Does Retirement Make People Happy?

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Abstract

This paper evaluates the impacts of retirement on people's depressive disorder level, exploiting the fact that it is compulsory to retire across certain age threshold in China. Overall, retirement tends to make people less happier, and it may have opposite effects between men and women in the short-term right before and after retirement, though not statistically significant. We account this insignificance for counterbalance of different factors and self-adjustment prior to retirement.

Keywords: Mental Health; Retirement; Regression Discontinuity

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1 Introduction

Many countries have rolled out or plan to roll out to postpone retirement age.[1] While economists and policy makers have tried to assess the cost and value of postponing retirement age, most of the analysis focus on pension fund, labor shortage, physical health and mortality rate, (see for instance Kuhn et al. (2015), Staubli and Zweimüller (2013), Eibich (2015) and Xiaoyan et al. (2010)) and few, as we are aware of, has considered mental health. Since mental disorders have been a leading cause of disability worldwide and is a major culprit for global health burden,[2] and that old citizen tend to report higher depressive score, as in Figure 1, the analysis of retirement on mental health is non-negligible.

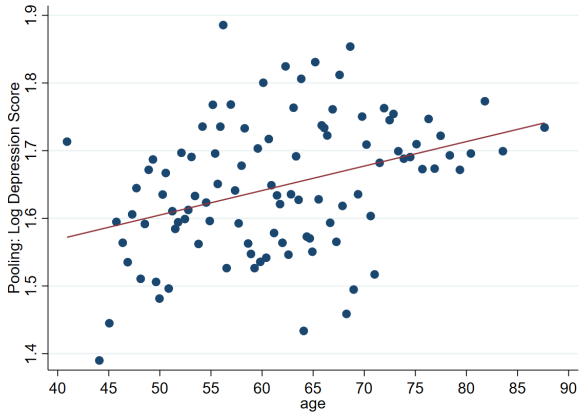

Figure 1: Correlation between mental health and age

X axis is age, and y axis is log depression score. Data comes from China Health and Retirement Longitudinal Study (CHARLS), which is also used in our main study. This figure documents a positive correlation between mental health and age, and that old citizen tend to have higher depression level.

How to identify the causal effect of retirement on mental health remains a challenging empirical question, as a simple OLS regression will run into endogenous problem. First, mental health could be influenced by multiple factors, which could influence retirement decision at the same time. One gets depressed is not just because she is retired, but simply because she is getting old and facing physical health issues. Second, there could be reverse causality where the declining mental health causes retirement, rather than the other direction around. Though we could adopt individual fixed

[1] E.g., in Switzerland, the Senate has voted that the retirement age for women should be raised from 64 to 65 and in China, the 14th Five-Year Plan writes that "...gradually raise the statuary retirement age in response to an aging population..."

[2] Over 264 million people of all ages, globally, suffer from depressive disorders, see James et al. (2018)

effect to fix time-constant factors in panel data setting, we would still be bothered with time-varying omitted variable bias and reverse causality.

Some studies use eligible age to receive pension benefit as instrument variable in regression discontinuity (RD) framework to address potential endogenous problems (see for instance Picchio and van Ours (2020), Gorry et al. (2018), Eibich (2015) and Zhao et al. (2017)). Receiving pension benefit as a monetary incentive might indeed lead to retirement decision of old people. However, it could be highly possible that some people continue to work even they have begun to receive pension benefit, which could lead to weak instrument problem.

We rely on is the practice of statuary retirement age in China, and we argue that the institutional setting could give a more stable and strong relationship between retirement and statuary retirement age than previous studies. Explicit requirement of law and the incentive structure originating from employer and employee could make officially retired people less likely to re-work. Comparing with other studies where getting across cutoff age averagely leads to a 20% increase in retirement probability, we find 45% average increment in our study .

Our identification settings could also leverage us to identify the local average treatment effect (LATE) at a much younger age. The statuary retirement age in previous studies is usually around 65 years old. In China, however, the statutory retirement age is normally 50 years old for female and 60 years old for male, which is much earlier than most OECD countries.[3] It could be fundamentally different if someone retires at the age of 60 and at age of 65. For the latter, retirement could relieve pressure from work in old age and be likely helpful to mental health, while for the former the effect remains unclear.

