094 | 3,837 |
| **Log of loan** | -0.083 | -0.186 | -0.098 | -0.116 |
| | (0.145) | (0.172) | (0.149) | (0.152) |
| Obs. | 4,284 | 3,257 | 4,083 | 3,828 |

Note: The table reports IVFE estimates of binary household NRP participation. Each coefficient is estimated from an independent regression using the same setting as is shown in Table 3.10 while using different subsamples. The unit of observation is a household. Cluster standard errors are given in the parenthesis with clustering at the household level. The significance level is presented as + 0.10 * 0.05, ** 0.01, *** 0.001. F-statistics of each regression are reported in the curly brackets. The instrument used in IVFE is village level participation rate. Fixed effect is done by first differencing. The savings rate is defined as log(income)-log(expenditure) following Wei and Zhang (2011) and Chamon and Prasad (2010). The similar robustness check is also performed for number of respondents joined NRP and results are available upon request.

### Table 3.12 Main results for households' expenditure allocation

| No. | Categories of expenditure | All sample | | Obs. |
|---|---|---|---|---|
| | | Instrument: =1 if any respondents joined NRP (1) | Instrument: Number of respondents joined NRP (2) | |
| 1 | Food | 0.187* (0.089) | 0.113* (0.054) | 3,720 |
| 2 | Smoking and drinking | -0.026 (0.115) | -0.015 (0.070) | 4,100 |
| 3 | Daily goods | 0.129+ (0.076) | 0.078+ (0.046) | 3,887 |
| 4 | Leisure | 0.257*** (0.071) | 0.156*** (0.043) | 4,036 |
| 5 | Communication and transportation | 0.165* (0.072) | 0.100* (0.044) | 3,702 |
| 6 | Utilities | -0.020 (0.050) | -0.012 (0.030) | 3,952 |
| 7 | Clothes | 0.105 (0.081) | 0.063 (0.049) | 3,763 |
| 8 | Education | 0.160 (0.105) | 0.097 (0.063) | 4,091 |
| 9 | Medical and fitness | 0.384** (0.118) | 0.232** (0.071) | 3,936 |
| 10 | Durable goods | 0.175 (0.124) | 0.106 (0.075) | 4,115 |
| | **Total expenses** | 0.109* (0.054) | 0.066* (0.033) | 4,254 |

Note: The table reports IVFE estimates. The unit of observation is a household. Each coefficient is estimated from an independent regression using the same setting as is shown in Table 3.10. All expenditure categories are logarithm-transformed. One additional control variable is number of household members eating at home last week. Cluster standard errors are given in the parenthesis with clustering at the household level. The significance level is presented as + 0.10 * 0.05, ** 0.01, *** 0.001. The instrument used in IVFE is village level participation rate. Fixed effect is done by first differencing. Other expenses is not included in the regression analysis.

## Figures



Note: the percentage is calculated based on the number the respondents who answered this question in which wave, which is 7,334 observations and 8,063 observations separately.

**Figure 3.1 Distribution of general satisfaction with life**
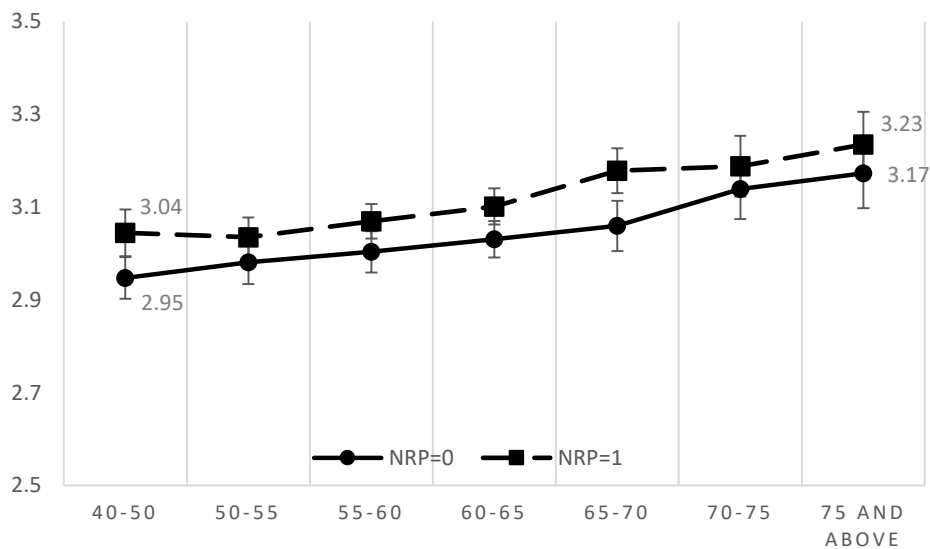


Note: Age group 40-45 and 45-50 are combined because there are very few observations (202 obs.) in the former group. The mean presented are values weighted by individual longitudinal weights. Confidence intervals are illustrated at 95% confidence level. General satisfaction with life is measured as 1=not at all satisfied, 2=not satisfied, 3=somewhat satisfied, 4=very satisfied, and 5=completely satisfied.

