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Zeen He

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# Pension Schemes, Healthcare Use, and Health: Evidence from China*

**Zeen He**[†]

Department of Economics, Lancaster University Management School

**Abstract:** Using a non-parametric fuzzy regression discontinuity design and leveraging data from the China Health and Retirement Longitudinal Study (CHARLS), this paper explores the role of the urban-rural split in China's pension system in shaping healthcare utilization and health outcomes. Our estimates show that receipt of public pensions, particularly the Urban Employee Basic Pension Scheme (UEBPS), significantly improves self-reported health, mental health (CES-D scores), and physical health (ADL scales), especially among urban married males. However, there are no significant effects on healthcare utilization among urban residents. Moreover, social pensions, the New Rural Pension Scheme (NRPS), increase healthcare utilization (inpatient/outpatient) and corresponding healthcare spending of the rural population, particularly among married male residents. Additionally, these findings exhibit heterogeneity across gender, rural-urban differences, hukou status, and marital status. Furthermore, the health effects stemming from urban pension schemes can be explained by retirement, providing more leisure time for males and grandparental childcare responsibilities for females. However, the positive effect on healthcare use of rural males and the null effect for rural females are driven by the pure income effect of household joint financial pooling under the NRPS and female altruism. Finally, we find that integrating NRPS and URPS increased migration, non-agricultural employment, and health of non-pensioners, with no effect on rural pensioners.

**Keywords:** Pension schemes; Non-parametric fuzzy regression discontinuity; Health service utilization; Urban-rural split

**JEL classification:** I0, I1, J0, J1

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[†]Department of Economics, Lancaster University Management School, LA1 4YX; email: z.he10@lancaster.ac.uk

## Introduction

Aging has become a significant global challenge, with approximately 16.7% of the world's population expected to be aged 60 and over by 2030[1], which is particularly evident in developed countries, such as European countries[2], and the United States[3]. In China, the aging population (60 and over) has reached 297 million, accounting for 21.1% of the total population[4]. This means that China has officially transitioned into a moderately aging society under the United Nations' criteria for population ageing[5]. Typically, elderly people experience a higher incidence of both chronic and acute diseases. Furthermore, the body function and mental health of old people may deteriorate if their post-retirement life is not well secured with adequate healthcare and well-structured leisure activities. Consequently, population aging presents a significant policy issue for the Chinese government.

This paper aims to address the following questions: How does receipt of public or private pensions affect health outcomes (physical and mental health) and healthcare utilization (usage and expenses) among urban and rural residents? Second, what are the underlying mechanisms for these effects in the two groups: does the provision of pensions affect intra-household healthcare resource allocation, gender norms, or produce spillover effects?

These questions are important for several reasons. Broadly, a growing elderly population poses considerable challenges for the government in sustainably allocating pension benefits to retirees/pensioners. For pensioners, receiving a public pension may signify exiting from the labor market for urban employees or serve as an additional

[1] The 60+ population in the world will increase to 2.1 billion by 2050. Sources: World Health Organization (WHO), https://www.who.int/news-room/fact-sheets/detail/ageing-and-health.

[2] Specifically, by 1st January 2024, the European population was estimated at 449.3 million people, and approximately 21.6% of it was aged 65 years and over. Source: Eurostat, European Commission, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Population_structure_and_ageing

[3] 18.0% of the US population age 65 and over in 2024. Source: United States Census Bureau, https://www.census.gov/newsroom/press-releases/2025/older-adults-outnumber-children.html.

[4] Sources: Chinese National Bureau Statistics, https://www.stats.gov.cn.

[5] The United Nations classifies aging degree according to the proportion of people aged 60 and over. A proportion of 10% is called a mildly aging society, 20% is a moderately aging society, 30% is a severely aging society, and more than 35% is a deeply aging society.

subsidy for rural residents, resulting in changes to income and consumption patterns as well as increased leisure time, both of which can potentially impact health through pension benefits.

Second, China's pension system differs from those in developed countries due to the hukou system, which classifies household as either urban hukou or rural hukou. This system provides different access to public services and social security for urban and rural residents, making China a particularly informative setting for studying how pension design shapes healthcare utilization and health outcomes. Generally, in urban China, employees face mandatory retirement at a fixed age and become eligible to claim a public pension, the Urban Employee Basic Pension Scheme (UEBPS)[6], only after completing formal retirement procedures. However, rural residents are not bound by a mandatory retirement policy. Instead, they rely primarily on a government-subsidized social pension, the New Rural Pension Scheme (NRPS), which was introduced in 2009 and offers small old-age security.

In a nutshell, pension benefits are proportional to pre-retirement income for urban retirees, whereas rural pensions are unconditional cash transfers. This urban-rural distinction may result in differing health impacts of pension receipt between the two groups after 2008. Overall, in an urban setting, a mandatory retirement policy leads to a lower pension than their pre-retirement earnings, with a replacement ratio[7] of about 50%, as well as more leisure time (e.g., for social activities) for urban retirees. Reduced income and increased non-working time alter both budget constraints and time allocation. These joint changes provide a mechanism through which pension receipt can influence urban residents' health-related behaviors and consumption patterns, especially healthcare consumption/utilization. In contrast, for rural residents, social pension benefits from the NRPS are unconditional cash transfers not tied to retirement

[6] UEBPS includes both the Urban Employee Pension Scheme (UEPS) and the Public Employee Pension Scheme (PEPS). We use an aggregate measure of UEBPS receipt in the main analysis; see Section 3.2 for details.

[7] Sources: China Statistical Yearbook, 2001-2023. https://www.stats.gov.cn/english/Statisticaldata/yearbook/.

from work, relaxing liquidity constraints rather than inducing sharp changes in labor supply or time use. Potential health effects may arise through increased access to medical care.

Pension eligibility is directly tied to the compulsory state retirement age (SRA) in urban China, ranging between 50 and 60 years depending on gender and occupation type[8]. Using data from the China Health and Retirement Longitudinal Study (CHARLS) for the 2011, 2013, 2015, and 2018 waves, we employs a non-parametric fuzzy regression discontinuity design (RDD) to estimate the causal effects of receiving an urban pension scheme (i.e UEBPS) on outcomes such as health service utilization (outpatient /inpatient visits), corresponding healthcare spending (total/out-of-pocket), physical health (ADL-scale and self-reported health), mental health (CES-D score), health-related behaviors, and household expenditures, and we distinguish between public (UEBPS) and private (occupational annuity) pension schemes for urban residents. Based on the state pension age (of 60 years old) for NRPS in rural areas, using a fuzzy RDD approach, we also estimate the impact of receiving NRPS on the aforementioned health-related outcomes.

Furthermore, we employ a two-way fixed effects difference-in-differences (DID) approach to exploit two rural pension reforms: the "Implementation of the New Rural Pension Scheme (NRPS)" and the "Integration of NRPS with the Urban Residents Pension Scheme (URPS)". As a robustness check, this identification strategy enables us to estimate the overall impact of NRPS, as a cash transfer program, on household income and healthcare utilization among the treatment group. The second reform relaxed the hukou restrictions on location-based pension entitlements for rural residents, thereby reducing institutional barriers between rural and urban pension systems and

[8] In urban China, enterprise employees and public sector workers are enrolled in separate pension schemes—UEPS and PEPS, respectively. Both follow mandatory retirement, with females retiring at age 50 under UEPS and 55 under PEPS; the male retirement age is 60 for both. PEPS typically offers more generous benefits than UEPS. One of these advantages for employees in public sector is that they have a supplementary private pension (occupational annuity).

providing a setting to examine whether narrowing the urban–rural pension split drives health.

This paper has a rich set of findings. First, receipt of urban public pensions (UEBPS) significantly improves both physical and mental health, as well as well-being (life satisfaction), among urban male residents. These positive effects are driven by retirement and the associated increase in leisure time for social activities, rather than by the income effect, as we do not observe that UEBPS improves healthcare utilization. Moreover, receipt of UEBPS does not improve urban females' health. A plausible mechanism is that retirement of female workers with UEBPS increases their involvement in grandchild care, limiting the health-related benefits of increased leisure time.

However, in rural areas, receiving the social pension (NRPS) reduces rural married males' likelihood of diseases, while no effects are observed among rural females. The health improvement among males is attributable to increased healthcare utilisation financed by NRPS. Specifically, NRPS increases hospital-based healthcare utilization and out-of-pocket healthcare expenses among husbands, whereas wives primarily shift toward non-hospital self-treatment, such as purchasing traditional herbs or prescription drugs. This mechanism is supported by healthcare resource allocation and female altruism within households. In other words, this gender difference stems from the pure income effect of household joint financial pooling under the NRPS, whereby women recipients prioritize their family's welfare over their personal medical needs.

Our results are robust to employing the DD approach. Using a two-way fixed effect DD approach, this paper finds that introducing NRPS significantly increases the household income of elderly rural people by 26% and increases inpatient treatment among males (aged 60 and over) by 5.2%. Such estimates further serve as a robustness check on the main RDD work, and also support the income effects of NRPS.

Finally, DD estimates show that the "2014 Rural Pension Reform" affected NRPS non-pensioners and pensioners differently. Removing hukou-based disparities in

pension entitlement (enrollment and claimant), this reform significantly increased rural non-pensioners' non-agricultural employment and corresponding annual working hours by 140.5 hours respectively, while also improving the mental health of working-age rural residents. In addition, this reform had no impact on household income and healthcare utilization among pensioners. The results are validated using an alternative dataset, the China Family Panel Survey (CFPS) datasets.

The core contribution of this paper is to exploit China's segmented urban–rural pension system to provide a unified comparison of how different institutional pension designs affect health outcomes. Specifically, this paper explores the effects of receiving urban pension schemes (UEBPS) or rural social pension (NRPS) on health outcomes for urban and rural residents separately, while also comparing differences based on hukou status, marital status, and gender. By comparing the health impacts of pension receipt across these two groups, we provide new evidence on how pension design and institutional urban-rural split shape health inequalities.

Furthermore, we contribute to the literature by examining within-system differences in China's urban pension system. In urban China, public sector employees normally receive more generous retirement benefits as they are mandatorily covered by an occupational annuity in addition to the Public Employee Pension Scheme (PEPS). Although enterprise-specific annuities are available to Urban Enterprise Pension Scheme (UEPS) enrollees, private enterprises voluntarily offer them according to their market performance. This difference in pension benefits for UEPS enrollees and PEPS enrollees results in different post-retirement behaviors in the two groups. Given the supplementary role of private pensions in financing urban pension systems, this paper estimates the impact of receiving an occupational annuity on health indicators for urban PEPS enrollees.

In addition, the paper provides new evidence on the role of China's gender norms in shaping health and economic outcomes, in both urban and rural contexts. Specifically, we highlight the role of grandparenting being a predominantly female

responsibility, a fundamental cultural norm, on the health outcomes of urban public pension receipt (UEBPS). In urban areas, these gender differences shape marriage and fertility decisions among respondents' children. Whereas, in rural China, female altruism drives the pooling of social pensions (NRPS) benefits, prioritizing husbands' healthcare over wives' needs. This paper empirically examines these gender-based disparities and explains how female altruism and household collective decision-making underpin the observed differences in health effects of the urban and rural pension schemes.

The structure of this paper is organized as follows: the second section provides a summary of the relevant literature; the third section presents the institutional background of the pension healthcare systems in China; the fourth section introduces data and provides descriptive statistics; the fifth to the eighth sections outline empirical specifications and present empirical results; while the last two sections are robustness checks and conclusions.

## Literature Review

Our foundational references focus on the causal impact of retirement on health in developed countries, such as the United Kingdom (Rose, 2020), the United States (Insler, 2014), and Europe (Coe and Zamarro, 2011; Kesavayuth et al., 2018). These studies suggest that retirement improves individuals' self-assessed health. To address endogeneity concerns, these studies employ fuzzy regression discontinuity (RDD) or the instrumental variable approach. However, the state pension age in these countries is (in 2026) over 65 for both men and women, and there is no urban-rural segmented pension system or hukou system in developed economies like China. In fact, as the largest developing country, China has the lowest compulsory retirement age for males (60) and females (50/55), which varies by occupation in urban areas, and a state social pension age (60) for everyone in rural areas. Moreover, the eligibility of the pension scheme is subject to their hukou status (urban/rural). These bring significant gender and

urban-rural differences in the health effects of retirement and pension payment[9]. Hence, this paper fills these gaps by exploring the effects of receipt of different pension schemes on health under urban and rural settings separately.

There are very few papers discussing the relationship between retirement and health in urban China (Che and Li, 2018; Feng et al., 2020). Using an IV-2SLS approach and the China Health and Nutrition Survey (CHNS) in the period 1991-2006, Che and Li (2018) explore the effect of retirement on the health of urban white-collar workers. They concluded that retirement reduced the likelihood of males being in poor health. Feng et al. (2018) also suggested that retirement increases weight and BMI among males. However, these studies have some shortcomings regarding data obsolescence and lack of national representativeness[10]. Furthermore, these studies do not estimate the health effects of retirement on females in urban areas. Discussing the role of gender norms in Chinese families, our work contributes to the existing literature by exploring the channels of health effects for both males and females in urban China.

