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Mind the Gap: Health at the Edge of Retirement

-- Evidence from Fuzzy RD in China

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Abstract

Using panel data from the China Family Panel Studies (CFPS) between 2010 and 2020, this paper examines the causal impact of statutory retirement on individual health outcomes in China's formal sector. Employing a fuzzy regression discontinuity design, we find that retirement significantly improves self-rated health among men and reduces the probability of some chronic diseases among women. The health benefits are more pronounced among individuals with higher socioeconomic status and appear partially driven by changes in post-retirement consumption patterns. In contrast, psychological health indicators show no significant response to retirement. These findings contribute to the growing literature on the health consequences of retirement and offer timely insights for China's ongoing pension reform amid population aging.

Keywords

Retirement; Health; Pension Reform.

1. Introduction

In September 2024, China officially launched a landmark reform to gradually raise the statutory retirement age, marking a pivotal step in response to its intensifying population ageing and rising pension deficits. Over the next 15 years, the reform will increase the retirement age for male employees from 60 to 63, for blue-collar women from 50 to 55, and for white-collar women from 55 to 58. The urgency stems from China's demographic reality: by the end of 2024, 15.6% of China's population was aged 65 or older, and 22.0% was aged 60 or older. Without timely intervention, the basic pension fund is projected to face severe long-term deficits.

While international studies have shown that delayed retirement improves fiscal sustainability and labor supply, retirement reform also has far-reaching implications for health. Retirement marks not only the end of formal employment but also a shift in time use, social roles, and health-related behaviors and thereby drawing growing attention in public policy discussions. In China, recent studies have reported mixed health outcomes: some show improvements in physical or mental health post-retirement while some report no significant changes (Che & Li, 2018; Wang et al., 2024), while others highlight changes in outpatient visits and other health behaviors (Wu et al., 2023; Yuan et al., 2023). These findings underscore the complexity of the retirement–health relationship and point to the need for further research based on rigorously defined samples and more credible causal identification.

Building on this literature, our paper presents evidence that, despite the general health depreciation associated with aging, retirement can lead to improvements in self-reported health and a lower likelihood of being diagnosed with certain chronic diseases, particularly among formal-sector workers in China. Using a fuzzy regression discontinuity (RD) design on ten years of China Family Panel Studies (CFPS) data, we leverage discontinuities in retirement probability at current policy-mandated ages (60 for men, 50/55 for women) and focus on

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workers covered by the Urban Employee Basic Pension Insurance (UEBPI) system. We further show that the health effects are heterogeneous by gender, education, and pre-retirement income, and likely operate through increased health-related spending. These findings provide timely insights into the broader consequences of delayed retirement reform[1-4].

2. Literature Review

The relationship between health and retirement is complex and bidirectional. Under flexible pension systems, better health often motivates delayed retirement (Jennen et al., 2021), whereas poor health may trigger early labor force exit (Homaie Rad et al., 2017; Ten Have et al., 2015). Chronic conditions (Jennen et al., 2021), multi-morbidity (Ten Have et al., 2015), work stress (Toczek et al., 2022), mental functioning (Harkonmäki et al., 2006), and self-rated health (Jonsson et al., 2019; Van Rijn et al., 2014) have all been shown to influence retirement timing.

Conversely, the causal impact of retirement on health remains under debate. Some studies find that retirement improves perceived health and reduces fatigue and depressive symptoms (Coe & Zamarro, 2011; Glasson et al., 2023; Stenholm et al., 2014). Others suggest retirement increases risks of chronic disease, mobility limitations, and declines in self-reported health (Behncke, 2012; Che & Li, 2018; Dave et al., 2008). Studies using biomarker data, such as blood pressure and cholesterol, also yield mixed conclusions (Gorry & Slavov, 2021).

Empirical research on the topic in China has expanded in recent years, documenting post-retirement changes in health-related behaviors and medical utilization. For example, Che & Li (2018) find that retirement improves the health status of white-collar male workers, potentially through increased physical activity and healthier lifestyle adjustments. Wu et al. (2023) report a rise in outpatient visits and medical expenses, particularly among urban retirees, while Yuan et al. (2023) finds higher BMI among retired women. The direction and magnitude of these effects vary across gender, occupation, and baseline health, reflecting the heterogeneity of retirement impacts in labor market[5-23].

3. Background

China’s pension system is structured into three pillars: the Basic Pension System (BPS) led by the state, the second-tier Enterprise Annuities (EAs) provided voluntarily by employers, and third-tier Private Pension Schemes (PPSs) based on individual contributions. Among these, the Urban Employee Basic Pension Insurance (UEBPI) serves as the core component of the first pillar and covers formal-sector urban workers who are subject to mandatory retirement ages and related policy reforms. China’s pension administration primarily operates at the provincial level rather than through a national pool and has thus led to some regional disparities in funding capacity pressure. Governments in the north of the country have the biggest pension deficits because of weaker economies and large population outflows over the years. To address the imbalances, the government established a national adjustment fund in 2018 to redistribute pension resources across regions, transferring funds from relatively affluent coastal provinces like Guangdong to deficit-prone areas such as Heilongjiang and Liaoning. More recently, the delayed retirement reform was introduced as a structural response to long-term pension sustainability challenges, drawing on international precedents such as Japan’s incremental retirement age adjustments.