In this paper, we first exam the RD assumptions for identification. We use the statutory retirement age as an instrument of retirement status, and find the latter significantly jumps at the cutoff. Another assumption is the continuity of covariables, and the RD will therefore isolate out the causal impact of reaching statutory retirement age. We select education and marriage status as covariables and find that they change smoothly across the cutoff. Additionally, we also eliminate potential measurement errors both in treatment variables by identifying that people tend to pretend they are happy (in front of interviewers), and in instrument variables by arguing that there

[3]Some might argue that different statutory retirement age might reflect different life expectancy in each country. However, as shown, the average life expectancy in China is 76.9 years old, which is far beyond statutory retirement age, and only 6 years old smaller than average level of OECD's. https://ourworldindata.org/life-expectancy

is no bunching around the cutoff.

Although OLS reports strongly significant positive results, it is likely biased because of endogenous problems. Our RD results imply that, with a bandwidth of 2 years, changing from working to retirement status increases depression level by 5.0% for the whole population, and with a bandwidth of 1 year, a change in retirement status increases depression level for women, but not for men. It indicates that, if we look at a sufficient small interval around the retirement age, men could have different attitudes toward retirement from women.

However, our RD design reports statistically insignificant results, and we provides three possible explanations. First, the limited sample size has insufficient variations that make the standard errors too high. Second, as the RD design captures a whole basket of effects of retirement, different effects might cancel out with each other and in the end make retirement neutral to mental health. For instance, the negative effect from reduction in income could offset the positive effect from the increase of leisure time. Third, as people could foresee their retirement, they could mentally or economically adjust themselves before retirement to smooth the sudden switch of lifestyle, which thus prevents us to find observable changes in depression level when they are actually retired.

This paper is organized as follows. Section 2 introduces the retirement system in China, especially the way it is compulsory to retire. Section 3 provides an overview of the empirical design, examines the assumptions of identification, and reports the RD results. Finally, Section 4 concludes.

2 Institutional Setting

2.1 Statutory Retirement Age

It is compulsory by law to retire at the statutory retirement age in China. Dating back to 1978 shortly after the end of Cultural Revolution, the Central Committee launched the *Four Modernization Plan* aiming to fully develop economy. In order to leave room for the young, who are presumably more open-minded and energetic to economical development, in May, the 5^{th} Standing Committee of the national People's Congress passed the regulation that sets up the statutory retirement age among different institutions.[4]

Specifically, the statutory retirement age is different among the government, institutions, and

[4]See http://www.npc.gov.cn/wxzl/wxzl/2000-12/07/content_9548.htm

firms. For firms' workers, the statutory retirement age is age 60 for men and age 50 for women. For officials in the government and institutions, the statutory retirement age is age 60 for men and 55 for women. Firms' workers engaging in hazardous jobs (e.g., working at heights, in high temperatures) have options to retire early at age 55 for men and age 45 for women. For all officials and workers who are disabled to work, certificated by medical department, the statutory retirement age is age 50 for men and 45 for women.

Individuals participating in pension programs can decide to apply for retirement at the statutory age. Although it seems to be voluntary to retire at the statutory retirement age, it can be regarded as compulsory in practice, as retirees only receive monthly pension once their application are approved, and the monthly pension between the date of age 60 (for men) and the date of retired will not be repaid. On the other hand, firms are NOT allowed by the "Law of the People's Republic of China on Employment Contracts" to employ individuals once they reach the statutory retirement age. Of course, those who are willing to work after retirement can choose to provide independent services and sign a service contract with firms, instead of a labor contract which is protected by the Law on Employment Contracts. For example, when unilaterally terminating a service contract, unless otherwise contracted, a firm has no obligation to its service provider for double compensation, which is statutorily insured with a labor contract. Therefore, a rational individual shall apply for retirement and leave the labor market once they meet the age requirements, though the actual retirement date could be later than the exact date or reaching age 60 (for men) due to the application procedure.

In addition to the possibility of late retirement and the early retirement because of hazardous jobs and disability, there could be "internal retirement" that allows state-owned enterprises' workers who are closed to the statutory retirement age (within 5 years) to leave their work positions while their labor contracts remain effective. The state-owned enterprises pay them allowance. Although internal retirees are not officially retired as they have not applied for retirement, they are essentially retired. To conclude, it is not necessarily the individuals get retired exactly at the date of age 60 (or 55 for women), and table 1 summarizes the statutory age for different types of workers, which leads to our fuzzy RD design in Chapter 3.