A related strand of studies examines spousal spillovers of retirement in urban China (Zang, 2020; Chen, 2022). All these works agree that the husband's retirement improves their spouses' health. In particular, by applying the CHARLS data and using a fuzzy RDD approach, Zang (2020) explores the causal effect of husbands' retirement on spousal health. This study suggests that the retirement of husbands improves wives' health through increasing the frequency of the wife's social interactions and exercise. However, their paper includes all residents in both urban and rural areas of China. In fact, there is a mandatory retirement policy for urban employees, while no compulsory rule for urban non-workers and rural residents. Therefore, including rural residents in

[9] In China, there is a compulsory state retirement age only for employees who formally work in public institutions, government, or enterprises (state-owned/private). As for the unemployed or those who have no formal job, these people can claim a pension when they reach state pension age (not retirement age) if they enrolled in social pension (NRPS/URPS).

[10] The CHNS dataset is relatively outdated and limited in capturing recent changes in socioeconomic conditions, individual health, and pension system reforms. Additionally, it only covers 15 out of China's 34 provinces and municipalities, restricting its national representativeness.

the sample may lead to inaccurate health effects because of differences in the urban-rural pension system and characteristics of urban and rural residents. Building on this literature, we examine both direct and spousal health effects of public pension receipt within the urban pension system

Furthermore, few papers explore the impact of social pensions in rural China. Applying a fixed-effect model with instrumental variable estimations, Chen et al. (2018) estimate the impact of social pension income from the New Rural Pension Scheme (NRPS) on the health of elderly rural people. They suggested that NRPS pension benefits are beneficial for the physical health and cognitive function of older people in rural China. However, focusing only on recipients conditions on realized take-up, their estimand does not capture the policy-relevant impact of expanding pension eligibility.

Institutionally, the NRPS operates as an age-eligibility-based transfer: once individuals reach the eligibility age, they become entitled to pension benefits conditional on prior enrolment, and actual take-up is induced by the age rule and NRPS implementation rather than by short-run health shocks. Several studies document that this eligibility-induced transfer generates sizable income gains and behavioural responses, including higher household income (Huang and Zhang, 2021), increased intergenerational investments (Shan and Park, 2023), and reduced reliance on children's transfers (Guo et al., 2025). Because the income shock is triggered by NRPS eligibility, we estimate the intention-to-treat (ITT) effect among eligible enrollees. This approach captures the average health effect of pension receipt induced by the scheme design, rather than the effect among a selected group of recipients.

Despite these insightful studies, the mechanisms through which pension receipt affects health remain insufficiently understood, particularly with respect to changes in healthcare utilization. Existing evidence from other contexts suggests that retirement increases healthcare use among retirees (Coe and Zamarro, 2015; Frimmel and Pruckner, 2018; Zhang et al., 2018). However, these findings may not fully apply to

China, where the urban-rural duality results in differences in pension systems, leading to heterogeneous effects of pensions on healthcare utilization in urban and rural areas.

Limited attention has been paid to examining the impacts of receiving pension schemes on healthcare service utilization, particularly in the urban Chinese context. Only one paper estimates the causal effect of retirement on healthcare use in urban China (Zhang et al., 2018). Using a non-parametric fuzzy RDD approach around the statutory retirement age (integer-level), they apply the first two waves (2011-2013) of CHARLS data and find that retirement significantly increases healthcare use among urban male retirees. We extend this literature by highlighting that, in urban China, retirement and pension receipt are different and that public pension schemes differ substantially in benefit rules and generosity, so utilization effects may vary by scheme. Pension receipt captures not only the transition out of work but also the income effect of pension benefits, and typically requires both reaching the statutory retirement age and completing formal retirement procedures. Using month-of-age as the running variable and longer-term data, we estimate the causal effects of pension receipt on healthcare utilization in the urban context.

Only a small number of studies examine how NRPS receipt affects healthcare utilization in rural China. Employing a fuzzy RDD approach, Yang and Chang (2023) found that pension payments increased outpatient visits and related expenditures among farmers in Taiwan. However, the pension systems in Taiwan and mainland China differ significantly in their institution details. Within mainland China, employing pension age eligibility as an instrument, two studies utilized a fuzzy RDD methodology and the CHARLS data to explore the impact of NRPS on healthcare utilization among the elderly in rural China (Hu et al., 2019; Chen et al., 2020). Their findings suggest that NRPS significantly increased both inpatient and outpatient healthcare utilization among rural residents. However, these studies focus on individual-level utilization responses and provide limited discussion of gender heterogeneity or the role of intra-household allocation in shaping men's and women's healthcare use.

This omission matters because consumption patterns shift upon retirement and decisions are made by households rather than individuals (Vermeulen, 2002; Banks, Blundell, and Casanova Rivas, 2007). Access to medical care depends on resources (i.e., NRPS) and how resources are allocated (i.e., pooling couples' pensions under the NRPS) within the household. In rural Chinese households, traditional gender roles (i.e., female altruism) and household decision-making may influence allocation rules, with women often prioritizing family well-being over personal financial gains when resources are scarce (Carlsson et al., 2012, 2013). This cultural norm may shape the healthcare consumption patterns of households receiving NRPS benefits. Therefore, without considering intra-household allocation and gender norms, the existing literature provides limited evidence on the mechanisms through which NRPS drives healthcare utilization and health outcomes.

Our paper fills this gap by explicitly modeling intra-household allocation in healthcare use under the NRPS within households. We examine how financial pooling from NRPS influences males and females differently within married households. Furthermore, based on collective household decision theory, we estimate the effect of household-level receipt of NRPS on husbands' healthcare utilization, as well as the spillover effect of wives' receipt of NRPS on their husbands' healthcare use, using both fuzzy RDD and DID methodologies. In addition, to verify the role of collective household decision-making, we conduct heterogeneity analysis by marital status (married vs. single).

Furthermore, in China, there is a special group commuting between urban and rural areas: rural migrant workers and rural migrant residents[11]. groups may enroll in social pension programs, especially UEPS and the NRPS, respectively, in urban areas. The former pension scheme offers higher pension income. However, most rural migrant workers still participate in NRPS, as these workers may have no formal employee

[11] Both groups have rural hukou but live in urban areas. The difference is that the former group lives and works in an urban area while the latter just lives in an urban area.

contract[12]. Often rural migrant residents live with their children who work in urban China. Their children may pay them a pension contribution. Both groups can receive better healthcare treatment due to the higher-quality medical services in urban China. All these factors drive their potential medical demand during their post-retirement life. However, these questions are not discussed and resolved in prior studies; this paper fills this gap and explores the impact of receiving NRPS on rural migrants and rural residents (non-movers), separately.

## Institutional Background of Pension in China

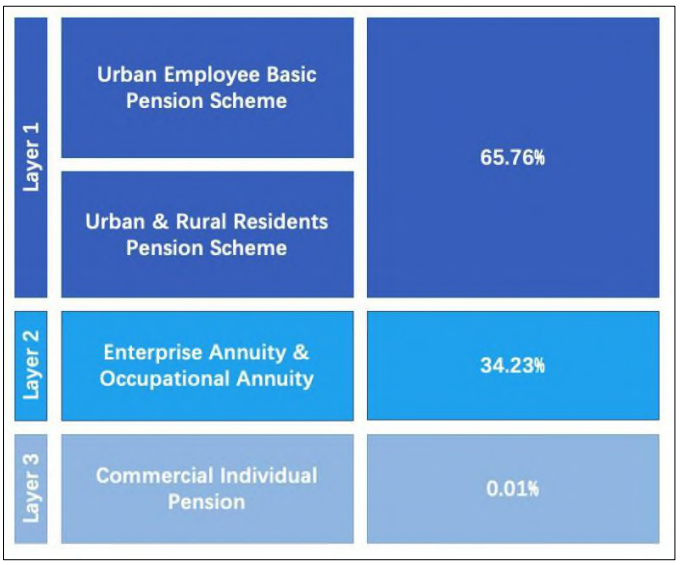
### 1.1 The Pension System in China

In general, the pension system in China is structured into three layers, as illustrated in Figure 1. Specifically, the first layer encompasses public pension schemes (also Basic Pension Insurance), followed by the Enterprise/Occupational Annuity program (the second layer), and the commercial individual pension program (the third layer). China's public pension system includes three schemes catering to individuals based on their hukou status and occupation: the Urban Employee Pension Scheme (UEPS), the Public Employee Pension Scheme (PEPS), and the Basic Residents Pension Scheme (BRPS). The first layer, comprising public pension schemes, holds significant prominence, representing approximately 66% of China's pension system. As of 2022, around 1.05 billion individuals are covered by public basic pension schemes, emphasizing the extensive reach and impact of this foundational layer[13].

[12] This group may not be well treated by their employers because of their illiteracy, therefore, their employers do not provide formal UEPS for them.

[13] Source: 2021 and 2022 Annual Human Resources and Social Security Development Statistical Bulletin, MoHRSS, June 2022, http://www.mohrss.gov.cn/SYrlzyhshbzb/zwgk/szrs/tjgb/.

**Figure 1 Structure of Pension System in China**



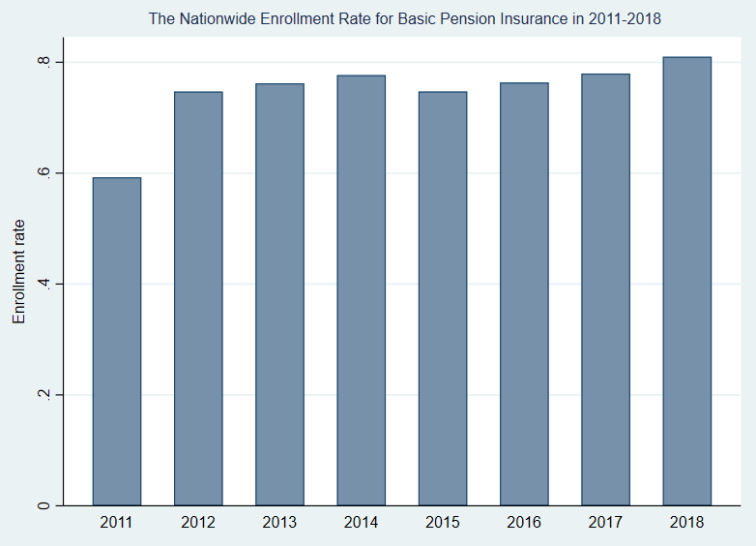

Note: "Urban Employee Basic Pension Scheme" includes "Urban Employee Pension Scheme (UEPS)" and "Public Employee Pension Scheme (PEPS)".

Source: Ministry of Human Resources and Social Security of the People's Republic of China. http://www.mohrss.gov.cn/.

The Chinese population covered by public pension schemes is increasing year by year. As Figure A 5 shows, the nationwide enrollment rate of the Basic Pension Insurance and the number of people enrolling in basic pension insurance both increase steadily from 2011 to 2018, with coverage reaching around 90% by the end of 2022[14].

[14] Source: the 2022 report of the State Council of China, National Statistics Bureau.

**Figure 2 The Nationwide Enrollment for Basic Pension Insurance in China in 2011-2018**




Source: "Report on China's Social Security Development Index" from China Social Security Research Center

As illustrated in Table 1, individuals who are not employed and are over 16 years old (excluding students) are eligible to enroll in the Urban Resident Pension Scheme (URPS) or the New Rural Pension Scheme (NRPS), depending on their hukou status—urban hukou for URPS enrollment and rural hukou for NRPS enrollment. These two schemes were for non-employed individuals in rural and urban areas or those who are not covered by the UEPS and the PEPS, which is collectively called the Urban Employee Basic Pension Scheme (UEBPS) in this paper.

**Table 1.1-1: Features of Pension Schemes in China**

| | Public Pension Scheme | | |
|---|---|---|---|
| | Urban Employee Basic Pension Scheme (UEBPS) | | Residents Pension Scheme (Unified in 2014) |
| | UEPS | PEPS | URPS (2011) + NRPS (2009) |
| **Eligibility for Enrolment** | Urban employees and self-employed | Urban civil servants and employees in public institutions | URPS: urban residents over 16 old and not in employment; NRPS: rural residents over 16 old. |
| **Enrolment (millions)** | Around 503.49 | | 549.52 |
| **Compulsory Enrolment** | Yes | Yes | No |
| **Contribution Rates (% of salaries)** | 20% from employers + 8% from employees; 20% from self-employed | before 2015: No Contribution ; After 2015: 20% from employers + 8% from employees | Government subsidies + contributions to individual accounts |
| **Minimum Vesting Period (Year)** | 15 | 15 | 15 |
| **Retirement Age** | 60 for male and 50 for female urban residents | 60 for man; 55 for females | 60 for both urban and rural residents |
| **Claiming Way** | Monthly | Monthly | Monthly |
| **Average Monthly Amount (Yuan[15])** | Around 3100 yuan | Around 6100 yuan | Around 1000 yuan[16] |

Sources: National Bureau of Statistics (2022), *China Labour Statistical Yearbook 2022*, China Statistics Press, Beijing, Ministry of Human Resources and Social Security.