4. Data

We draw on data from the China Family Panel Studies (CFPS), conducted by the Institute of Social Science Survey (ISSS) at Peking University. CFPS provides nationally representative micro-level information on individual health, employment, education, and household demographics, covering 25 provinces. The baseline survey was launched in 2010 and includes 14,960 households and 42,590 individuals, with stratified sampling at county, village, household, and individual levels. All household members in the baseline survey, along with their biological and adopted children, are tracked across waves. Our analysis uses the full panel from 2010 to 2020, covering six waves. CFPS has been widely used in studies on health insurance (Huang & Liu, 2023), social pensions (Zhang et al., 2019), and income dynamics (Fan et al., 2021), offering a rich longitudinal dataset for analyzing retirement and health outcomes.

We construct three categories of health outcome variables. Self-rated health (SRH) is a widely adopted measure in health economics that captures individuals' subjective assessment of their overall well-being. Prior research suggests that SRH incorporates both physical and psychological health dimensions, filtered through personal perception and environmental context (Halliday et al., 2020; Pascual & Cantarero, 2009), and is predictive of mortality risk even beyond clinical diagnoses (Andersen, 2021). In CFPS, respondents report their health on a 1–5 scale. We construct a binary indicator equal to 1 if the response is "Excellent," "Very Good," or "Good," and 0 otherwise. However, this variable may be influenced by social class, cultural norms, or placebo effects related to policy changes (Coneus & Spiess, 2012), which we address by including socioeconomic controls.

Mental health is measured using the CES-D short form, based on responses to questions regarding depressive symptoms experienced over the past week. Items include "felt low in spirit," "could not sleep well," "felt lonely," "had trouble doing anything," "felt sad," "felt life was not worth living," and "felt happy" (reverse coded). Each item is scored from 0 ("Never or less than 1 day") to 3 ("Most of the time or 5–7 days"), with positively worded items reverse-coded. Following standard practice, we assign 1 to respondents whose total score exceeds 6, and 0 otherwise (Ridley et al., 2020; Sullivan et al., 2000), aiming to capture the likelihood of moderate to severe depressive symptoms.[24-30]

We also consider chronic physical health, beginning with a general indicator for whether the respondent had any doctor-diagnosed chronic disease in the past six months. In addition, we identify four major chronic conditions, including hypertension, diabetes, cardiopathy, and cancer, each coded as a binary variable based on self-reported diagnosis confirmed by a physician. These conditions are among the most prevalent age-related illnesses in China and are highly relevant to assessing both short- and long-term health risks associated with retirement, potentially imposing financial and emotional burdens on affected households.

Our key explanatory variable is a retirement dummy equal to 1 if the respondent has officially retired or resigned, and 0 otherwise. Age is measured in months and used as a running variable in RD design. We also include a set of covariates: education level, marital status, ethnicity, migrant status, family size, and living environment, to capture both socioeconomic status and environmental exposures that may influence health and retirement behavior.

We focus on urban residents aged 40 to 70, a demographic most relevant to China's ongoing retirement reforms. The main analysis sample includes individuals who are formally employed in the urban sector, enrolled in the UEBPI, and hold non-agricultural household registration. These individuals are typically covered by mandatory retirement policies and are directly exposed to institutional pension reform. To ensure demographic comparability while distinguishing institutional exposure, we construct a placebo group consisting of urban residents who are self-employed and thus not enrolled in UEBPI. Rural residents are not included due to their distinct demographic profiles, which would otherwise introduce systematic differences in both retirement behavior and health trajectories. Table 1 details the construction of all variables used in our empirical analysis.

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Table 1. Variable definition.

Variable	Definition
SRH	Dummy variable: assigned 1 if the respondent reports “Fair” or “Poor” health; assigned 0 if reporting “Excellent,” “Very Good,” or “Good.”
CES-D	Dummy variable: constructed from multiple CES-D items each scored from 0 (“Never or less than 1 day”) to 3 (“Most of the time or 5–7 days”), with positively worded items reverse coded. Assigned 1 if the summed score exceeds 6, assigned 0 otherwise.
Chronic	Dummy variable: assigned 1 if the respondent had any doctor-diagnosed chronic disease in the past six months, assigned 0 otherwise.
Hypertension	Dummy variable: assigned 1 if the respondent had any doctor-diagnosed hypertension in the past six months, assigned 0 otherwise (a sub-indicator derived from the chronic disease variable).
Diabetes	Dummy variable: assigned 1 if the respondent had any doctor-diagnosed diabetes in the past six months, assigned 0 otherwise (a sub-indicator derived from the chronic disease variable).
Cardiopathy	Dummy variable: assigned 1 if the respondent had any doctor-diagnosed cardiopathy in the past six months, assigned 0 otherwise (a sub-indicator derived from the chronic disease variable).
Cancer	Dummy variable: assigned 1 if the respondent had any doctor-diagnosed cancer in the past six months, assigned 0 otherwise (a sub-indicator derived from the chronic disease variable).
Retired	Dummy variable: assigned 1 if the respondent had officially retired or resigned, assigned 0 otherwise.
Age	Continuous variable: the respondent’s age, measured in months.
Covariates	
Education level	Ordered categorical variable: the respondent’s highest completed level of education, ranging from 1 (Illiterate/Semi-literate) to 8 (Doctoral degree).
Marital status	Dummy variable: assigned 1 if the respondent is married, having a partner, or cohabited; assigned 0 if the respondent is never married, divorced, or widowed.
Ethnicity	Dummy variable: assigned 1 if the respondent is of Han ethnicity, assigned 0 if the respondent is of other ethnicities.
Migrant	Dummy variable: assigned 1 if place of household registration different from the place of living, or moved out, assigned 0 otherwise.
Family size	Continuous variable: number of the respondent’s family numbers.
Fuel for cooking	Dummy variable: assigned 1 if the primary fuel for cooking is firewood, straw, or coal; assigned 0 if the main source is gas, liquid gas, natural gas, solar energy, or electricity.
Water for cooking	Dummy variable: assigned 1 if the water source for cooking is river water, lake water, well water, spring water, rainwater, cellar water, pond water, or other untreated sources; assigned 0 if the main source is tap water, mineral water, purified water, or filtered water.