Retirement Type	Males	Females
Statutory Retirement	60	50
Officials in the gov. & Inst.	60	55
Workers doing hazardous jobs	55	45
Disabled to work	50	45

Table 1: Statutory Retirement Age in China

2.2 Pension System

Participating in pension programs is one of the necessary conditions to apply for retirement. There are 8 major pension programs, in which we mainly focus on the Pension for the Government and the Institutions and Basis Pension for the Firms. Pension for the Government and the Institutions is for officials working in government and the institutions, which is in most cases not a social mutual insurance, but funded by fiscal appropriation, and officials need not to pay for it before retirement. Basis Pension for the Firms is for firms' workers and is the most common one. All firms and firms' workers are required by the "Social Insurance Law" to co-pay the pension until the workers are retired. Supplementary Pension for the Firms, or Enterprise Annuity, is voluntarily set up by the firms only on the basis of the Basis Pension for the Firms, therefore we omit it throughout this analysis. By definition, individuals who are participating in or receiving these pensions are those covered by the compulsory retirement policy.

There are 5 other pension programs. Commercial Endowment Insurance is insured by insurance companies and voluntarily purchase by individuals. Urban Residents' Pension is for those not qualified to participate in Basis Pension for Firms, voluntarily purchased by urban residents and co-paid with the government allowance. Residents Pension and New Rural Pension are primarily for the farmers or rural residents, co-paid by individuals, collective allowance, and the fiscal allowance. Old Age Allowance is for the old above age 80 and financed by the government. These programs are primarily for farmers, self-employer and the unemployed, who have no formal retirement or receding process but start to receive pensions as social security at the age of statutory retirement age. In these cases, retirement is no longer of its typical definition, as it does not affect their working status, but merely provides a new source of income. Therefore, we do not regard individuals participating in these 5 pension programs as covered by the compulsory retirement policy throughout this study.

3 Retirement's Impacts on Mental Health

3.1 Empirical Design

As discussed in Section 2, under current retirement policy in China, there are three possible cut-offs in terms of retirement status: age 60, 55 and 50 for men, and age 55, 50 and 45 for women. Obviously, not everyone gets retired exactly at the statutory retirement age and the probability of retirement could only jump partially. So we use fuzzy RD to identify the retirement effects on mental health with whether reaching statutory retirement age as an instrument for actual retirement:

$$depre_{it} = \alpha_0 + \alpha_1 retired_{it} + \alpha_2(age_{it} - c_{it}) + \alpha_3(age_{it} - c_{it})Z_{it} + \lambda_t + u_{it} \quad (1)$$

where $depre_{it}$ is a measure of depression level of individual i in year t, and $retired_{it}$ is a dummy equal to 1 if individual i is retired. c_{it} is the statuary retirement age, and individuals who have reached retirement age are assigned 1 to instrument Z_{it}. $age_{it} - cit$ and $(age_{it} - cit)Z_{it}$ control the effects of age on depression level on each side of cutoff. Year fixed effect, λ_t, is included to control yearly specific shock. Standard errors are clustered in individual level, as one may be interviewed more than once. To show how sensitive our estimated are for different bandwidths, we also report results with alternative bandwidths.

In terms of external validity, many have suspected that the results only apply to the compliers who get retired exactly at the statutory retirement age, and it may be only a fraction of the population (Behncke (2012)), hence limited validity. Indeed, people may continue to work after the retirement age, as they are not obliged to quit while receiving pension, for example, in the United States. But in China, as discussed in section 2, once workers apply for retirement, they can no longer be employed by firms, and thus the majority are actually the compliers, which leads our study more universal.

Some might argue that age could have direct effects on mental health, which could further lead to failure of exogeneity requirement. However, this problem could be well eliminated if we limit the sample on a short interval around the cutoff, where there is no big difference in age.

3.2 Data and Summary Statistics

This study uses data from the China Health and Retirement Longitudinal Study (CHARLS) of the year 2013, 2015 and 2018. The CHARLS collects data from all counties/districts over China except Tibet. It records micro-data on an individual level including demographic background, health status, income, work, retirement, and pension.

Individuals' age is calculated at the date of interview. Individuals who self-reported retirement or who were receiving the Pension for the Government and the Institutions and Basis Pension for the Firms are regarded as retired. Individuals' income is the wage income in the past year, including bonus and allowance, excluding pension income.