**Figure 3.2 General satisfaction with life among age groups**
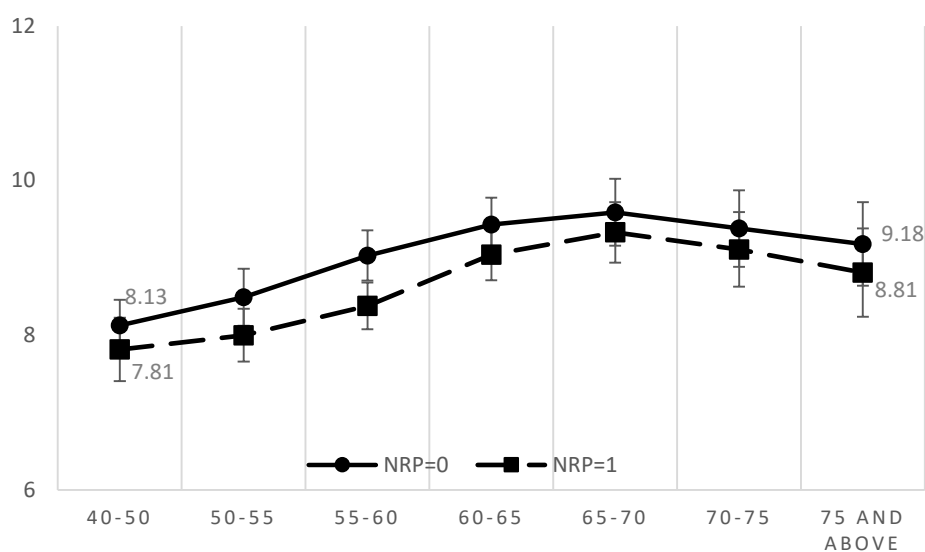
Note: Age group 40-45 and 45-50 are combined because there are very few observations (214 obs.) in the former group. The mean presented are values weighted by individual longitudinal weights. Confidence intervals are illustrated at 95% confidence level. The Center for Epidemiological Studies - Depression (CES-D) scores range from 0 to 30, with high scores indicating greater depression symptoms.

**Figure 3.3 CES-D among age groups**

# *Appendices*

**Appendix 3.1 CES-D scale, 10-item version list in CHARLS**

**Questions:**

I was bothered by things that don't usually bother me.

I had trouble keeping my mind on what I was doing.

I felt depressed.

I felt like everything I did was an effort.

I felt hopeful about the future.

I felt fearful.

My sleep was restless.

I was happy.

I felt lonely.

I could not get "going".

**Response options:**

Rarely or none of the time (< 1 day)

Some or a little of the time (1-2 days)

Occasionally or a moderate amount of the time (3-4 days)

Most or all of the time (5-7 days)