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Table 2. Descriptive statistics.

	(1)	(2)	(3)	(4)	(5)	(6)
	Full sample	Formally employed with UEBPI		Self-employed without UEBPI		
	Obs.	Obs.	Mean	Obs.	Mean	Diff-in-Diff
Panel A Male						
SRH	8532	3476	0.2592	5056	0.2775	-0.0183
CES-D	5418	2615	0.1935	2803	0.2929	-0.0994
Chronic	8425	3450	0.1817	4975	0.1624	-0.0193
Hypertension	8425	3450	0.0641	4975	0.0328	0.0313
Diabetes	8425	3450	0.0278	4975	0.0167	0.0111
Cardiopathy	8425	3450	0.0128	4975	0.0115	0.0013
Cancer	8425	3450	0.0023	4975	0.0018	0.0005
Retired	8557	3483	0.2446	5074	0.0974	0.1473
Age	8557	3483	52.2818	5074	52.1820	0.0998
Covariates						
Education level	8557	3483	3.8608	5074	2.4896	1.3712
Marital status	8557	3483	0.9572	5074	0.9543	0.0029
Ethnicity	8553	3481	0.9655	5072	0.9338	0.0318
Migrant	8557	3483	0.9891	5074	0.9817	0.0074
Family size	8557	3483	3.4241	5074	4.2121	-0.7880
Fuel for cooking	8557	3483	0.0339	5074	0.2974	-0.2635
Water for cooking	8557	3483	0.0204	5074	0.2840	-0.2636
Panel B Female						
SRH	8390	2441	0.3204	5949	0.3733	-0.0530
CES-D	5173	1869	0.3226	3304	0.4104	-0.0878
Chronic	8283	2430	0.2045	5853	0.2069	-0.0024
Hypertension	8283	2430	0.0395	5853	0.0402	-0.0006
Diabetes	8283	2430	0.0177	5853	0.0214	-0.0037
Cardiopathy	8283	2430	0.0136	5853	0.0164	-0.0028
Cancer	8283	2430	0.0021	5853	0.0014	0.0007
Retired	8416	2443	0.3795	5973	0.1046	0.2748
Age	8416	2443	49.8501	5973	52.2741	-2.4240
Covariates						
Education level	8416	2443	3.8752	5973	2.0469	1.8283
Marital status	8416	2443	0.8960	5973	0.9451	-0.0491
Ethnicity	8413	2442	0.9697	5971	0.9255	0.0442
Migrant	8416	2443	0.9947	5973	0.9886	0.0061
Family size	8416	2443	3.2554	5973	4.2670	-1.0116
Fuel for cooking	8415	2443	0.0254	5972	0.3170	-0.2916
Water for cooking	8415	2443	0.0225	5972	0.2991	-0.2765

Notes: Diff-in-Diff refers to the mean difference between the formally employed group with pension and the self-employed group without.

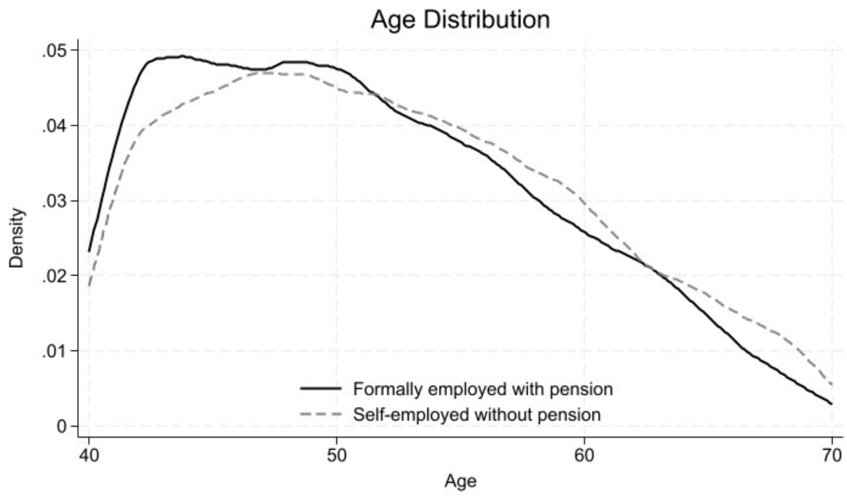

Figure 1. Age Distribution by Pension Status and Employment Type

Table 2 below summarizes the demographic and health characteristics of our sample. For people who are formally employed and enrolled in the UEBPI, the average age is approximately 54 years, with a balanced gender composition. Most individuals in this group have completed at least high school education. In terms of health, they report slightly favorable self-rated health, a low average score on the CES-D mental health scale, and moderate prevalence of doctor-diagnosed chronic diseases. The incidence rates for hypertension, diabetes, cardiopathy, and cancer are within expected ranges for this age cohort, but generally lower than those observed in lower-income or rural populations. For placebo analysis, we also identify a comparison group of urban self-employed individuals who are not covered by UEBPI. These individuals are similar in age distribution but tend to have lower levels of education, larger household sizes, and less stable employment histories. Health indicators suggest slightly worse outcomes, including higher average CES-D scores and greater likelihood of reporting at least one chronic condition. This group does not face institutional retirement mandates, making them suitable for robust checks. Figure 1 displays the age distribution for both groups, showing relatively similar coverage across the 40–70 age range.