VARIABLES	N	mean	sd	min	max
depression score	10,201	6.045	5.157	0	30
age	11,312	61.97	10.42	19.33	97.67
retirement status	11,498	0.664	0.472	0	1
education	10,593	8.879	4.017	0	16
marriage	11,371	0.844	0.363	0	1
gender	11,371	0.426	0.495	0	1

Table 2: Decriptive statistics

In terms of the outcome variable, CHARLS provides a measure of depression using a scale of The Center for Epidemiological Studies-Depression (CES-D) (Radloff (1977)) with 10 items. Individuals are to rate how often over the past week they experienced symptoms associated with depression, such as restless sleep, poor appetite and feeling lonely. Response options range from 0 to 3 for each item (0 = rarely or none of the time ¡ 1 days; 1 = some or a little of the time 1-2 days; 2 = occasionally or a moderate amount of the time 3-4 days; most or all of the time 5-7 days). The total depression score ranges from 0 to 30 and a high score indicates a high level of depression. It is widely agreed that a cutoff of 8 or 10 is considered depressed. We use several ways of coding depression for robustness: the sum scores, the log of sum scores, a dummy equal to 1 if the score is larger than 8, and a dummy equal to 1 if the score is larger than 10. As they yield similar results, we only report the results of log of sum scores (which we will call log depression score briefly) throughout this paper.

Potential systematic measurement error in depression score. Psychological literature have showed that it is still hard to openly talk about depression and admit mental health issues, as people tend to show a positive self-image (see for instance Brower (2021) and Coleman et al. (2017)). We plot the log depression score in Figure 2, and there are abnormal bunches at 0 where interviewees gave "rarely or none of the time" to *EACH* question. Though we cannot rule out the possibility that people do perform such a large scale, it seems more likely to suggest a systematic measurement error. Therefore, we drop out those samples whose depression score is 0 in our regression.

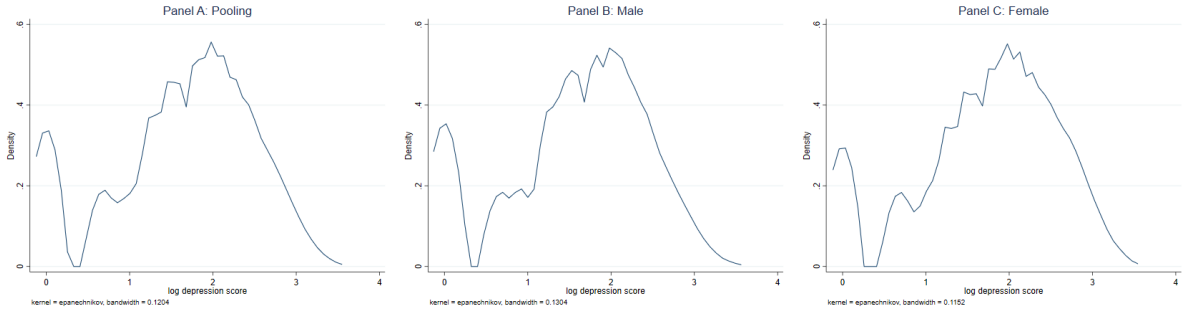

Figure 2: Potential systematic measurement error in depression score

Panel A, panel B and panel C estimate the density of log depression score with kernel density estimation method for pooling, male and female sample respectively. There are abnormal bunches at 0 for all sub-samples, indicating there might be a systematic measurement error for depression score.

3.3 Identification

Discontinuity of treatment variable. One of the underlying assumptions for fuzzy RD is the discontinuity of treatment variable across the cutoff. Panel B and C of Figure 3 show that the retirement rate jumps greatly at the cutoff, age 60 for male and age 50 for female, respectively. Due to the different statutory retirement age, we also witness a moderately jump at age 55 for male (workers doing hazardous jobs) and age 55 for female (officials in government and institutions). Since the magnitude of discontinuity is strongest at age 60 for male and age 50 for female, we use these two as cutoffs in the pooling sample. Panel A, it delivers the same result.