The Urban Employee Pension Scheme (UEPS) was initially established in 1997 for urban employees in enterprises, including state-owned enterprises, and the private sector. In 2003, this scheme was expanded to cover urban self-employed residents. The Public Employee Pension Scheme (PEPS) was launched in 2015 for civil servants and employees in non-profit government institutions, such as schools and cultural and health facilities[17]. Also, in 2015, the PEPS was merged with UEPS, making UEBPS the uniform program for all employees in urban sectors. It is worth noting that those covered by the UEBPS system require employers and employees to jointly pay their respective contributions for the pension.

[15] The average exchange rate for RMB to USD in 2022 is around 6.7.

[16] Pension = Basic Pension + Individual Account Pension. The basic pension varies by provinces and cities and the enrollees can receive higher pension if they pay more for individual pension account before 60. Apart from the unconditional government subsidy, NRPS enrollees may voluntarily contribute 100 RMB, 200 RMB, 300 RMB, 400 RMB, or 500 RMB to their individual pension accounts (Source: The State Council of the People' Republic of China, https://www.gov.cn/gongbao/content/2009/content_1417926.htm).

[17] Before 2015, civil servants and employees in public institutions in China were covered by a non-contributory pension system, receiving retirement benefits without making personal contributions. The introduction of the Public Employee Pension System (PEPS) in 2015 marked a fundamental shift, requiring them to make personal contributions toward their pensions.

Furthermore, the eligibility for receiving a public pension is directly linked to the state retirement age and statutory pension age. Specifically, as for enrollees with UEPS and PEPS, the retirement age is 60 for males, 50 for females, and 55 for female civil servants in urban areas. These criteria apply to urban employees and some self-employed individuals. For those above 16 years old but not engaged in formal employment, the pension age is set at 60 for all urban and rural residents covered by the Basic Residents Pension Scheme (URPS/NRPS).

Finally, the Enterprise/Occupational Annuity and Commercial Individual Annuity serve as supplementary components within the Chinese pension system. The enterprise annuity is a voluntary, employer-sponsored supplementary pension plan, offered by state-owned or private enterprises. However, the payment of an occupational annuity is compulsorily for government and public institutions.

### 1.2 Retirement and Pensions

In urban China, employees are required to participate in the relevant pension scheme - PEPS in public institutions, government, state-owned enterprises, and UEPS in private sector companies. They are eligible to claim a pension when they reach their state retirement age (SRA) and "process retirement"[18]. Furthermore, pension benefits vary by years of contribution and occupation. Actual pension incomes is normally lower than the pre-retirement earnings. Figure A 1 illustrates the average annual pension benefits and average replacement ratio for urban pensioners in the period 2000-2022. It is obvious that the replacement ratio decreases by year and stays approximately 40-45% in the past 10 years.

Figure A 2 presents the average monthly pension benefits for enrollees in UEPS, PEPS, and the combined group of UEPS + PEPS pensioners from 2011 to 2018. The data clearly show an upward trend in pension income over the years, with pension benefits for PEPS enrollees significantly higher than those for UEPS enrollees. According to CHARLS data, the average monthly benefit for UEPS and PEPS enrollees

[18] "process retirement" means that employees who reach SRA and leave their current job go through all the formalities with their employer and the local government.

is 2,295.11 RMB and 3,517.33 RMB (approximately 3353.09 USD and 541.13 USD), respectively, while the average for UEBPS enrollees is 2,610.78 RMB (roughly 377.15 USD). This pattern aligns with the broader economic context, as pension benefits for individuals employed in government or public institutions tend to be more generous, supplemented by private annuities in addition to public pensions upon retirement.

However, China's pension system is highly segmented, with rural residents excluded from the UEPS and PEPS. In contrast, rural residents are not subject to a mandatory retirement policy and typically work beyond the compulsory retirement age, often in informal or agricultural employment. Moreover, they do not participate in employer-funded pension schemes, as most rural employment lacks formal labor contracts.

### 1.3 Social Pension Reform in China

China's social pension system consists of two primary schemes for unemployed urban and rural residents: the Urban Residents Pension Scheme (URPS) and the New Rural Pension Scheme (NRPS). Eligibility for these programs is determined by the hukou system, a household registration classification that distinguishes between urban hukou and rural hukou holders. Individuals with urban hukou are eligible to enroll in the URPS, whereas those with rural hukou qualify for the NRPS, as outlined in Table 1. As of recent estimates, China has approximately 464.8 million permanent rural residents in 2022[19]. The annual average disposable income of rural residents is only 23,119 RMB (approximately 3,156 USD) in 2022, less than half that of urban residents. Most rural residents lack formal employment and do not have stable monthly pension payments, unlike urban employees covered by the formal pension system.

The financial insecurity of this large low-income group in old age led the Chinese government to launch the New Rural Pension Scheme (NRPS) as a pilot program in 320 counties across 27 provinces and four municipalities — Beijing, Shanghai, Chongqing, and Tianjin in 2009. The program aimed to cover 130 million rural

[19] National Bureau of Statistics of China, https://www.gov.cn/gongbao/content/2009/content_1417926.html.

residents and provide the foundation for a social security system for the elderly in rural areas [20]. The scheme was gradually expanded in 2010 and 2011, reaching full nationwide coverage by August 2012[21], and in 2014, the NRPS and the URPS were merged into a unified system, the Basic Residents Pension Scheme (BRPS). This paper refers to this policy as the "2014 Rural Pension Reform".

The reform eliminated hukou-based eligibility restrictions and resulted in a modest increase in pension benefits for individuals previously enrolled in the NRPS. Following this integration, NRPS pensioners and non-pensioners are differentially affected by this reform. Specifically, the URPS offered a greater range of contribution options, higher contribution levels, and more generous governmental subsidies for potential participants, and the NRPS was adjusted to align with these standards after this reform. Therefore, the NRPS recipient will receive higher basic pension benefits after 2014.

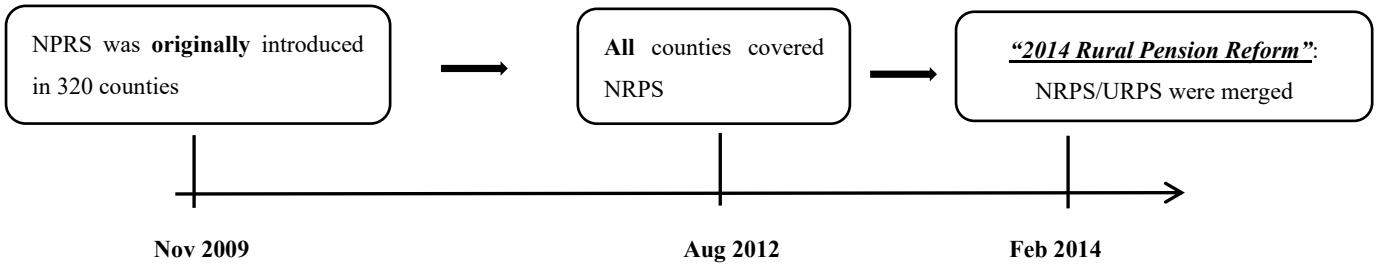
Furthermore, as for non-pensioners, before the reform rural residents below 60 were only eligible to enroll in the NRPS and could claim NRPS within their registered rural hukou location. This implied that if a rural resident moves to an urban area, they cannot continuously enroll in or claim NRPS benefits and access the Urban Employee Pension Scheme (UEPS), thereby losing pension entitlements.

This strict administrative separation significantly limited pension portability and hindered rural migrants from working in urban areas. The system was poorly aligned with China's massive internal migration patterns. However, the 2014 Rural Pension Reform removed this hukou-based distinction. Migrants were no longer required to return to their rural hometowns to enroll or claim benefits. Instead, they were allowed to enroll locally, based on their place of residence, regardless of hukou status. This increased the portability of pension benefits and likely encouraged greater labor mobility (especially rural-to-urban migration) among middle-aged rural migrants who had not yet begun receiving pensions.

[20] Ministry of Human Resources and Social Security of the People's Republic of China. https://www.mohrss.gov.cn/ncshbxs/NCSHBXSgongzuodongtai/201004/t20100402_83857.html.

[21] According to official documents from the State Council of the PRC, Huang and Zhang (2021) reported that 320 counties (12%) were designated as pilot counties for the NRPS in 2009, followed by an expansion to 450 counties in 2010, 1,075 counties in 2011, and full nationwide coverage by 2012.

**Figure 3 Timeline of Social Pension Reforms**




The social pension benefits are from the Basic Pension Account and the Individual Pension Account[22]. Figure A 3 presents the average monthly social pension (BRPS) across 27 provinces and four centrally administered municipalities (Beijing, Shanghai, Tianjin, and Chongqing) during the period 2014-2022. Overall, significant regional disparities exist in social pension benefits. Notably, Beijing and Shanghai stand out, with monthly pension payments exceeding 1,000 RMB (about 138 USD) and experiencing substantial annual increases. However, pension benefits in other provinces and nationwide remain relatively stable, with monthly payments generally below 500 RMB (around 69 USD). While the pension benefit is relatively modest, it is sufficient to cover basic needs for the majority of recipients, particularly rural residents.

Similarly, Figure A 4 presents the average monthly pension benefit for NRPS in 2010 and 2011[23]. The average monthly NRPS pension is approximately 100 RMB (roughly 14.45 USD), though some developed cities, such as Beijing and Shanghai, offer significantly higher benefits, around 300-400 RMB (roughly 43.3-57.8 USD). While NRPS benefits are lower than those of BRPS, the difference remains relatively small.

[22] The Basic Pension Account is subsidized by the government, and the Individual Pension Account is from individual paid contributions before age 60.

[23] The China Statistical Yearbook reports NRPS pensioners and benefits only for the years 2010 and 2011.

## 1.4 Healthcare System in China

Public health insurance coverage in China is universal. Individuals are eligible for either the Urban Employee Basic Medical Insurance (UEBMI) or the Urban and Rural Residents Medical Insurance (URRMI), depending on their occupation and hukou status. Generally, employees working in public institutions, government, or enterprises participate in UEBMI, while those who are not eligible for UEBMI can enroll in URRMI. By 2024, around 337 million (about 25% of the Chinese population) people are covered by UEBMI, and about 71% of Chinese people are covered by URRMI[24]. Specifically, the New Rural Cooperative Medical Scheme (NRCMS) increases medical service utilization among rural residents (Yu et al., 2010; Lei and Lin, 2009), while the Urban Basic Medical Insurance (UBMI) finances healthcare use among urban residents (Mao et al., 2020)[25] Therefore, healthcare expenditures in China are financed mainly through copayments under public medical insurance and through out-of-pocket payments.

Nevertheless, the reimbursement rate for China's universal social health insurance is not sufficiently generous to cover all medical expenses (Zhou et al., 2014; Li and Zhang, 2013; Tan et al., 2018). China has made significant efforts to reduce out-of-pocket (OOP) healthcare expenditures, bringing them down from 60% in 2000 to approximately 34% in 2021[26]. However, China's out-of-pocket (OOP) healthcare expenditure ratio remains significantly higher than the global average, Europe (below

[24] Source: Ministry of Human Resources and Social Security (https://english.www.gov.cn/archive/statistics/202404/12/content_WS661876d0c6d0868f4e8e5f5b.html); The State Council of The People's Republic of China (https://www.gov.cn/xinwen/2020-06/27/content_5522166.htm).

[25] However, private health insurance (PHI) remains relatively uncommon, covering only about 10% of households, below 3% for the middle-aged and elderly Chinese population. The PHI coverage is especially low in urban areas (under 3%) and even lower in rural regions (under 1%), as reported in two waves of CHARLS data (Wang et al., 2016; Jing et al., 2016). Source: China Family Panel Survey (CFPS) data, 2012 wave; China Health and Retirement Longitudinal Study (CHARLS) data, 2011, 2013, 2015, and 2018 waves.

[26] Source: World Health Organization Global Health Expenditure database. https://data.worldbank.org/indicator/SH.XPD.OOPC.CH.ZS?locations=CN.

20%), and the United States (below 10%)[27]. This means Chinese people still pay a high ratio of out-of-pocket medical expenses.

Moreover, social health insurance covers approximately half of the healthcare expenses for rural residents, compared to about 70% for urban employees[28]. This implies that rural residents face substantially higher out-of-pocket healthcare costs. Consequently, for the elderly rural population, a social pension (NRPS) may play a crucial role in financing their medical expenses.