5. Research Methodology

We employ a fuzzy RD design to identify the causal effect of retirement on health outcomes, leveraging the institutional discontinuities in retirement probability around the statutory retirement ages in China. For male urban employees with formal employment and UEBPI eligibility, the retirement age is 60; for women, it is typically 50 or 55 depending on employment type. These thresholds generate observable jumps in the probability of retirement, which serve as the basis for our identification strategy.

However, retirement decisions are not mechanically determined by statutory age. In practice, individuals may retire earlier due to poor health or personal preferences, while others may continue working beyond eligibility, either by being rehired or through informal employment. These patterns reflect partial compliance with the institutional cutoff, resulting in a fuzzy discontinuity rather than a sharp one (Angrist, 1998; Chen & Van Der Klaauw, 2008; Van Der Klaauw, 2002).

For our setting, let D_i denote the retirement status of individual i, equal to 1 if retired and 0 otherwise, and let Y_i be a health-related outcome. We define X_i as age in months, with c representing the age threshold. Under the standard assumptions of continuity in potential outcomes and monotonicity in treatment assignment, the causal effect of retirement is identified through a Wald estimator around the threshold:

$$\alpha = \frac{\lim_{x \to c^+} E[Y_i|X_i = x] - \lim_{x \to c^-} E[Y_i|X_i = x]}{\lim_{x \to c^+} E[D_i|X_i = x] - \lim_{x \to c^-} E[D_i|X_i = x]} \tag{1}$$

Here, α captures the LATE for compliers, whose retirement behavior is influenced by reaching the statutory retirement age. In our main analysis sample, this condition is most applicable to workers in large organizations or the public sector, where pension eligibility and retirement timing are closely tied to institutional rules. By contrast, individuals in the placebo comparison group, employed in private firms without pension coverage, typically have greater discretion in deciding when to retire. As a result, their retirement behavior is less responsive to the statutory cutoff due to the presence of always-takers and never-takers.

To estimate this effect, we use a local linear regression approach with a triangular kernel, and apply the mean squared error–optimal bandwidth selection (Calonico et al., 2014). Standard errors are clustered at the provincial level to account for geographic correlation in unobserved shocks. Our estimation follows a two-stage least squares (2SLS) specification:

First stage:

$$D_i = \pi_0 + \pi_1 \cdot 1(X_i > c) + g(X_i - c) + v_i \tag{2}$$

And causal relation:

$$Y_i = \alpha D_i + f(X_i - c) + \varepsilon_i \tag{3}$$

where $f(.)$ and $g(.)$ are functions of running variable and are linear in our case. We further include individual covariates including education level, marital status, ethnicity, migrant status, family size, fuel and water source for cooking. All health outcome variables are coded such that higher values indicate worse health conditions. Therefore, a negative significant estimate of α implies that retirement causally improves health outcomes for this subgroup.

6. Main Results

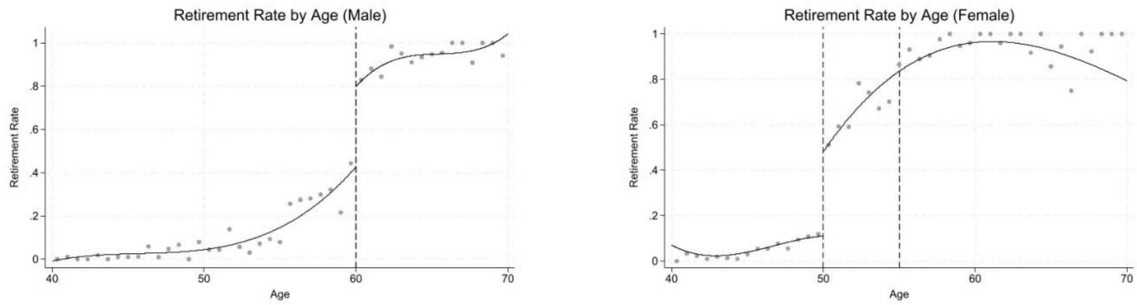

Figure 2. Retirement Rate by Age

For this part, we first confirm that retirement probability exhibits discrete jumps at policy thresholds. As shown in Figure 2, both men and women face clear discontinuities in retirement likelihood at the statutory ages-age 60 for men and age 50 for women. The jump at age 55 is visible but relatively weak for women, probably due to cadre's small share in the sample.

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Table 3 presents our first stage results for the first-stage RD estimates, which validate the graphical observations. There is a significant increase of approximately 38 percentage points in the retirement rate for men at age 60. Among women, the jump at age 50 is about 39 percentage points, while that at age 55 is smaller. By contrast, we do not observe similar jumps in the placebo group, whose retirement decisions are not constrained by formal retirement rules. This strengthens the interpretation that the observed discontinuities are driven by institutional thresholds and that our estimates capture the LATE for compliers whose retirement status is sensitive to the policy cutoffs.

Table 3. First-stage RD estimates.

	(1)	(2)	(3)	(4)
	Formally employed with pension		Self-employed without pension	
	Male	Female	Male	Female
Panel A				
50	-0.0104	**0.3855*****	0.0133	0.0118
	(0.0253)	(0.0491)	(0.0146)	(0.0186)
Bandwidth	3.804	5.105	2.693	3.959
Panel B				
55	0.0123	**0.1493*****	-0.0071	-0.0217
	(0.0500)	(0.0508)	(0.0316)	(0.0310)
Bandwidth	1.835	2.920	3.817	3.978
Panel C				
60	**0.3808*****	0.0356	0.0731	-0.0018
	(0.0515)	(0.0507)	(0.0493)	(0.0537)
Bandwidth	3.318	3.449	2.328	3.943
Obs.	3,481	2,442	5,072	5,969

Notes: ***, **, and * denote the significance at the 1%, 5%, and 10% level, respectively. The running variable is age in months, centered at the policy cutoff (60 for men, 50/55 for women). Estimates use a triangular kernel and a local linear polynomial, with MSE-optimal bandwidths. Individual-level covariates include education level, marital status, ethnicity, migrant status, household size, and access to clean cooking fuel and water. Standard errors are clustered at the province level.