We also run the first stage regression as following and the results with different bandwidth are

shown in Table 3.

$$retired_{it} = \gamma_0 + \gamma_1 Z_{it} + \gamma_2(age_{it} - c_{it}) + \gamma_3(age_{it} - c_{it})Z_{it} + \epsilon_{it} \tag{2}$$

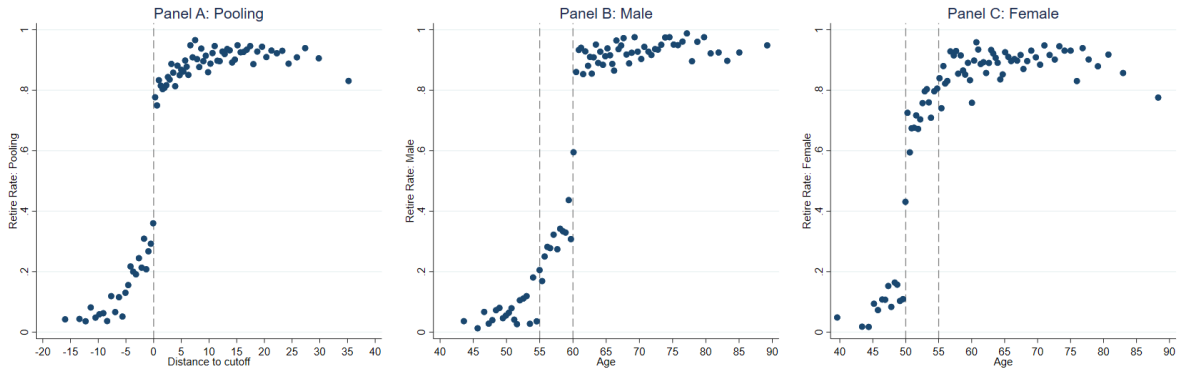

Figure 3: Discontinuity of Treatment Assignment

Panel A, panel B and panel C plot the retirement rate across different cutoff for pooling, male and female sample respectively. Each point plots an average retirement rate within a bin, and dish lines show potential compulsory retirement age. There is a stable and strong relationship between retirement and statuary retirement age.

Overall, a change from below to above the cutoff increases the probability of retirement by 44.6% with respect to a 2-year bandwidth, and 34.4% to a 1-year bandwidth. Similar significant jumps also appear in both male and female sub-sample. F-statistics are larger than 10 for all columns, indicating that our instrumental variable is a strong instrument, and that reaching statutory retirement age to a large extent indicates retirement.

	(1) Pooling	(2) Pooling	(3) Male	(4) Male	(5) Female	(6) Female
cutoff	0.446***	0.344***	0.422***	0.427***	0.479***	0.444***
	(0.046)	(0.066)	(0.062)	(0.080)	(0.065)	(0.097)
Observations	1,526	760	869	664	657	339
Bandwidth	2	1	2	1	2	1
Adjusted R-squared	0.271	0.249	0.303	0.298	0.268	0.251
F statistic	92.96	27.04	45.92	28.27	53.86	21.12

Table 3: First Stage Regression with Different Bandwidth

The dependent variable is dummy for retirement status. *Cutoff* is a indicator equal to 1 if someone has reached statutory retirement age. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Continuity of covariables. Another assumption for fuzzy RD is that other factors change smoothly across the cutoff, and the RD will therefore isolate the causal impact of reaching statutory retirement age. As education and marriage status are two of major factors that affect psychological well-being (Ross and Mirowsky (2006); Ross et al. (1983)), we select them as covariables to provide suggestive evidence for this assumption.

We restrict our sample to 2 years before and after retirement, and use linear regression to fit data on each side of the cutoff. Figure 4 plots the mean of each bin and the dash line indicates 90% confidence interval of mean estimation. While year of education and marriage status are overall balanced for pooling and female, there seems to be, for male, a sharp decrease in education, and a small jump in marriage status across the cutoff. However, as shown later, it is not a statistically significant difference.

We run a reduced-form specification using equation 2, except that we use years of education and marriage status as dependent variable. The first three columns of table 4 exam the year of education for pooling, male and female, respectively. For male, although year of education is 0.73 shorter for those above age 60, it is not statistically significant. For female and pooling sample, the results are economically small and statistically insignificant. Same arguments can be made with respect to marriage status as well. Overall, we do not see any statistically significant discontinuity of covariables across the cutoff.

VARIABLES	(1) Pooling education	(2) Male education	(3) Female education	(4) Pooling marriage	(5) Male marriage	(6) Female marriage
cutoff	-0.239	-0.738	0.300	0.016	0.063	-0.043
	(0.381)	(0.512)	(0.562)	(0.036)	(0.043)	(0.059)
Observations	1,304	718	586	1,385	776	609
R-squared	0.014	0.046	0.001	0.000	0.003	0.001
Bandwidth	2	2	2	2	2	2

Table 4: Continuity of covariables: education, marriage status

Cutoff is a indicator equal to 1 if someone has reached statutory retirement age. Robust standard errors are clustered in same individual level. *** p<0.01, ** p<0.05, * p<0.1.