## Datasets

### 1.5 CHARLS

The China Health and Retirement Longitudinal Study (CHARLS) aims to facilitate research on aging and health-related issues of the middle-aged and elderly population (aged 40 and above). Initiated with its baseline national wave in 2011, the CHARLS involves follow-ups every two years, resulting in a longitudinal dataset encompassing the 2011, 2013, 2015, 2018, and 2020 waves. Each wave of the CHARLS dataset encompasses around 10,000 households and 17,500 individuals across 150 counties/districts and 450 villages/resident committees. This dataset informs the research because of its national coverage, the panel design, and the comprehensive information on pertinent variables, including pension, healthcare utilization, expenditure, health-related factors, income, and demographic characteristics. Such features enable an in-depth examination of the impact of pension payments on healthcare use and health outcomes. This paper applies the first four waves and excludes the 2020 wave due to the impact of the COVID-19 lockdown policy in China.

[27] Sources: National Health Expenditure Accounts (NHEA), available through the Centers for Medicare & Medicaid Services (CMS): https://www.cms.gov/Research-Statistics-Data-andSystems/Statistics-Trends-and-Reports/NationalHealthExpendData/NationalHealthAccountsHistorical.

[28] World Health Organization Global Health Expenditure database.

For our analysis, we restricted the sample to individuals aged between 40 and 75, resulting in a dataset comprising 66,657 individual observations.

Within the CHARLS dataset, key outcome variables related to healthcare utilization include questions such as: “Did you stay in a hospital last year?”, “Did you visit a doctor for outpatient treatment last month?”, “Did you visit a Chinese Medicine Hospital last month?”, “Did you visit Dental Care last year?”, “What was the total expenditure for hospitalization last year?”, “What was the out-of-pocket expenditure for hospitalization last year?”, “What was the total expenditure for doctor visits/outpatient treatment last month?”, “What was the out-of-pocket expenditure for doctor visits/outpatient treatment last month?”, “What was the total expenditure for doctor visits/outpatient treatment last month?” “What was the total expenditure for dental care last year?”, and “What was the out-of-pocket expenditure for dental care last year?”. Additionally, pension-related questions include: “Do you receive a public pension?”, “Do you receive a private pension?”, “Do you receive the basic pension program of firms (UEPS)?”, “Do you receive a pension program from the government or institutions (PEPS)?”, “Do you receive the New Rural Pension Scheme (NRPS)?”, “Do you receive the Urban Residents Pension Scheme (URPS)?”

Additional dependent variables encompass health-related outcomes, including: self-reported health (rated on a scale of 1-very good, 2-good, 3-fair, 4-poor, 5-very poor) and code a dummy health indicator as 1 if the respondent reports “very good”, “good” or “fair” and 0 otherwise; mental health (quantified by CES-D score estimating depression symptoms derived from the Center for Epidemiologic Studies Depression Scale); indicators for physical health: Activities of Daily Living (ADL) scale (values from 0-5, with higher values being worse); disease dummy; and Body Mass Index (BMI). Other health-related indicators include: life satisfaction (values from 1-5, 1-not at all satisfied, 2-not very satisfied, 3-somewhat satisfied, 4-very satisfied, 5-completely satisfied) and a life satisfaction indicator as 1 if the value is 3 or higher; a dummy variable for smoking status; whether doing physical exercise or not; and private health insurance coverage.

Other household-level dependent variables include household income, food expenditure and non-food expenditure. We also list individual-level social activities. The question in CHARLS for social activities is "Have you done any of these activities in the last month?" - interacted with friends, played Ma-jong or chess or cards or went to community club, provided help to family or friends or neighbors who do not live with you and who did not pay you for help, went to sport or social or other kind of club, took part in a community-related organization, done voluntary or charity work, cared for a sick or disabled adult who does not live with you and who did not pay you for the help, stock investment, used the internet, other. We code each of these social activities as binary dummies.

Furthermore, some dependent variables for further analysis encompass grandchild care and spousal health outcome, retirement status, and working status. All these variables are binary. Moreover, to mitigate potential confounding factors and account for time trends, our analyses incorporate control variables at both the household and individual levels. Pertinent controls in our foundational estimations encompass marital status, educational attainment, household size, year indicators, and month indicators. Controlling for the above mentioned characteristics, we estimate the implications of pension by region (community dummy constructed based on reported province, city, and county), by hukou (household residence registration location--rural/urban), and by gender.

Moreover, as a robustness check of our main estimates exploiting the "2014 Rural Pension Reform" using CHARLS data, we replicate the analysis with an alternative nationwide survey dataset (the China Family Panel Study). The results are presented in Appendix A.1.

### 1.6 Descriptive statistics

Table 2 summarizes the main variables about health and healthcare use for those aged between 40 and 75 by area (urban/rural). The average rate of receiving public pension is 30.6 percent for the whole sample, 32.3 percent for people in urban areas, and 29.5 percent for those in rural areas, respectively. Furthermore, the average

proportion of receiving a private pension is 9.6 percent for the total sample, 20.6 percent for those in urban China, and 2.5 percent for people in rural China. As for health service utilization, in general, the usage of healthcare in urban areas is higher than that in rural areas. There are about 18.4 percent of people using outpatient care last 12 months, followed by 18 percent for dental care and 12.7 percent for inpatient care. The proportion of visits to a Chinese Medical Hospital is lowest at about 1.3 percent last month. Table A 33 summarizes additional covariates, including age, education, marital status, employment status, household size, residential status, hukou status, and participation in social activities.

**Table 2: Descriptive Statistics for CHARLS data between 2011 and 2008**

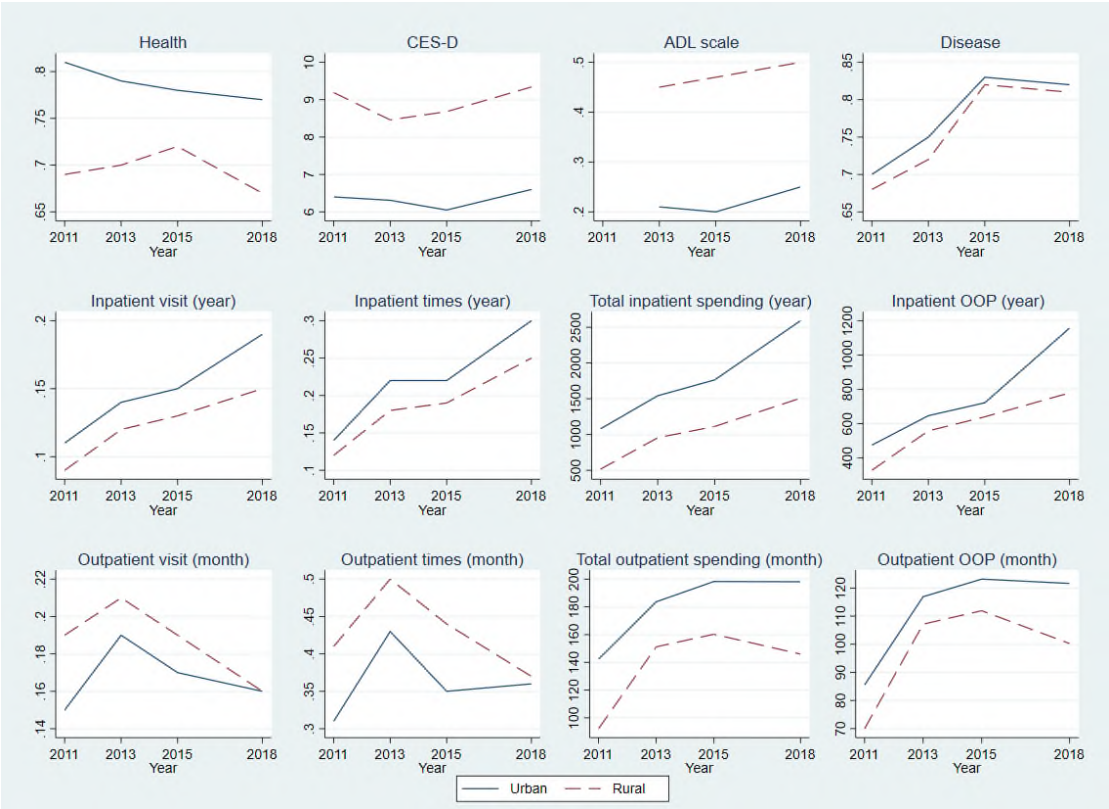
| Variable | All | Urban | Rural |
|---|---|---|---|
| Receipt of Public Pension | 0.306 | 0.323 | 0.295 |
| - Urban Employee Basic Pension Scheme | 0.059 | 0.132 | 0.012 |
| - Public Employee Pension Scheme | 0.022 | 0.043 | 0.008 |
| - Urban Residents Pension Scheme | 0.028 | 0.033 | 0.025 |
| - New Rural Pension Scheme | 0.199 | 0.120 | 0.251 |
| Receipt of Private Pension | | | |
| - Occupational Annuity | 0.021 | 0.041 | 0.007 |
| Inpatient Visit | 0.127 | 0.135 | 0.123 |
| Inpatient Times (last year) | 0.237 | 0.292 | 0.201 |
| Outpatient Visit | 0.184 | 0.175 | 0.190 |
| Outpatient Times (last month) | 0.415 | 0.386 | 0.434 |
| Chinese Medical Hospital Visit | 0.013 | 0.018 | 0.009 |
| Dental Care Visit | 0.178 | 0.202 | 0.162 |
| Inpatient Total Expenditure | 1178.736 | 1396.745 | 1036.318 |
| Outpatient Total Expenditure | 146.287 | 158.201 | 138.499 |
| Inpatient Out-of-pocket Expenditure | 531.462 | 572.803 | 504.015 |
| Outpatient Out-of-pocket Expenditure | 100.927 | 104.564 | 98.560 |
| Dental Care Cost | 113.357 | 150.095 | 89.133 |
| **Self-reported Health** | | | |
| -very good | 0.101 | 0.111 | 0.095 |
| -good | 0.142 | 0.165 | 0.128 |
| -fair | 0.511 | 0.530 | 0.498 |
| -poor | 0.194 | 0.155 | 0.220 |
| -very poor | 0.050 | 0.038 | 0.058 |
| CES-D score | 8.107 | 7.031 | 8.796 |
| ADL-score | 0.473 | 0.370 | 0.541 |
| Disease | 0.763 | 0.765 | 0.762 |
| BMI | 25.731 | 28.808 | 23.930 |
| Life satisfaction | 0.877 | 0.897 | 0.864 |
| Smoking | 0.308 | 0.293 | 0.321 |
| Physical Exercise | 0.498 | 0.495 | 0.500 |
| **N** | 66,657 | 26,339 | 40,318 |

Notes: the proportion of receiving all pensions here is based on all samples that include those who do not enroll in the respective pension scheme.
Sources: China Health and Retirement Longitudinal Study, 2011, 2013, 2015, and 2018 waves (Individual-level).

Figures A 5- A 10 illustrate the probability of individuals receiving either a public pension (UEBPS/NRPS) or a private pension (Occupational Annuity) at different ages, stratified by gender and region. The distinct upward jumps at specific pension claiming ages are evident in the figures, notably at 60 years old for males and 50/55 years old for females in urban China, and universally at 60 years old in rural China. These graphical representations provide a visual description of the age-related patterns in pension enrollment, emphasizing gender and regional differences in pension participation and the importance of critical ages.

Moreover, Figure 4 plots mean health outcomes (self-reported health - binary, CES-D score, the ADL scale, and the probability of disease), as well as healthcare use (inpatient and outpatient utilization and spending) for urban (urban hukou) and rural (rural hukou) residents. The figure reveals a clear urban–rural split: urban residents report better health on average, while using more healthcare and spending more on both inpatient and outpatient services.

**Figure 4 Urban-rural Split in Health and Healthcare Utilization**




Sources: China Health and Retirement Longitudinal Study, 2011, 2013, 2015, and 2018 waves.

# Empirical Specification

## 1.7 Fuzzy Regression Discontinuity Design (FRDD)

Eligibility to claim a New Rural Pension Scheme (NRPS) pension is contingent upon reaching specific state pension ages, set at 60 for all enrollees who are 16 and over and with rural hukou, 60 for male employees that enroll in the Urban Employee Pension Scheme (UEPS) or the Public Employee Pension Scheme (PEPS), 50 or 55 years for female employees that enroll in UEPS and those with PEPS respectively in urban China. Moreover, the state pension age for the Urban Residents Pension Scheme (URPS) is also 60 for all enrollees in urban areas. Regarding estimates for private pension, we only consider the impact of "occupational annuity" as this pension is compulsorily offered to those who enroll in PEPS by their employer[29]. To address potential manipulation around the age cut-off for each pension scheme, we conduct a continuity test following the approach of Cattaneo et al. (2020), employing local polynomial density estimators. The results, presented in Figure A 13, do not reject the null hypothesis of continuity in the density function.

These age discontinuities serve as logical instruments, justifying the application of a non-parametric fuzzy regression discontinuity design (RDD) for our estimations. To determine the appropriate bandwidth for the kernel function, we adopt a data-driven approach as proposed by Calonico et al. (2014, 2017). We use Mean Squared Error (MSE)-optimal bandwidth selectors, one below and one above the cutoff point. Additionally, we use a robust variance estimator or cluster at the individual level to address the correlation of error terms across consecutive waves for each individual.