Based on the identified first-stage discontinuities, we estimate the LATE of retirement on health outcomes. Table 4 presents the main results. We find that retirement significantly improves self-rated health among male formal-sector workers: at the age-60 cutoff, the probability of reporting good health increases by approximately 0.34, and the coefficient is statistically significant. In contrast, while the subjective health response is weaker among women, objective health indicators show notable improvements. Most notably, retirement significantly reduces the probability of being diagnosed with hypertension, with a decline of about 8 percentage points at the relevant threshold. Other chronic conditions, including diabetes and cardiopathy, also decline after retirement, though the magnitudes vary across gender. Perhaps unexpectedly, we find limited effects on mental health conditions such as CES-D scores or reported stress levels. This suggests that the mechanisms through which retirement improve health may be more physiological than psychological.

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Table 4. LATE of retirement on health outcomes.

	(1)	(2)	(3)	(4)	(5)	(6)
	Formally employed with pension			Self-employed without pension		
	Male	Female		Male	Female	
	60	50	55	60	50	55
Panel A						
SRH	**-0.3367****	0.2212	-0.1750	-0.9511	-7.9908	0.0768
	(0.1705)	(0.1833)	(0.5564)	(1.0233)	(12.9874)	(1.3051)
Bandwidth	3.204	3.431	2.970	2.385	2.926	5.347
Obs.	3,474	2,440	2,440	5,054	5,945	5,945
Panel B						
CES-D	0.0224	0.0251	0.1779	-0.8336	-13.5539	-0.2427
	(0.2978)	(0.1716)	(0.6766)	(2.9011)	(157.6598)	(1.2106)
Bandwidth	3.598	5.344	3.990	2.859	3.690	5.015
Obs.	2,614	1,868	1,868	2,802	3,301	3,301
Panel C						
Chronic	0.1510	-0.0125	0.3939	0.4506	-0.6906	0.0109
	(0.1476)	(0.1387)	(0.6871)	(0.6768)	(3.2275)	(0.5732)
Bandwidth	3.684	4.752	4.990	4.106	3.296	8.084
Obs.	3,448	2,429	2,429	4,974	5,850	5,850
Panel D						
Hypertension	0.1477	**-0.0862****	0.5344	0.1678	-0.8541	-2.6235
	(0.1451)	(0.0418)	(0.4921)	(0.6211)	(2.0136)	(3.4827)
Bandwidth	3.286	4.982	4.615	2.434	4.259	3.479
Obs.	3,448	2,429	2,429	4,974	5,850	5,850
Panel E						
Diabetes	0.1130	0.0449	0.0965	0.2176	-1.2833	-0.1177
	(0.0899)	(0.0386)	(0.2605)	(0.2465)	(2.0691)	(0.2938)
Bandwidth	3.792	3.297	4.043	2.669	3.855	6.080
Obs.	3,448	2,429	2,429	4,974	5,850	5,850
Panel F						
Cardiopathy	0.0566	-0.0553	0.3216	0.4890	0.3665	-0.0351
	(0.0664)	(0.0478)	(0.1995)	(0.4117)	(1.0492)	(0.5328)
Bandwidth	2.614	5.856	2.816	2.618	3.217	4.409
Obs.	3,448	2,429	2,429	4,974	5,850	5,850
Panel G						
Cancer	-0.0514	-0.0073	-0.0269	0.0199	0.4192	-0.1398
	(0.0401)	(0.0071)	(0.0280)	(0.0188)	(0.7765)	(0.2246)
Bandwidth	3.765	5.438	2.712	3.224	3.241	3.718
Obs.	3,448	2,429	2,429	4,974	5,850	5,850

Notes: ***, **, and * denote the significance at the 1%, 5%, and 10% level, respectively. The running variable is age in months, centered at the policy cutoff (60 for men, 50/55 for women). Indicator for actual retirement status is instrumented by a discontinuity in the probability of being retired. Estimates use a triangular kernel and a local linear polynomial, with MSE-optimal bandwidths. Individual-level covariates include education level, marital status, ethnicity, migrant status, household size, and access to clean cooking fuel and water. Standard errors are clustered at the province level.

We find no significant changes in health outcomes for the placebo group, further supporting the interpretation that the observed effects are causally driven by retirement rather than by age itself or other confounding factors.

To further evaluate the robustness of our main results, Table 5 presents the fuzzy RD estimates using alternative bandwidth choices of ±3, ±4, and ±5 years around the policy cutoff. The core findings remain stable, indicating that the estimated health effects are not sensitive to the choice of local neighborhood around the cutoff.

Table 5. LATE of retirement on health outcomes with different bandwidths.