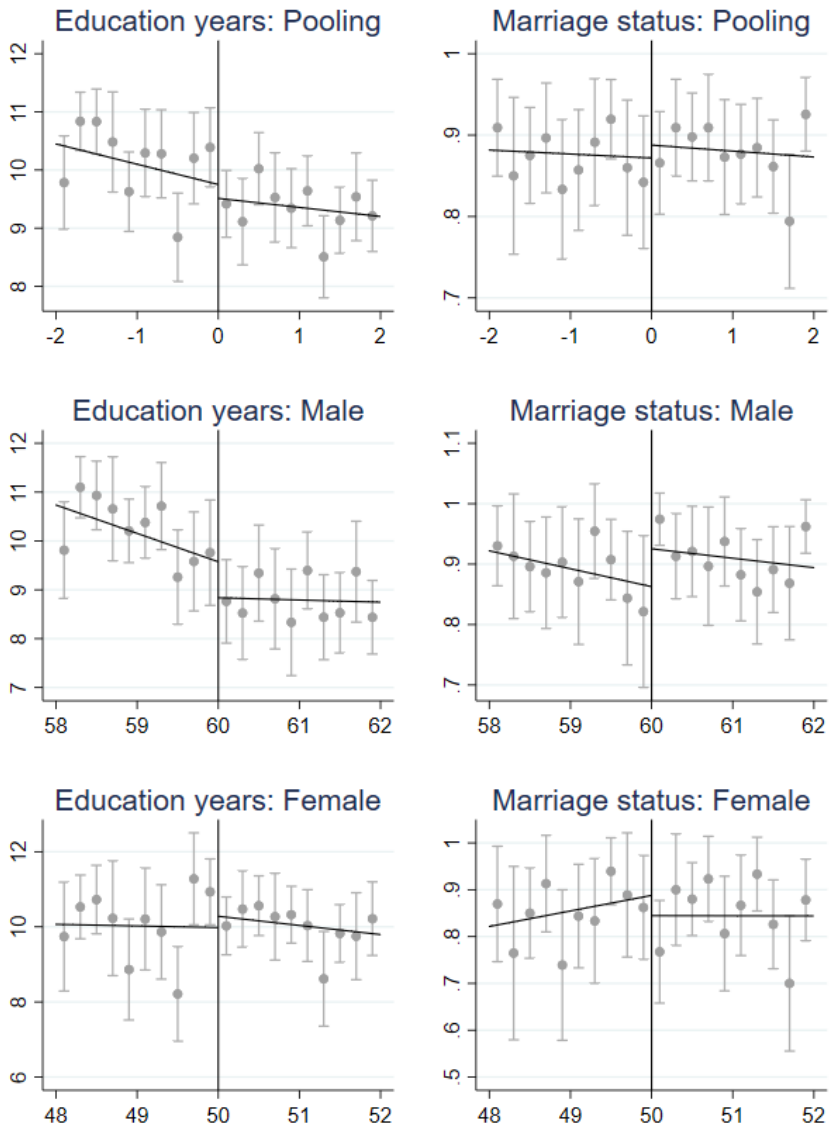

Figure 4: Continuity of covariales

Each point plots an average value within a bin. The solid line plots a local linear regression and grey lines show 90% confidence intervals.

Density of running variable besides cutoff. The last assumption of RD is that there should be no manipulability of running variable besides cutoff. In our study, it could the case that people misreport their age in order to retire earlier or latter. However, We argue that this could highly unlikely happen in our study.

The way the age was documented provides evidence for non-manipulation, as it was not self-reported by interviewees and, instead directly calculated from demographic information from personal ID, an immutable official document. This should rule out the possibility of misreporting due to some potential social stigma. Additionally, official identification information is recorded shortly after one's born by the government, connected with one's social rights and obligation, and highly impossible to be manipulated.

Figure 5 shows the density of age and there is no bunching of running variable around the cutoff. To statistically confirm this, we use *rddensity* in *stata*, and the p-value are 0.32, 0.25 and 0.39 for pooling, male and female, respectively. Hence we cannot reject the null that the age was manipulated or misreported around the cutoff.