The RDD framework allows for the estimation of the causal effect of receiving a pension on health-related outcomes among individuals at the state pension age. By contrasting outcomes for individuals immediately above and below the age cutoff, while accounting for other pertinent factors. The local average treatment effect is then

[29] For enrollees in private individual pension insurance, the ability to claim a private pension depends on reaching the state pension age for the public pension scheme.

obtained as a local Wald ratio, given by the jump in the outcome at the cutoff divided by the jump in the probability of receiving a pension. The fundamental equation guiding our analysis is as follows:

$$\tau_{\mathrm{FRD}} = \frac{\lim_{\varepsilon\downarrow 0} \mathrm{E}[\mathrm{HDV_{it}}|\mathrm{AGE_{it}}=0+\varepsilon] - \lim_{\varepsilon\uparrow 0} \mathrm{E}[\mathrm{HDV_{it}}|\mathrm{AGE_{it}}=0+\varepsilon]}{\lim_{\varepsilon\downarrow 0} \mathrm{E}[\mathrm{Pension_{it}}|\mathrm{AGE_{it}}=0+\varepsilon] - \lim_{\varepsilon\uparrow 0} \mathrm{E}[\mathrm{Pension_{it}}|\mathrm{AGE_{it}}=0+\varepsilon]} \quad (1)$$

where $AGE_{it}$ is the normalized age. $Pension_{it}$ is a binary variable equal to one if individual "*i*" received public pension or private pension at calendar date "*t*", and zero otherwise. $HDV_{it}$ represents the various explanatory variables that drive the outcome variables - health service utilization, healthcare expenditure (inpatient/outpatient/dental out-of-pocket/total expenses), health-related variables, household income, and household expenditure. $\tau_{FRD}$ is the local Wald ratio for a fuzzy regression discontinuity design. In our context, it is the average change in the abovementioned dependent variables for those who received a pension exactly at the state retirement age (SRA)/state pension age (SPA)[30].

A valid fuzzy RD design relies on two main assumptions (Imbens and Lemieux, 2008). The first assumption requires that the probability of receiving a pension is discontinuous at the SRA/SPA:

$$\lim_{\varepsilon\downarrow 0} Pr[Pension_{it} = 1|AGE_{it} = 0 + \varepsilon] \neq \lim_{\varepsilon\uparrow 0} Pr[Pension_{it} = 1|AGE_{it} = 0 + \varepsilon] \quad (2)$$

This assumption is visually supported in Figures A 5-A 10 for each pension scheme, which show pronounced increases in pension receipt at the mandatory ages of 50, 55, or 60, depending on gender and pension type. The second assumption of the fuzzy RD design requires that potential outcomes evolve smoothly with respect to the running variable around the cutoff. In the absence of treatment (i.e., receiving a pension), there should be no discontinuous shifts in outcome variables at the threshold.

[30] In the joint household-level analysis (Section 7.3.2), $Pension_{it}$ is total NRPS benefits refer to the sum received by both spouses in rural NRPS-enrolled households. $\mathrm{AGE_{it}}$ incorporates flexible functions of the spouses' maximum age.

This implies that no other institutional or behavioral changes should coincide with the cutoff age (Hahn et al., 2001). To verify this, we examine whether predetermined covariates, such as educational attainment, marital status, household size, and health insurance coverage, change discontinuously at the full or statutory pension age across pension schemes (see Figures A 11- A 12 and Table A 2). We find no evidence of significant shifts, thereby supporting the validity of this identifying assumption.

As for dependent variables concerning healthcare expenditure (inpatient/outpatient/dental), we use untransformed out-of-pocket medical expenses. Mullahy and Norton (2024) demonstrate that, even when dependent variables are non-negative, exhibit right-skewed distributions, and contain a substantial probability mass at zero, estimates using untransformed dependent variables produce unbiased marginal effects. They find that applying log or inverse hyperbolic sine transformations to the dependent variable in such cases leads to biased estimates. Therefore, our main analysis also employs out-of-pocket medical expenditures in levels (including zeros) as the dependent variable, aligning with the methodology of Lovenheim and Yun (2025) in estimating the effects on healthcare out-of-pocket expenditures.

### 1.8 Difference-in-differences

As a robustness check for our RD estimates, we use a two-way fixed effect difference-in-differences estimator to exploit the expansion of NRPS between 2011 and 2013. We use the 2011 and 2013 CHARLS waves, which span the nationwide expansion of NRPS. The regression for this reform is as follows:

$$Y_{ict} = \alpha + \beta_1 Treat_c \times Post_t + \theta X_{ict} + \mu_t + \gamma_i + \varepsilon_{ict} \quad (3)$$

where, $Y_{ict}$ is a series of outcomes, such as household income, inpatient visit, inpatient expenditure, outpatient visit, and outpatient expenditure of individual "*i*" in county "*c*" and year "*t*". In equation (3), $Treat_c$ = 1 if county "*c*" is treatment group. $Post_t$ = 1 if "*t*" represents 2013 wave. In $X_{ict}$, we control for individual-level and household-level characteristics such as age, marital status, employment status, self-reported health status, educational level, intra-family transfer from children, intra-family transfer to

children, and household size. Then we control for individual fixed effects, $\gamma_i$, and time fixed effects, $\mu_t$. It is noteworthy that our analyses focus on non-movers. Therefore, county fixed effects are absorbed by individual fixed effects. $\varepsilon_{ict}$ is the residual term. Moreover, all standard errors are clustered at the county level.

The official records on the exact timing of NRPS implementation and county identifiers are unavailable in CHARLS. However, the 2011 Community Survey in CHARLS includes a question, answered by the community/village committee office, on whether their community or village had introduced NRPS, while by 2013, NRPS had been implemented nationwide. Thus, counties without NRPS in 2011 serve as the treatment group. Therefore, a two-period DD is allowed to estimate the effects of NRPS implementation. To strengthen DD identification, following Shan and Park (2023), we define NRPS availability at the county level based on self-reported enrollment and classify a county as covered by NRPS if at least five respondents report enrollment, restricting the sample to counties with at least 20 adult agricultural hukou holders. We then apply the DD approach using this treatment group to do a robustness check and examine whether the estimates are similar to our baseline results.

Following the identification strategy of studying the implementation of NRPS, we next exploit the "2014 Rural Pension Reform" (the integration of NRPS and URPS) as a test of the entitlement/portability channel implied by the urban–rural pension split using the CHARLS 2011, 2013, 2015, and 2018 waves. We only focus on those rural people with rural hukou (pensioners/non-pensioners) and have NRPS as the treatment group. In addition, NRPS enrollment status is self-reported by respondents in the CHARLS data; this may be subject to self-selection and measurement error issues. Therefore, this analysis uses a difference-in-differences approach with an instrumental variable[31] to solve this problem. For this part, the analysis separately estimates the

[31] This instrument is recorded in "2011 Community Survey" of 2011 wave of CHARLS data. Specifically, this survey question asks respondents whether their county/village had introduced the NRPS. Moreover, NRPS was implemented nationwide in August 2012. Thus, regions that had not introduced NRPS by the 2011 wave can serve as the treatment group. The interaction between this treatment group dummy and the year dummy (indicating whether the data is from the 2013 wave) serves as our instrumental variable, affects NRPS enrollment rate exogeneously. This instrument affects household

effect of this reform on the treatment group in rural and urban areas. The equation of this reform is as follows:

$$NRPS_{ict} = \alpha + \beta_2 Instrument_{ct} + \theta X'_{ict} + \mu_t + \gamma_i + \varepsilon_{ict} \quad (4)$$

$$Y'_{ict} = \alpha + \beta_3 \widehat{NRPS}_{ic} \times Post2014_t + \theta X'_{ict} + \mu_t + \gamma_i + \varepsilon_{ict} \quad (5)$$

where $Instrument_{ct}$ is the interaction of the NRPS placement region dummy and 2013 wave dummy[32]. $NRPS_{ct}$ represents self-reported NRPS enrollment status of individual "*i*" in county "*c*" and year "*t*". $Y'_{ict}$ is the relative outcome of individual "*i*" in county "*c*" and year "*t*". This analysis mainly focuses on household income, inpatient visits, inpatient expenditure, outpatient visits, and outpatient expenditure. In the equation, $\widehat{NRPS}_{ict}$ represents predicted NRPS enrollment rate. $Post2014_t$ = 1 if "*t*" represents whether it is after 2014 reform (here is 2015 and 2018 waves). $X'_{ict}$ controls same variables like $X_{ict}$. Then we control for individual fixed effects, $\gamma_i$, and time fixed effect, $\mu_t$. $\varepsilon_{ict}$ is the residual term. Moreover, all standard errors are clustered at the county level.

## Results

Before estimating the impact of pension receipt on health outcomes, this study first examines how reaching the state pension age affects the probability of receiving a pension. Accounting for access to public health insurance, educational level, marital status, household size, year dummies, and county dummies, we use month-level age as the running variable and ascertain the local average effect of exceeding the state pension age on the probability of pension receipt, categorized by pension type, gender, and

income/health outcome only though its impact on NRPS participation, thereby satisfying the exclusion restriction assumption.

[32] We assess the validity of the instrumental variable. A valid instrument should exhibit sufficient relevance, typically assessed by an F-statistic exceeding the conventional threshold of 10 (Stock et al., 2002). As reported in Table A 14, the first-stage F-statistics for rural and urban residents are 30.21 and 12.47.

region within a specific age bandwidth. We conduct analysis and report estimates using a non-parametric Regression Discontinuity Design (RDD) approach.

Table B 1 delineates that surpassing the specified state pension age—60 for males, 60 for females enrolled in the Basic Residents Pension Scheme (BRPS), inclusive of the New Rural Pension Scheme (NRPS) and Urban Residents Pension Scheme (URPS), 55 for female public servants, and 50 for other female workers in urban areas; 60 for all individuals in rural areas—significantly increases the likelihood of claiming both public and private pensions for both genders. Moreover, these positive effects are statistically significant in both urban and rural China. These findings underscore the robustness of the state pension age cutoff as a compelling instrument for estimating the impact of pension payments on health-related outcomes. However, the eligibility age exhibits no significant effect on the receipt of private pension among rural residents with rural hukou.

## 1.9 Pension Receipt and Health Outcomes among Urban Residents

### 1.9.1 *Urban Public Pension Receipt and Health Outcomes among Urban Residents*

Table 6.1-1 reports the effects of receiving different public pension schemes on healthcare service utilization, healthcare costs, health, and health-related behaviors, segmented by residence region (urban/rural), hukou type, and gender, respectively. In urban settings, three public pension schemes coexist: the Urban Employee Pension Scheme (UEPS), the Public Employee Pension Scheme (PEPS), and the Urban Basic Residents Pension Scheme (URPS). For a larger sample size, given the same urban mandatory retirement policy, we combine the first two schemes as the Urban Employee Basic Pension Scheme (UEBPS). For urban residents, it is clear that URPS does not affect the likelihood of hospitalization visits and inpatient healthcare costs. Similarly, such effects are not statistically significant among UEBPS enrollees, while receipt of UEBPS significantly increases the probability for preventive care (physical check-up or consultation). Moreover, the receipt of UEBPS/URPS has an insignificant impact on out-of-pocket medical expenditures, including inpatient, outpatient, and dental expenses.

It is worth noting that receiving UEBPS has positive effects on health-related indicators of urban males, as Figure A 15 shows, especially on the self-reported health status (SRH), while it decreases the CES-D scale and ADL-score[33]. This means receipt of UEBPS improves the health status (both physical health and mental health) of urban male enrollees. This can be attributed to two reasons: firstly, receiving UEBPS means retirement, which allows individuals to spend more on leisure because they exit from the labor market, thereby enhancing their overall health status; second, those retired from UEBPS pay more attention to physical check-ups and consultations, which shows that they concentrate on their health and prevent them from suffering from diseases. However, both pension schemes have no pronounced impact on the health of urban females. This is because females normally retire at around 50/55. Nevertheless, at this stage, their husbands are basically still working as the male mandatory retirement age is 60. This means that wives need to spend time on their post-retirement life alone, with no significant mental health effects from retirement. Moreover, URPS demonstrates no statistically significant effects on any healthcare service for both urban males and females.

[33] As Table A12 in the appendix, the baseline level of SRH, CES-D scale,and ADL-score are 2.7, 5.3, and 0.29, respectively.