	(1)	(2)	(3)	(4)	(5)	(6)
	Male			Female		
	+/- 3 years	+/- 4 years	/- 5 years	+/- 3 years	+/- 4 years	/- 5 years
Panel A						
SRH	**-0.3412***	**-0.2689***	**-0.2158***	0.2046	0.1990	0.1314
	(0.1766)	(0.1508)	(0.1252)	(0.1925)	(0.1747)	(0.1597)
Obs.	3,474	3,474	3,474	2,440	2,440	2,440
Panel B						
Hypertension	0.1706	0.1381	0.1204	**-0.1287****	**-0.1066****	**-0.0858****
	(0.1524)	(0.1270)	(0.1011)	(0.0582)	(0.0487)	(0.0417)
Obs.	3,448	3,448	3,448	2,429	2,429	2,429

Notes: ***, **, and * denote the significance at the 1%, 5%, and 10% level, respectively. The running variable is age in months, centered at the policy cutoff (60 for men, 50 for women). Indicator for actual retirement status is instrumented by a discontinuity in the probability of being retired. Estimates use a triangular kernel and a local linear polynomial. Individual-level covariates include education level, marital status, ethnicity, migrant status, household size, and access to clean cooking fuel and water. Standard errors are clustered at the province level.

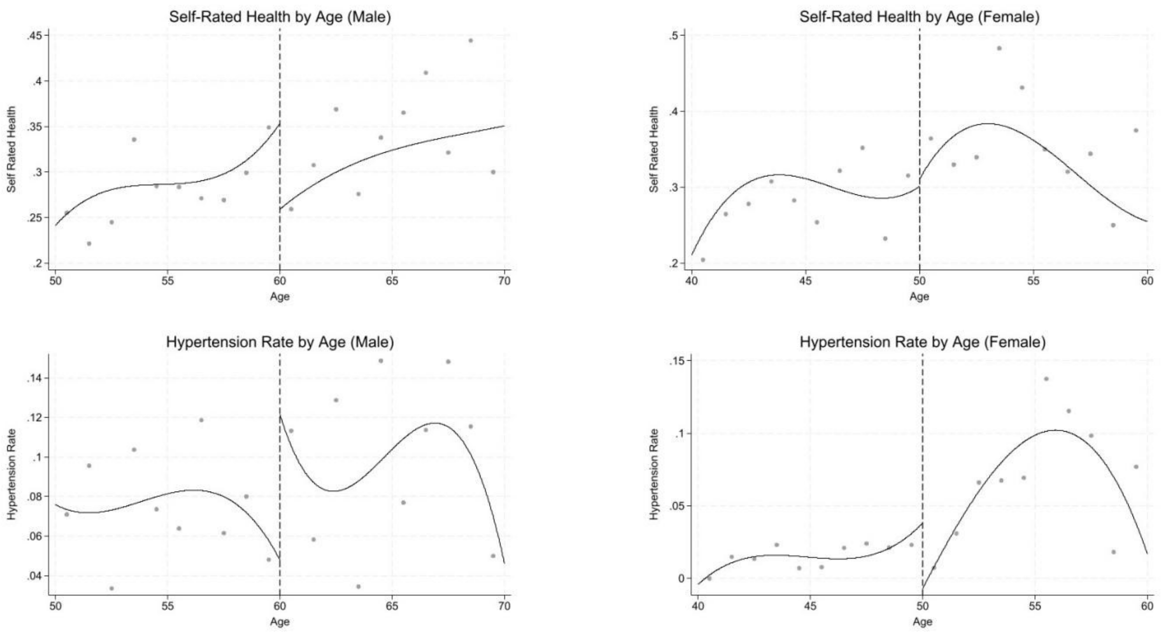

Figure 3. Discontinuities in Health Outcomes Around Retirement Age

The graphical evidence aligns well with the estimation results presented in Table 5. As shown in Figure 3, there is a clear upward jump in self-rated health for males around the age 60 retirement cutoff, consistent with the statistically significant negative coefficients on poor SRH among men. For women, while SRH does not exhibit an obvious shift at age 50, the prevalence of hypertension drops sharply at the cutoff. In contrast, the visual pattern for male hypertension suggests a possible change at the threshold, but the shift is less clear and remains statistically insignificant in the regressions. Overall, these results imply that retirement leads to improvements in both subjective and objective health, with gender-specific effects concentrated in different dimensions of health, supporting the hypothesis that work cessation can reduce stress exposure and restore health stock.

7. Robustness

To validate the identification assumptions of the RD design, we conduct a series of robustness checks. First, we test whether individuals can manipulate their age to sort into retirement eligibility. Figure 4 present McCrary-type density tests, which reveal no statistically significant discontinuities in the frequency of observations around the cutoff points. This supports the assumption that age is not subject to manipulation, preserving the quasi-random assignment near the threshold.

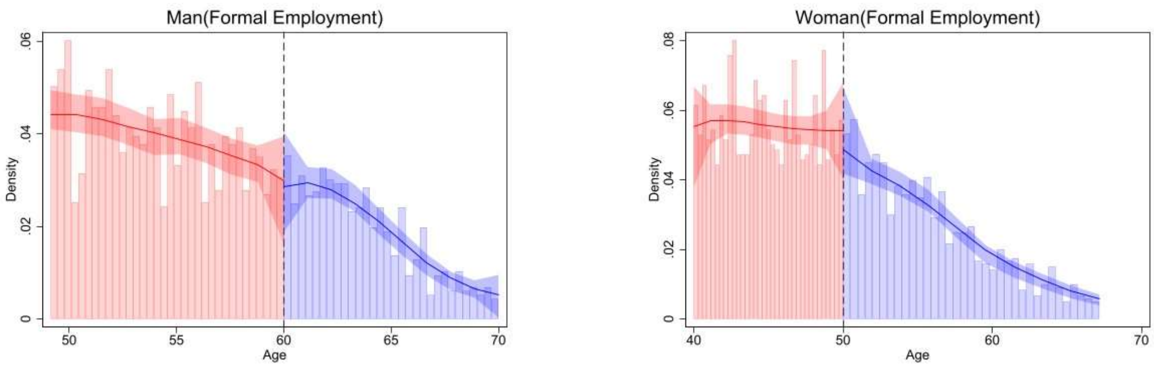

Figure 4. Density of the running variable

Furthermore, we examine the key RD assumption that the continuity of the regression functions for treatment and controls at the cutoff in the absence of the treatment. Table 6 reports the results of continuity tests for baseline covariates. None of these characteristics exhibit statistically significant jumps at the retirement age thresholds for either gender, suggesting that any observed discontinuities in outcomes can be attributed to retirement status rather than underlying differences in individual characteristics.