**Appendix 3.2 Distribution of savings**
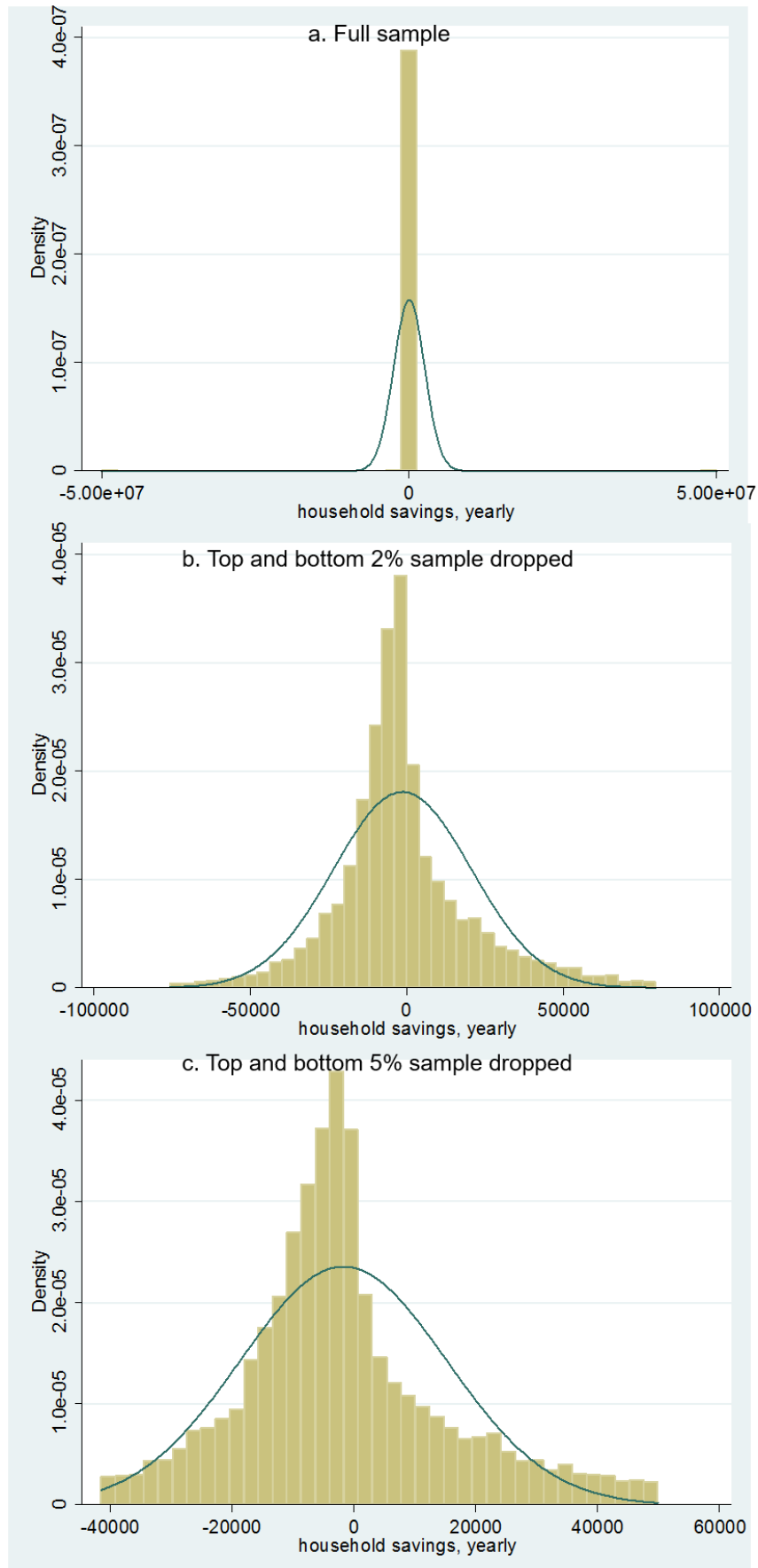
**Appendix 3.3 General patterns of rural residents' subjective well-being**

| | CES-D | =1 if being at risk of clinical depression | General satisfaction with life |
|---|---|---|---|
| | (1) | (2) | (3) |
| Male | -1.716*** | -0.121*** | 0.044** |
| | (0.111) | (0.009) | (0.014) |
| Age | 0.367*** | 0.020*** | -0.010 |
| | (0.065) | (0.005) | (0.009) |
| Age squared | -0.315*** | -0.017*** | 0.016* |
| | (0.053) | (0.004) | (0.007) |
| Secondary | -0.677*** | -0.045*** | -0.006 |
| | (0.137) | (0.011) | (0.017) |
| Married | -1.824*** | -0.073+ | 0.174* |
| | (0.526) | (0.041) | (0.072) |
| Divorced | 0.634 | 0.020 | 0.018 |
| | (0.836) | (0.059) | (0.108) |
| Widowed | -0.871 | -0.028 | 0.139+ |
| | (0.555) | (0.043) | (0.075) |
| Any disability | 1.202*** | 0.068*** | -0.081*** |
| | (0.138) | (0.011) | (0.017) |
| Any chronic | 2.001*** | 0.138*** | -0.113*** |
| | (0.109) | (0.009) | (0.014) |
| ADL | 5.025*** | 0.185** | -0.459*** |
| | (0.913) | (0.060) | (0.132) |
| IADL | 5.507*** | 0.361*** | -0.277*** |
| | (0.449) | (0.032) | (0.061) |
| Log of household income | -0.209*** | -0.014*** | 0.030*** |
| | (0.029) | (0.002) | (0.004) |
| Children | -0.023 | -0.003 | 0.015* |
| | (0.050) | (0.004) | (0.006) |
| Sibling | 0.031 | 0.002 | -0.003 |
| | (0.028) | (0.002) | (0.004) |
| Parents | 0.012 | 0.001 | -0.004 |
| | (0.063) | (0.005) | (0.008) |
| Year FE | Yes | Yes | Yes |
| County FE | Yes | Yes | Yes |
| Obs. | 15,002 | 15,002 | 14,168 |

Note: The unit of observation is an individual. Cluster standard errors are given in the parenthesis with clustering at the household level. The significance level is presented as + 0.10 * 0.05, ** 0.01, *** 0.001.