## Table 1.9-1: Effects of Receiving Public Pension Scheme in Urban Areas by Pension Type

| Dependent variable | Male | | | | Female | | | |
|---|---|---|---|---|---|---|---|---|
| | UEBPS | | URPS | | UEBPS | | URPS | |
| | Conventional | Robust | Conventional | Robust | Conventional | Robust | Conventional | Robust |
| Inpatient visit | 0.203 | 0.232 | -0.109 | -0.130 | 0.073 | 0.079 | 0.207 | 0.246 |
| | (0.154) | (0.176) | (0.268) | (0.268) | (0.113) | (0.128) | (0.310) | (0.354) |
| Outpatient visit | -0.104 | -0.134 | 0.173 | 0.249 | -0.105 | -0.144 | 0.152 | 0.166 |
| | (0.134) | (0.154) | (0.343) | (0.396) | (0.149) | (0.176) | (0.341) | (0.380) |
| Chinese Medical Hospital Visit | -0.014 | -0.025 | 0.003 | -0.004 | 0.019 | 0.025 | 0.288 | 0.313 |
| | (0.054) | (0.059) | (0.081) | (0.086) | (0.038) | (0.043) | (0.201) | (0.220) |
| Dental visit | -0.284 | -0.262 | -0.110 | -0.175 | -0.148 | -0.248 | -0.296 | -0.397 |
| | (0.328) | (0.328) | (0.030) | (0.345) | (0.477) | (0.545) | (0.454) | (0.502) |
| Inpatient out-of-pocket cost | 499.54 | 594.32 | 254.09 | 381.33 | -72.21 | -189.77 | 767 | 955.56 |
| | (457.73) | (524.29) | (796.11) | (848.05) | (437.43) | (502.58) | (1073.3) | (1248.5) |
| Outpatient out-of-pocket cost | -25.006 | -33.305 | 18.152 | 41.423 | -59.061 | -60.378 | 69.723 | 42.02 |
| | (52.884) | (61.233) | (158.24) | (182.9) | (76.932) | (89.974) | (140) | (159.86) |
| Dental out-of-pocket cost | -91.751 | -90.448 | -60.91 | -75.348 | 162.34 | 168.64 | 65.715 | 49.501 |
| | (83.262) | (93.503) | (153.7) | (177.61) | (106.33) | (115.85) | (259.74) | (307.66) |
| Physical Check-up/Consultation | 0.669** | 0.747** | 0.206 | 0.132 | -0.217 | -0.284 | 0.184 | 0.256 |
| | (0.340) | (0.380) | (0.448) | (0.507) | (0.507) | (0.569) | (0.756) | (0.869) |
| Self-reported health | -0.704* | -0.856** | -1.878 | -2.084 | -0.101 | -0.124 | -0.304 | -0.412 |
| (1=very good, 5=very poor) | (0.304) | (0.090) | (1.224) | (1.362) | (0.418) | (0.418) | (0.826) | (0.937) |
| Binary SRH | 0.361** | 0.415** | 0.268 | 0.336 | 0.183 | 0.207 | -0.268 | -0.243 |
| | (0.169) | (0.193) | (0.415) | (0.468) | (0.136) | (0.155) | (0.326) | (0.363) |
| Mental Health (CES-D) | -4.015** | -4.696** | -9.782 | -11.524* | -2.027 | -1.716 | -1.755 | -2.680 |
| | (1.926) | (2.210) | (6.419) | (6.919) | (2.497) | (2.844) | (4.787) | (5.445) |
| ADL-Score | -0.848*** | -0.928*** | -0.124 | -0.293 | -0.061 | -0.027 | -0.216 | -0.386 |
| | (0.325) | (0.347) | (0.618) | (0.728) | (0.102) | (0.117) | (0.661) | (0.729) |
| Disease | 0.230 | 0.284 | -0.123 | -0.219 | -0.444** | -0.556** | 0.062 | 0.087 |
| | (0.158) | (0.177) | (0.312) | (0.372) | (0.227) | (0.261) | (0.344) | (0.388) |
| Life Satisfaction | 0.132 | 0.189 | -0.192 | -0.168 | 0.115 | 0.099 | -0.274 | -0.319 |
| | (0.104) | (0.117) | (0.145) | (0.163) | (0.149) | (0.174) | (0.299) | (0.334) |
| Physical Exercise | -0.052 | -0.101 | 0.498 | -0.212 | -0.162 | -0.184 | 0.295 | 0.393 |
| | (0.159) | (0.180) | (0.858) | (0.289) | (0.191) | (0.224) | (0.423) | (0.486) |
| Smoking | 0.299 | 0.334 | 0.155 | 0.323 | 0.039 | 0.033 | -0.195 | -0.212 |
| | (0.187) | (0.212) | (0.360) | (0.451) | (0.048) | (0.056) | (0.210) | (0.237) |
| BMI | 1.126 | 1.375 | 1.139 | 1.171 | 0.734 | 2.268 | -1.849 | -3.915 |
| | (2.584) | (2.999) | (4.603) | (5.261) | (7.520) | (0.270) | (10.078) | (11.982) |
| Private Health Insurance | -0.099 | -0.118 | 0.368* | 0.416* | -0.175 | -0.218 | -0.297 | -0.287 |
| | (0.093) | (0.107) | (0.209) | (0.225) | (0.142) | (0.163) | (0.207) | (0.233) |
| Covariates | YES | YES | YES | YES | YES | YES | YES | YES |
| Observations | 1356 | 1356 | 434 | 434 | 1146 | 1146 | 521 | 521 |

Notes: *** p<0.01, ** p<0.05, * p<0.1. As for the estimate for the urban area, we restrict the sample to people living in an urban area with urban hukou, while the sample is restricted to those living in a rural area and with rural hukou for the estimate for the rural area. "Conventional" refers to estimates using conventional coefficient and variance estimators, and "Robust" refers to estimates using robust variance estimators. Controls include size of household, marital status, education, public health insurance access, county dummy, year dummy, and month dummy.

Sources: China Health and Retirement Longitudinal Study, 2011, 2013, 2015, and 2018 waves.

### *1.9.2 Private Pension and Health Outcomes among Urban Residents*

#### *1.9.2.1 Urban Private Pension Receipt and Health Service Utilization*

In general, the private pension includes enterprise annuity from firms, occupational annuity from the government and public institutions, commercial pension, and life insurance pension in our basic estimates. However, we primarily estimate the effects of receiving an occupational annuity for PEPS enrollees because this private pension is mandatorily offered by the employer. Moreover, those who expect to claim private pension payments should reach the state pension age for the specific public pension scheme.

In general, as Table A 31 shows, the receipt of a private pension has no significant effects on medical service utilization and related expenses. Specifically, the receipt of occupational annuity from the Public Employee Pension Scheme (PEPS) does not affect healthcare utilization. This could potentially be attributed to the income effect resulting from supplementary occupational annuity, which may positively impact the health status of this group. Consequently, the reduced demand for healthcare services among individuals benefiting from occupational annuity could be attributed to their overall improved health status.

#### *1.9.2.2 Urban Private Pension Receipt, Health, and Health-related Behaviors*

As Table A 32 reports, we investigate the effects of receiving a private pension (occupational annuity) among those enrolled in the Public Employee Pension Scheme (PEPS) by gender.

Specifically, the receipt of occupational annuity significantly improves self-reported health and mental health, with a smaller impact on Activities of Daily Living (ADL) scales for those who enrolled in the Private Enterprise Pension Scheme (PEPS). However, these effects are pronounced among urban males. Moreover, private pension payments contribute to higher life satisfaction, though these effects are significant only among urban male pensioners. Occupational annuities serve as a generous supplement

to PEPS, primarily benefiting retirees from government and institutional sectors, potentially generating substantial income effects on health and well-being.

To further assess the income effect of private pensions on urban male PEPS enrollees, we employ a fuzzy RDD approach to estimate the impact of private pension amounts on health outcomes. Since private pension payments for PEPS enrollees are typically zero before age 60 but become available upon reaching this threshold, we observe a discrete increase at age 60, as illustrated in Figure A 21. As reported in Table A 25, an increase in private pension payments significantly improves mental health (reducing CES-D scores) and physical health (lowering ADL scores) among urban males, whereas no significant effects are observed for urban female PEPS enrollees.

### 1.10 Rural Pension Receipt and Health Outcomes among Rural Residents

As shown in Table 6.2-1, using a non-parametric fuzzy RDD approach, receiving NRPS affects healthcare utilization among rural residents, with a positive effect for male enrollees, as illustrated in Figure A 16. Specifically, for rural residents, receiving NRPS significantly increases inpatient and outpatient visits and corresponding expenses. Moreover, receiving NRPS significantly increases out-of-pocket inpatient expenses among rural males. However, effects are less significant among rural migrants as Table B 2 presents in Appendix B.

However, no effects are found on dental and Chinese medical hospital visits. Similarly, in urban areas, receipt of NRPS also increases the probability of visiting inpatient care, while no effect is observed for other healthcare utilization and health status.

Moreover, receiving NRPS has no significant effect on overall health status, particularly self-reported health and mental well-being, for both male and female beneficiaries. However, the receipt of NRPS reduces the likelihood of disease occurrence among male enrollees. This means NRPS does lead to improvements in physical health. This effect may be attributed to NRPS increasing healthcare utilization among male enrollees.

In addition, Table B 17 presents the effects of receiving NRPS on the probability of consuming different types of medicines, referred to as “self-treatment,” separately for males and females. The results indicate that NRPS does not increase medication consumption among males. However, for females, receiving NRPS significantly raises their likelihood of consuming prescription medicines and traditional herbal remedies. This suggests that women are more inclined to engage in self-treatment rather than seeking medical care in hospitals. Consequently, this explains the previously observed insignificant effects of NRPS on healthcare utilization among females.

**Table 1.10-1: Effects of Receiving New Rural Pension Scheme in Rural Areas**

| Dependent variable | All | | Male | | Female | |
|---|---|---|---|---|---|---|
| | NRPS | | NRPS | | NRPS | |
| | Conventional | Robust | Conventional | Robust | Conventional | Robust |
| Inpatient visit | 0.078* | 0.090** | 0.201* | 0.261** | 0.061 | 0.086 |
| | (0.040) | (0.044) | (0.106) | (0.118) | (0.073) | (0.084) |
| Inpatient Times | 0.173* | 0.208* | 0.530* | 0.689** | 0.019 | 0.036 |
| | (0.103) | (0.112) | (0.282) | (0.317) | (0.105) | (0.116) |
| Outpatient visit | 0.061 | 0.088 | 0.259* | 0.337** | -0.013 | -0.001 |
| | (0.053) | (0.059) | (0.143) | (0.158) | (0.089) | (0.099) |
| Outpatient Times | 0.470* | 0.643** | 1.266 | 1.625* | 0.058 | 0.134 |
| | (0.272) | (0.309) | (0.789) | (0.879) | (0.246) | (0.275) |
| Chinese Medical Hospital Visit | 0.008 | 0.011 | -0.002 | -0.007 | 0.014 | 0.024 |
| | (0.011) | (0.012) | (0.025) | (0.028) | (0.019) | (0.021) |
| Dental visit | 0.034 | 0.036 | -0.079 | -0.097 | 0.138* | 0.165* |
| | (0.055) | (0.063) | (0.090) | (0.102) | (0.081) | (0.091) |
| Inpatient out-of-pocket cost | 231.91* | 318.41** | 994.61* | 1393.7** | 76.742 | 129.56 |
| | (140.57) | (158.27) | (539.86) | (603.46) | (187.23) | (213.34) |
| Outpatient out-of-pocket cost | 14.751 | 20.1 | 38.577 | 45.721 | -9.888 | -15.582 |
| | (29.465) | (33.13) | (73.105) | (81.376) | (45.993) | (52.385) |
| Dental out-of-pocket cost | 18.671 | 22.843 | -14.624 | -18.429 | 76.041 | 95.26 |
| | (38.665) | (42.907) | (60.39) | (67.783) | (72.829) | (79.598) |
| Physical Check-up/Consultation | 0.036 | 0.059 | 0.171 | 0.251* | -0.072 | -0.078 |
| | (0.114) | (0.127) | (0.133) | (0.150) | (0.127) | (0.146) |
| Self-reported health | -0.006 | -0.010 | 0.078 | 0.117 | -0.047 | -0.065 |
| | (0.069) | (0.069) | (0.166) | (0.186) | (0.099 | (0.099) |
| Mental Health (CES-D) | 0.765 | 0.868 | -0.604 | -0.935 | 1.712 | 2.211 |
| | (1.214) | (1.345) | (1.779) | (1.978) | (1.299) | (1.425) |
| ADL-Score | -0.003 | 0.0001 | 0.037 | 0.579 | -0.096 | -0.099 |
| | (0.124) | (0.143) | (0.219) | (0.247) | (0.228) | (0.260) |
| Disease | 0.009 | 0.005 | -0.179* | -0.249** | 0.155* | 0.193* |
| | (0.058) | (0.065) | (0.110) | (0.122) | (0.091) | (0.101) |
| Life Satisfaction | 0.021 | 0.020 | -0.019* | -0.272** | 0.123 | 0.167* |
| | (0.057) | (0.065) | (0.110) | (0.122) | (0.076) | (0.087) |
| Physical Exercise | -0.007 | -0.016 | 0.217 | 0.266* | -0.125 | -0.166 |
| | (0.098) | (0.107) | (0.144) | (0.159) | (0.109) | (0.121) |
| Smoking | -0.057 | -0.070 | -0.118 | -0.135 | 0.021 | 0.020 |
| | (0.089) | (0.098) | (0.136) | (0.151) | (0.036) | (0.040) |
| BMI | 1.127 | 1.208 | 3.428 | 3.979 | 0.139 | 0.265 |
| | (3.358) | (3.790) | (2.711) | (3.106) | (6.113) | (6.802) |
| Private Health Insurance | 0.014 | 0.018 | -0.007 | -0.017 | 0.014 | 0.020 |
| | (0.017) | (0.019) | (0.073) | (0.081) | (0.027) | (0.029) |
| Covariates | YES | YES | YES | YES | YES | YES |
| Observations | 15,590 | 15,590 | 4556 | 4556 | 11,034 | 11,034 |

Notes: *** p<0.01, ** p<0.05, * p<0.1. As for the estimate for the urban area, we restrict the sample to people living in an urban area with urban hukou, while the sample is restricted to those living in a rural area and with rural hukou for the estimate for rural areas. "Conventional" refers to estimates using conventional coefficient and variance estimators, and "Robust" refers to estimates using robust variance estimators. Controls include household size, marital status, education, access to public health insurance, county dummy, year dummy, and month dummy.
Sources: China Health and Retirement Longitudinal Study, 2011, 2013, 2015, and 2018 waves.