Table 6. Null treatment effect on pre-treatment covariates.

	(1)	(2)	(3)	(4)	(5)	(6)
	Male			Female		
	+/- 3 years	+/- 4 years	/- 5 years	+/- 3 years	+/- 4 years	/- 5 years
Panel A						
Education level	0.1064	0.0116	-0.0463	0.2143	0.1568	0.1020
	(0.1965)	(0.1795)	(0.1604)	(0.1866)	(0.1701)	(0.1556)
Obs.	3,483	3,483	3,483	2,443	2,443	2,443
Panel B						
Marital status	-0.0205	-0.0279	-0.0262	-0.0082	-0.0179	-0.0207
	(0.0355)	(0.0309)	(0.0277)	(0.0423)	(0.0377)	(0.0370)
Obs.	3,483	3,483	3,483	2,443	2,443	2,443
Panel C						
Ethnicity	0.0179	0.0104	0.0068	0.0012	0.0010	0.0034
	(0.0184)	(0.0194)	(0.0196)	(0.0341)	(0.0280)	(0.0242)
Obs.	3,481	3,481	3,481	2,442	2,442	2,442
Panel D						
Migrant	0.0066	0.0045	0.0035	-0.0146	-0.0145	-0.0149
	(0.0196)	(0.0177)	(0.0152)	(0.0089)	(0.0105)	(0.0113)
Obs.	3,483	3,483	3,483	2,443	2,443	2,443
Panel E						
Family size	-0.6004	-0.5066	-0.4274	-0.0597	-0.0436	-0.0164
	(0.3713)	(0.3615)	(0.3552)	(0.1884)	(0.1745)	(0.1730)
Obs.	3,483	3,483	3,483	2,443	2,443	2,443
Panel F						
Fuel for cooking	0.0199	0.0274	0.0216	-0.0031	0.0001	-0.0032
	(0.0338)	(0.0328)	(0.0320)	(0.0080)	(0.0090)	(0.0102)
Obs.	3,483	3,483	3,483	2,443	2,443	2,443
Panel G						
Water for cooking	0.0333	0.0246	0.0204	-0.0002	-0.0007	-0.0022
	(0.0307)	(0.0267)	(0.0237)	(0.0183)	(0.0168)	(0.0149)
Obs.	3,483	3,483	3,483	2,443	2,443	2,443

Notes: ***, **, and * denote the significance at the 1%, 5%, and 10% level, respectively. The running variable is age in months, centered at the policy cutoff (60 for men, 50 for women). Indicator for actual retirement status is instrumented by a discontinuity in the probability of being retired. Estimates use a triangular kernel and a local linear polynomial.

In addition, we assess the robustness of our results by shifting the cutoff to several placebo ages around the statutory retirement thresholds. We re-estimate the RD models using alternative cutoffs with MSE-optimal bandwidths and find that the estimated treatment effects at these placebo points are statistically insignificant. The pattern reinforces the validity of identification strategy and alleviates concerns of model overfitting or specification artifacts, suggesting that the observed health improvements are indeed driven by retirement rather than spurious age-related discontinuities.

Table 7. Alternative Cutoffs.

	(1)	(2)	(3)	(4)	(5)	(6)
	Male			Female		
	55	59	61	49	51	60
Panel A						
SRH	-0.8788	0.2351	-0.4222	-0.3409	2.2999	1.6875
	(0.6921)	(0.8884)	(0.5367)	(0.3855)	(3.3036)	(3.3220)
Bandwidth	3.668	2.624	2.154	2.389	3.546	2.417
Obs.	3,474	3,474	3,474	2,440	2,440	2,440
Panel B						
Hypertension	-0.0975	0.4356	0.6933	0.0953	0.2218	-1.1639
	(0.2887)	(0.4268)	(0.5016)	(0.1187)	(0.3131)	(1.6964)
Bandwidth	4.020	2.238	2.053	1.997	4.867	2.342
Obs.	3,448	3,448	3,448	2,429	2,429	2,429

Notes: ***, **, and * denote the significance at the 1%, 5%, and 10% level, respectively. The running variable is age in months, centered at alternative cutoff. Indicator for actual retirement status is instrumented by a discontinuity in the probability of being retired. Estimates use a triangular kernel and a local linear polynomial, with MSE-optimal bandwidths. Individual-level covariates include education level, marital status, ethnicity, migrant status, household size, and access to clean cooking fuel and water. Standard errors are clustered at the province level.

8. Heterogeneous effects and Channel Analysis

To further explore the heterogeneity, we stratify the sample by education, income level, and job satisfaction prior to retirement. As shown in Table 8, the health benefits of retirement are more pronounced among those with higher socioeconomic status. For example, men with at least a senior high or secondary education or high income show significant improvements in SRH, whereas no effect is observed for their less-educated or lower-income counterparts. For women, the reduction in hypertension probability is larger among those not satisfied with their job prior to retirement, suggesting that work-related stress may play an important mediating role. The presented heterogeneous effects underscore that the health consequences of retirement are not uniform, but conditional on individual characteristics and pre-retirement job quality.