## 1.11 Hukou Relaxation of Rural-Urban Pension Entitlement

This section uses the "2014 Rural Pension Reform" (integration of NRPS and URPS) as a policy test of the portability channel embedded in China's urban–rural pension segmentation. While our estimates show that the reform did not increase benefit levels for existing NRPS pensioners, it may still affect rural non-pensioners by relaxing location-based enrollment and claiming restrictions on pension, thereby driving migration, labor-market behavior, and welfare-relevant outcomes. A potential concern is that a nationwide hukou reform announced in July 2014 may confound estimates of labor-market responses. Appendix A.3.2 discusses this issue and shows that our results are not to be driven by concurrent hukou-policy changes.

### *1.11.1 Effects of Integration of NRPS and URPS on Rural Old Residents*

First, we examine the impact of the 2014 Rural Pension Reform on NRPS beneficiaries aged 60 and above. Using a two-way fixed effects DID approach and applying an instrumental variable to solve endogeneity of the treatment group proposed by Ye et al. (2022), Table B 3 presents the effects of the integration of the NRPS and URPS on household income, inpatient visit, outpatient visit, and the probability of illness among rural enrollees aged 60 and over, disaggregated by region.

For rural residents living in rural China, the integration has no significant effect on household income or healthcare utilization. This may be due to the limited impact of integration on income for NRPS and URPS participants. This finding is also consistent with Figures A 2 and A 3 in Appendix A.2, which show the average pension benefits of NRPS and URPS. This finding indicates that removing hukou restrictions on social pension eligibility provides limited benefits to rural residents, as evidenced by the modest increase in pension benefits received by rural NRPS enrollees.

### *1.11.2 2014 Rural Pension Reform and Labor Market Effects of Rural Workers*

In China, rural migrants are generally classified into two groups: "rural migrant workers" and the broader "floating population". According to the National Bureau of Statistics, rural migrant workers are defined as individuals with rural hukou who engage in non-agricultural employment or who work outside their home township for more than 180 days per year. As the CHARLS dataset does not capture the full floating population, we focus exclusively on the non-agricultural employment of rural migrants.

To measure migration, this paper follows the approach of Gao et al. (2021) and constructs a migration dummy indicating whether respondents changed their permanent address (across village/neighborhood, county, city, or province) between CHARLS waves. Given the removal of rural-urban distinctions in pension access and benefit eligibility, the analysis focuses specifically on rural-to-urban migration. Accordingly, rural-to-urban migration is defined as a change in permanent address from a rural area to an urban area.

Table A 26 presents the estimated effects of the 2014 Rural Pension Reform on labor market outcomes among middle-aged rural individuals aged 40-59. The reform significantly increased non-agricultural employment by 8.35 percentage points, and raised annual non-agricultural working hours by approximately 140 hours, and increased rural-to-urban migration by 2.77 percentage points. These findings are consistent with a portability mechanism for pension entitlement: relaxing hukou-based restrictions on pension enrollment and benefit claiming reduced institutional barriers to migration and encouraged rural workers to relocate to urban areas for employment and residence.

### *1.11.3 Health Effects of 2014 Rural Pension Reform*

Table A 27 presents the effects of the 2014 Rural Pension Reform on mental health of rural residents below 60, measured by the CES-D score and the likelihood of depression (CES-D score $\geqslant$10). The results indicate that the reform significantly reduced both the CES-D score and the probability of being classified as depressed, with both effects statistically significant at the 5% level. These findings suggest that the

integration of NRPS and URPS contributed to improved mental health among rural residents.

One likely mechanism is that reducing hukou-based institutional barriers to pension entitlement and improving perceived portability may enhance individuals' ' sense of security about future access to social benefits. Furthermore, the reform led to increased non-agricultural employment, thereby fostering greater social interaction and self-worth. Therefore, these psychological gains are attributed to improved perceived security, future pension expectations, and economic opportunities.

## Mechanisms Underlying the Health Effects of Pension Receipt

In our setting, we follow Grossman's (1972) health capital framework and assume a simple health production function in which health is produced by medical care and leisure time. Building on this, we specify a household utility function that is based on a time allocation structure, where individuals divide a fixed time endowment between market work, home production (such as grandchild care), and leisure, following the household production and time-use framework of Becker (1965, 1981). In urban China, changes in this time allocation are driven by mandatory retirement rules, and these changes in turn affect health outcomes.

For rural China, we use a simple collective household model based on the theory of altruistic families and collective household behavior, in which household decisions are Pareto efficient and can be represented as a weighted sum of individual utilities (Becker, 1981; Bourguignon and Chiappori, 1992). The assumption that rural households behave in this collective and altruistic way is supported by evidence for rural China in Carlsson et al. (2012, 2013). Since there is no mandatory retirement in rural areas, we assume that NRPS affects health mainly through an income channel. The detailed utility function model and proofs are presented in Appendix C.

## 1.12 Mechanisms of UEBPS Under the Urban Setting

### *1.12.1 Public Pension Receipt and Household Income and Consumption*

Normally, a drop in household income is expected when one member of the couple retires from UEBPS, as pension income is some proportion of their previous working wage. Therefore, a decrease in household income may result in a corresponding modification in household consumption. This assumption is for employees in urban areas who are required to retire mandatorily when they reach state pension age. To evaluate the impact of pension payments on household income and expenditure, we focus on husbands' decision-making in urban households, where financial choices are mainly determined by husbands.

Figures B 2–B 3 show a pronounced drop in household income at the retirement age for UEPS households but not for PEPS households. Consistent with this visual evidence, Table B 7 reports the effects of husbands' UEBPS receipt on household income in urban China. Specifically, the retirements of husbands who participate in UEPS significantly decrease household income at 5% significance level, while no effect is found among those claiming PEPS. This is because, in China, the wage and pension benefits of those enrolled in the latter are much higher than those of the former.

Moreover, Table B 9 shows the effects of receiving a public pension on household expenditure in urban areas. Overall, in urban areas, receiving UEBPS (UEPS and PEPS) results in a decrease in the total household non-food expenditure. However, no effects are pronounced on household food and smoking expenditures when husbands retire.

We further estimate whether UEBPS receipt affects intergenerational financial transfers, which could indirectly influence household resources and health outcomes. We find no increase in financial support from adult children among UEBPS retirees, indicating that pension income primarily substitutes for private transfers (see Table B 6). This suggests that the estimated health effects operate through pension income and time allocation rather than through changes in intergenerational support (see Appendix B.2.2).

### *1.12.2 Retirement-Induced Leisure Time Allocation*

In practice, claiming a pension makes retirees reallocate their leisure time as their working time decreases dramatically. Therefore, this may impact their post-retirement behaviors, especially their involvement in social activities. Engagement in activities and social interaction impacts the health status of old people (Sirven and Debrand, 2008; Eibich, 2015), can reduce the risk of depression (Wang et al, 2022), and improve physical health (Humphreys et al, 2014) among the elderly.

To verify the mediator of social activities, following some papers that explore the impact mechanism (Chen et al., 2020; Goodman-Bacon, 2021), our paper estimates the effect of receiving a public pension on health and then explores the causal impact of receiving a public pension on social activities involvement. Using a fuzzy RDD method, Table B 11 shows the effects of receiving UEBPS on various social activities in urban China by gender.

Overall, for urban residents (with urban hukou), receiving UEBPS significantly increases the probability of participating in social activities (especially exercise) for males. This means that health improvements from the UEBPS receipt, as proved in previous estimates, are partly through involvement in social activities. The mediating analysis in Table A 11 also proves this finding. However, no effects are significant on the social activities of urban females, though their probability of caring for sick and disabled people increases when they receive UEBPS. This also occupies their leisure time for fun, which is why no significant improvement in health among urban females.

In addition, we document a spousal spillover in urban areas: husbands' receipt of UEBPS improved wives' mental health (see Table B 4). This pattern is consistent with changes in household time allocation and social interaction after retirement. Detailed estimates and explanations are reported in Appendix B.2.1.

### *1.12.3 Grandparental Care Responsibility*

In urban China, retired parents often help their adult children by caring for newborn babies or school-age grandchildren. It is also important that many urban

women retire at age 50 or 55, when they are still relatively young and physically able. As a result, they may be particularly likely to take on grandchild care, allowing their adult children to devote more effort to work.

To capture these patterns, we proceed in three steps. First, we examine how parental receipt of UEBPS affects the marriage and fertility outcomes of their adult children. Second, we test whether receiving UEBPS actually increases contact and interaction between older parents and their adult children. Such stories are explained in the following estimates.

After controlling for household size, education, access to public health insurance, county and time dummies, using a non-parametric fuzzy RDD approach, we restrict our sample to married groups and estimate the effects of receiving different public pensions on international care, especially grandchildren's care by gender. As Table B 14 reports, receiving UEBPS (UEPS or PEPS) significantly increases the probability of female pensioners caring for grandchildren, while having no impact on those participating in other pension schemes. This is why no health effects are pronounced among female pensioners, as previous estimates show.

In practice, grandparental childcare is detrimental to grandparents' physical functioning and subjective health (Eibich and Zai, 2024), and mental health (Chen et al., 2025). Moreover, grandparental care crowds out urban female retirees' leisure time, which discourages them from getting involved in social activities. Therefore, retirement from UEBPS does not improve their health.

Table B 15 reports the effects of receipt of different types of public pensions on the marriage rate of the first adult child and the fertility rate of their children. In particular, urban females' receipt of UEBPS significantly increases the marriage rate of the first adult child and the fertility rate of children at the 5% significance level. It is plausible that the retirement of urban female workers allows them to spend time on future grandchild care. Their children would have no worries about the trade-off between work and child care.

Furthermore, Table B 16 shows that receiving UEBPS significantly increases contact between both male and female pensioners with their children in urban areas. This implies that pensioners, especially women, may be more likely to provide grandchild care. Therefore, they meet their children more frequently when they retire or start receiving a pension.

## 1.13 Mechanisms of NRPS in Rural Setting

### *1.13.1 Pure Income Effect*

For NRPS enrollees, since there is no mandatory retirement policy in rural China, the NRPS benefit, as a cash transfer, may increase household income in rural areas, where individuals are typically engaged in agricultural work. Our analyses focus on household-level decisions, reflecting a more collective decision-making structure in rural families (Carlsson et al., 2012 & 2013). Figures B 10–B 11 show that household income rises sharply after age 60 among rural-hukou households residing in rural areas, whereas no increase is observed among rural-hukou households residing in urban areas.

Table B 8 confirms a sizable increase in income at SRA eligibility. NRPS receipt increases household income among poor households by 61% (Panel A), and by 31% among non-poor households (Panel B). This pattern is consistent with the NRPS benefit structure, which includes a basic pension benefit payable from age 60 even in the absence of prior contributions, in addition to any individual-account payments.[34] This increase is economically meaningful given the low baseline income of rural elderly households. The average per capita monthly income of our sample is approximately 300 yuan, with a non-trivial fraction earning less than 55 yuan, implying that NRPS represents a substantial income shock.

[34] The monthly pension benefit from the individual account is equal to "1/139 of total accumulation." The basic social pension benefit was 55 RMB per month before 2014. The Chinese government increased the basic pension benefit to 75 RMB in 2014 and 88 RMB in 2018. As for individual account pension, the NRPS enrollees can choose 100, 200, 300, 400, or 500 RMB as the annual contribution. If a 45-year-old rural enrollee who pays a yearly premium of 300 will receive an accumulated amount of 6047 in their individual account (assuming the yearly return rate equals 1-year deposit rate) and a monthly pension benefit of 98.5 RMB (6047/139+55) at age 60 in 2014 (and 131.5 in 2018).

The above results explain that NRPS improves healthcare use through generous income effects. Furthermore, according to the mediating analysis shown in Table A 12, when including household income into the basic regression, the effect of receipt of NRPS becomes no longer significant. This means NRPS significantly increases the rural males' probability of using healthcare services through pure income effects.

Importantly, we also examine whether NRPS merely replaces private support from adult children. While we observe a modest decline in financial support from adult children, the magnitude of the pension transfer exceeds the reduction in private remittances (Appendix B.2.2, Table B 6). This implies a positive net income effect at the household level, consistent with the income-driven increase in healthcare utilization rather than a reallocation of pre-existing private transfers.

Furthermore, to rule out a retirement-driven time-allocation mechanism, we examine whether NRPS receipt affects social activity engagement, although rural residents are not subject to mandatory retirement. Tables B12 and B13 show no effects for both rural residents and rural migrants covered by NRPS. This supports that NRPS affects health primarily through the income channel rather than through leaving work.

### *1.13.2 Crowding Out Effects and Joint Decision Making in Rural Families*

#### *1.13.2.1 Female Altruism*

Our earlier estimates explored whether husbands' NRPS receipt influenced healthcare use of their wives, while no significant effects were observed. Similarly, while NRPS did not lead to increased hospital visits for rural women, it did encourage greater reliance on their self-treatment. This may imply a gender norm, female altruism within rural households. Altruism plays a vital role in how rural Chinese families support one another financially. Traditional gender roles suppress women's earnings but leave men's incomes largely unaffected, indicating that women may prioritize their family's well-being over their own financial gains (Carlsson et al., 2012&2013). Given these gender differences and the importance of women's altruism within households, we use a two-way fixed-effects DID approach to examine how introducing NRPS

among wives affects their husbands' healthcare use. It is worth noting that we restrict the sample to individuals aged 60 and above, consistent with the NRPS claiming age.

The findings in Table A 15 indicate a crowding-out effect: introducing NRPS increases husbands' likelihood of using outpatient healthcare services by 6.6 pps and raises their out-of-pocket outpatient expenses by 22.4 RMB (3.24 USD) in pilot counties. However, prior estimates suggest that NRPS does not lead to greater hospital-based healthcare use for rural women. This implies that women, driven by altruism, prioritize their husbands' medical needs over their own.

Furthermore, Table A 16 examines the impact of NRPS coverage for husbands and wives on household expenditure separately. The results reveal that introducing NRPS for wives significantly increases household expenditure by 15.3%, whereas NRPS coverage for husbands has no significant effect.

#### *1.13.2.2 Intra-household Decision Making and Healthcare Allocation*

Household economic decisions are usually made jointly, and this collective decision-making tends to be more risk-averse than individual choices (De Palma et al., 2011). While men typically hold greater decision-making authority, women often implement these decisions and gradually gain influence over time. Consequently, individual and joint household decisions differ. In rural married households, couples may allocate their total NRPS benefits to determine healthcare utilization. Given prevailing gender roles, particularly the altruism of women, this subsection employs a fuzzy RDD approach to estimate the effects of household NRPS receipt on healthcare utilization for husbands and wives separately, focusing on married households[35]. Additionally, to isolate individual-level effects, we estimate the impact of NRPS receipt on healthcare utilization among single households by gender.

[35] To analyze household joint decision-making within the fuzzy RDD framework, we define the running variable as the maximum age of the husband and wife. The treatment variable, indicating household NRPS receipt, is assigned a value of "1" if at least one spouse (husband or wife) receives NRPS benefits and "0" otherwise. Figure A 19 illustrates a substantial positive discontinuity in the probability of household NRPS receipt at age 60.

Table A 17 presents the results. Columns (1) and (2) report the effects of NRPS receipt on healthcare utilization for husbands and wives in married households, while columns (3) and (4) examine the effects among single males and females, respectively. The findings indicate that, among married households, NRPS receipt significantly increases the probability of inpatient care utilization for husbands and raises their annual inpatient out-of-pocket expenses by 1,542.6 RMB (roughly 222.8 USD). However, no significant effects are observed for wives, suggesting that women may prioritize their husbands' healthcare over their own. Furthermore, among single-person households, NRPS receipt does not significantly affect healthcare utilization or healthcare expenses for either men or women. These findings suggest that the income effect of NRPS on healthcare utilization primarily arises from household-level financial pooling rather than individual financial constraints.

In practice, the total household NRPS benefits vary based on the pension receipt status of spouses—whether neither, one, or both receive benefits—which depends on their ages. Specifically, if neither spouse has reached the age of 60, household NRPS benefits remain zero. However, once at least one spouse turns 60 and begins receiving payments, total household benefits increase. As a result, there is an observable jump in NRPS benefits at the age threshold of 60 when one member of the couple receives the pension, as Figure A 20 shows. This design allows us to estimate how healthcare utilization responds to changes in household NRPS benefits, capturing the income effect. Specifically, we use an instrumental variable (IV) approach using two-stage least squares (2SLS)[36]. This approach identifies the causal effect of NRPS benefit amounts on inpatient care use, outpatient care use, inpatient out-of-pocket (OOP) expenditures, and outpatient OOP expenditures for husbands and wives separately.

[36] The instrument, a binary indicator for at least one spouse being 60 or older, is valid with a strong first-stage F-statistic of 139 as Table A14D reports, mitigating weak instrument concerns. It also satisfies the exclusion restriction, as prior estimates show no significant health differences between those below and above 60, ensuring healthcare utilization is affected only through NRPS benefits.

As reported in Table A 18, NRPS exhibits a significant income effect only for husbands. Specifically, a 100 RMB increase in annual NRPS benefits raises husbands' annual inpatient OOP expenditures by 14 RMB, implying an income effect of 0.14 for inpatient healthcare spending. Moreover, inpatient and outpatient care utilization increase by 0.007 and 0.008 percentage points, respectively, corresponding to implied income elasticities of 0.40 for inpatient care and 0.34 for outpatient care[37]. In contrast, no significant income effects are observed for wives.

Furthermore, we use CFPS data to estimate the effect of household NRPS receipt on healthcare expenditures by marital status. Unlike CHARLS, which only records out-of-pocket outpatient expenses in the past month, CFPS provides information on total non-hospitalization medical spending and total household out-of-pocket healthcare spending over the past year. This difference in the reference period may lead to variation in the estimated effects of NRPS. The results show that, when a household receives NRPS, rural husbands experience a significant increase of 1,080 RMB (roughly 156 USD) in total non-hospitalization medical expenses, while no significant effect is observed for wives or single-person households. Moreover, NRPS receipt also increases household per capita out-of-pocket medical expenses by 1,076 RMB (roughly 155.4 USD). These findings suggest that NRPS improves healthcare utilization, particularly outpatient care, among husbands, which is consistent with the results obtained using CHARLS data.

## Heterogeneous Effects

Previous estimations indicate that the receipt of public pension significantly affects males, both in urban and rural areas. To check which male group is most impacted, accounting for individual characteristics, the subsequent tables present the

[37] Mean baseline inpatient use, outpatient use, and total annual household NRPS benefits are 0.135, 0.173, and 766.769, respectively. Implied elasticity is calculated as (income effect × mean NRPS benefits) divided by mean inpatient or outpatient use.

effects of receiving the Urban Employee Basic Pension Scheme (UEBPS) and the New Rural Pension Scheme (NRPS) on health service utilization, healthcare expenditure, and health outcomes among male urban and rural residents, categorized by marital status and education level.

As Table B 18 shows, in urban China, receipt of UEBPS significantly enhances self-reported health, physical health (measured by ADL score), and life satisfaction among married and highly educated groups. However, no discernible effects are observed among single individuals or those with low levels of education. Moreover, enrollment in UEBPS reduces the likelihood of outpatient incidents. Notably, married and highly educated individuals are more inclined to undergo physical check-ups, contributing to their improved health during retirement.

As illustrated in Table B 19, receipt of NRPS increases health service utilization (both inpatient and outpatient) and healthcare expenditure (both inpatient and outpatient) among male rural residents. However, these significant effects are predominantly observed among married individuals and those with lower levels of education. This could be attributed to the fact that married and low-educated groups tend to pay less attention to maintaining their health and are more likely to engage in physically demanding occupations, resulting in poorer health statuses and increased demand for healthcare services. Furthermore, NRPS, a cash benefit, has a significant income effect on the demand for healthcare use, especially among NRPS enrollees who are married and low-educated. As Table A 10 and Figure A 14 show, the husband's receipt of NRPS significantly increases the household income of 60+ low-educated groups at the 5% level compared to those below 60 (not eligible for claiming NRPS). Consequently, they frequently seek medical assistance when afflicted with illnesses, benefiting from the additional pension provided by NRPS.

## Robustness Check

Tables A 4– A 6 report nonparametric estimates using alternative bandwidth choices, while Tables A 7– A9 assess robustness to the order of the local polynomial. In both sets of tables, we present the effects of UEBPS and NRPS receipt on health service utilization and health outcomes, separately for urban and rural China, by hukou status. Overall, all RDD estimates remain statistically significant, demonstrating robustness across different bandwidths and polynomial degrees. This consistency indicates the robust nature of the results, emphasizing their reliability.

To address potential non-randomness in sample selection, we conduct a re-estimation of local treatment effects at various age cut-off points, specifically examining the validity of the statutory pension age for individuals in rural China and males in urban China. Placebo tests for females in urban areas are not reported because the effects are not significant in our basic estimates. Figures A17 and A18 reveal that only the local treatment effect at 60 years old is statistically significant, while estimates for other age cut-off points lack statistical significance. This suggests that the observed significant effect at 60 years old is not influenced by potential biases from non-random sample selection, as effects at other age cut-off points do not share similar statistical significance.

Finally, we complement the fuzzy RDD estimates for NRPS with a two-way fixed effects DID specification that exploits variation in the rollout of NRPS among rural residents aged 60 and above. The DID estimates support the RDD findings, showing that NRPS introduction increases inpatient visits and related spending (see Appendix B.1 for details). As for the estimate for "2014 Rural Pension Reform", employing a two-way fixed effect approach, we replicate the main estimates based on CHARLS data using the CFPS datasets, and obtain similar results (see Tables A 28-30, Appendix A.3.1)

## Conclusion

Based on CHARLS data in waves 2011-2018, using non-parametric Fuzzy Regression Discontinuity Design (FRDD), this paper studies how the urban-rural split in pension institutions shapes health service utilization and health outcomes among residents in urban and rural China. We also use a two-way fixed effects DID approach to analyze "the rollout of the NRPS" and "the integration of NRPS and URPS." In summary, these estimates allow us to distinguish the role of retirement-driven time reallocation in urban settings from the income–healthcare channel that dominates in rural settings.

The results show that pension receipt affects health and healthcare use through different mechanisms due to urban-rural segmentation in pension systems. In urban China, receiving UEBPS (and occupational annuity for PEPS participants) improves health and life satisfaction of urban male residents, consistent with a retirement/leisure channel that increases involvement in social activities. Whereas, no effects are significant among females, which is consistent with post-retirement grandparental responsibilities that may offset potential health benefits from leaving work. Importantly, UEBPS receipt does not increase healthcare utilization, suggesting thatthe main pathway runs through retirement and time use rather than improved access to care in the urban setting.

In rural areas, not being tied to a binding retirement, the NRPS receipt acts as an income transfer. We find that receiving NRPS significantly increases rural married males' healthcare use, especially inpatient utilization and corresponding spending, while effects are not significant among rural females and appear as non-hospital self-treatment. These patterns are consistent with intra-household allocation and gender norms shaping how additional pension income funds medical spending, thereby impacting health. Overall, couples pool NRPS benefits and prioritize husbands' healthcare needs, reflecting wives' altruism within rural households.

Furthermore, the policy reform underscores the importance of institutional design in narrowing the urban-rural split in pensions. The 2014 Rural Pension Reform (integration of NRPS and URPS) does not affect healthcare use for either pensioners or non-pensioners. Instead, the integration promotes NRPS non-pensioners' non-agricultural labor supply and improves their health status. These effects can be driven by the removal of hukou-based restrictions on pension entitlement.

Overall, the results suggest that reducing health inequality among older adults in China requires governmental policies that account for the urban–rural split in pension institutions. In urban areas, pension rules and retirement arrangements matter because the health gains appear to operate mainly through retirement and changes in time use, such as more participation in social activities. Policies that ease women's post-retirement caregiving responsibilities may therefore be important for improving women's health outcomes. In rural areas, where pensions serve as income transfers, increasing benefit levels is more likely to raise healthcare use and improve health. At the same time, policymakers should consider intra-household resource allocation and women's economic security in old age, so that pension expansions do not widen gender gaps. Finally, the evidence from the 2014 integration reform, which reduced urban–rural (hukou-based) restrictions in pension entitlement, highlights the importance of portability and equal access across groups: removing institutional barriers can improve welfare even when benefit increases are modest.

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## Appendix

Statement: Due to length restrictions, the Appendices are available upon request. Please contact: z.he16@lancaster.ac.uk or zeen.he@outlook.com