Table 8. Heterogeneous effects.

	(1)	(2)	(3)	(4)	(5)	(6)
	Edu Level		Income		Satisfied with job	
	Higher education	Lower education	High income	Low income	Job satisfied	Job unsatisfied
Panel A Male						
SRH	**-0.4672****	0.3820	-0.4529	-0.2714	-0.2468	-0.3465
	(0.2172)	(0.6083)	(0.3598)	(0.1689)	(0.1540)	(0.3429)
Bandwidth	3.244	2.524	3.031	2.642	3.858	4.712
Obs.	1,382	2,092	1,589	3,134	1,898	1,575
Panel B Female						
Hypertension	-0.0798	**-0.1377***	-0.1382	-0.0351	-0.0784	**-0.0843****
	(0.0622)	(0.0823)	(0.0902)	(0.0344)	(0.0690)	(0.0405)
Bandwidth	3.303	3.779	2.895	3.129	5.106	5.615
Obs.	924	1,505	1,081	1,038	1,319	1,105

Notes: ***, **, and * denote the significance at the 1%, 5%, and 10% level, respectively. The running variable is age in months, centered at the policy cutoff (60 for men, 50 for women). Indicator for actual retirement status is instrumented by a discontinuity in the probability of being retired. Estimates use a triangular kernel and a local linear polynomial, with MSE-optimal bandwidths. Individual-level covariates include education level, marital status, ethnicity, migrant status, household size, and access to clean cooking fuel and water. Standard errors are clustered at the province level. Edu level is defined as senior high school / secondary school / technical school and above versus lower; income is split by within-gender-and-year median; job satisfaction is defined based on whether the respondent was satisfied with their main job before retirement.

As for the underlying mechanisms, Table 9 examines changes in consumption behavior after retirement. The results suggest that financial and behavioral adjustments vary by income group and gender. Among low-income male retirees, food expenditure increases substantially, indicating that retirement may relieve financial constraints and enable greater access to basic consumption needs. In contrast, high-income male retirees exhibit a significant decline in fitness-related expenditure, possibly reflecting reduced investment in preventive health behavior once they exit the labor force. This shift may arise from changes in daily routine, perceived necessity, or reduced access to employer-sponsored wellness programs. For women, the patterns are less pronounced but point in a similar direction, with modest increases in food spending and mild reductions in fitness-related costs. These findings suggest that retirement can have redistributive effects on health-related consumption: it improves the material well-being of lower-income groups while slightly reducing discretionary health investments among wealthier individuals, offering a plausible explanation for the observed convergence in certain health outcomes post-retirement and supports the interpretation that retirement may contribute to narrowing health inequality across socioeconomic groups.

Table 9. Possible Channels.

	(1)	(2)	(3)	(4)
	Male		Female	
	High income	Low income	High income	Low income
Panel A				
Food expenditure	4,771.0348	**16,125.7434****	3,617.5605	6,077.1419
	(9,812.2304)	(7,316.5231)	(10,817.3196)	(11,498.0247)
Bandwidth	2.280	4.255	2.826	4.339
Obs.	1,553	1,505	1,069	1,019
Panel B				
Fitness expenditure	**-2,887.9863****	-708.7570	-69.6695	-1,055.8654
	(1,186.5395)	(681.0358)	(893.2876)	(909.7680)
Bandwidth	3.665	4.466	4.385	3.008
Obs.	1,555	1,521	1,077	1,029

Notes: ***, **, and * denote the significance at the 1%, 5%, and 10% level, respectively. The running variable is age in months, centered at the policy cutoff (60 for men, 50 for women). Indicator for actual retirement status is instrumented by a discontinuity in the probability of being retired. Estimates use a triangular kernel and a local linear polynomial, with MSE-optimal bandwidths. Individual-level covariates include education level, marital status, ethnicity, migrant status, household size, and access to clean cooking fuel and water. Standard errors are clustered at the province level.

9. Conclusion

This paper contributes to the growing literature on the health consequences of retirement by providing causal evidence from China's formal-sector workforce. Using a fuzzy RD design and panel data from CFPS, we find that retirement improves health outcomes for individuals covered by the basic pension schemes. The effects vary by gender and outcome type: men experience notable improvements in self-rated health, while women see reductions in objectively measured chronic condition. Mental health outcomes, by contrast, appear largely unaffected. These health benefits are more pronounced among individuals with higher socioeconomic status and may be partially mediated by post-retirement changes in consumption behavior.

Our findings offer timely and policy-relevant insights for China's ongoing delayed retirement reform. While the reform is primarily motivated by fiscal and labor supply considerations, our evidence highlights its potential unintended consequences on individual well-being. Retirement is not merely an institutional exit from the labor force; it can function as a health-preserving intervention, especially for workers exposed to long-term occupational stress. However, the observed heterogeneity across income, education, and job satisfaction underscores that health benefits are not evenly distributed. Thus, gradually but uniformly postponing retirement may thus exacerbate health inequality and disproportionately harm vulnerable groups.

To mitigate these risks, complementary measures should be considered alongside the retirement age shift, which may include strengthened occupational health protections, pre-retirement stress management programs, and targeted support for low-income or high-stress workers during the transition phase. Future research may further investigate the long-term effects of delaying retirement age and examine how institutional factors could possibly mediate the retirement–health relationship in rapidly ageing societies, such as employer-sponsored health benefits or opportunities for meaningful post-retirement engagement.

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