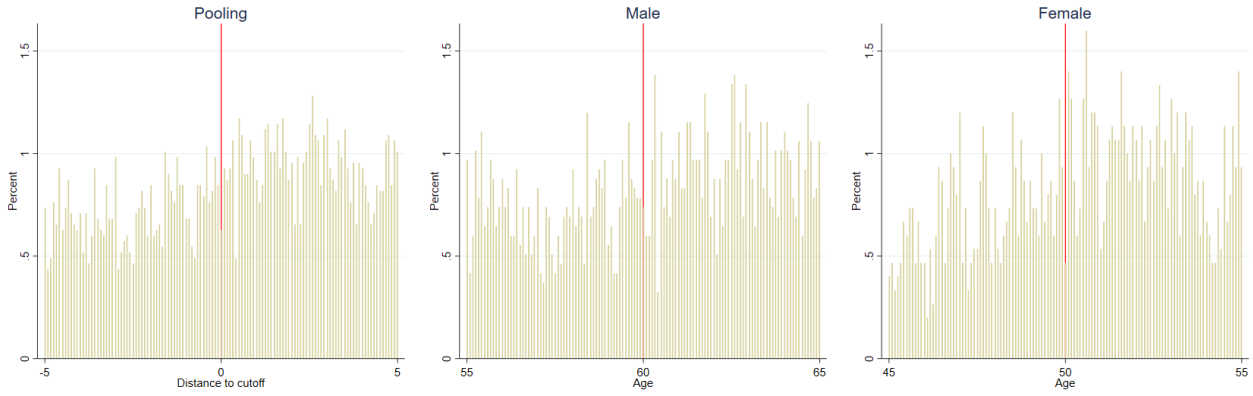

Figure 5: Manipulation of running variable

This figure shows the density of running variable for pooling, male and female sample respectively. There is no bunching of running variable around the cutoff.

3.4 Results

We now turn to exam the effect of retirement on mental health. Column (1) in Table 5 shows OLS results for pooling, male and female sample, respectively. As shown, a retired man tends to experience significantly higher depression than non-retired men, but it is not significant for women. If retirement status were exogenous, this could have lead to a causal statement. However, as we argue in the introduction, people are to some extent self-selected into retirement status according to their individual characteristics, and thus the OLS would likely suffer from endogenous problems.

	(1)	(2)	(3)	(4)	(5)
			log dep		
Panel A: Pooling	OLS	RD	RD	RD	RD
retired	0.0624***	0.050	0.062	0.075	0.035
	(0.0156)	(0.168)	(0.297)	(0.174)	(0.317)
Observations	8,705	1,173	591	1,131	576
Bandwidth	-	2	1	2	1
Education	-	No	No	Yes	Yes
Marriage Status	-	No	No	Yes	Yes
			log dep		
Panel B: Male	OLS	RD	RD	RD	RD
retired	0.0722***	0.027	-0.164	0.032	-0.204
	(0.0203)	(0.245)	(0.454)	(0.264)	(0.576)
Observations	4,737	654	323	627	313
Bandwidth	-	2	1	2	1
Education	-	No	No	Yes	Yes
Marriage Status	-	No	No	Yes	Yes
			log dep		
Panel C: Female	OLS	RD	RD	RD	RD
retired	0.0204	0.062	0.170	0.088	0.096
	(0.0258)	(0.227)	(0.352)	(0.225)	(0.346)
Observations	3,671	519	268	504	263
Bandwidth	-	2	1	2	1
Education	-	No	No	Yes	Yes
Marriage Status	-	No	No	Yes	Yes

Table 5

Panel A, panel B and panel C report pooling, male and female sample, respectively. In each panel, the first column reports the OLS results. Column (2) and (3) show RD results without controls and the last two columns add controls. Standard errors are clustered in same individual level, which are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Fuzzy regression discontinuity designs are performed in remaining columns, where we focus on the exogenous part of variation in retirement. Column (2) reports the estimates with a bandwidth of 2 years. Changing from working to retirement status increases depression level by 5.0% for the pooling, which is a 0.33 increment given the sample mean being 6.64. Although estimated effect from RD is the same as OLS in terms of economical magnitude[5], RD estimators are not sta-

[5]This could be the case because on average biases in the OLS cancel each other out—that is, an upward omitted

tistically significant with a p-value of 0.766 that is far beyond 0.1. Graphically, in Figure 6, there are merely negligible jumps of depression level across retirement age, and the 90% confidence intervals on each side mostly overlap with each other. This indicates, at least so far, that under sound empirical method design, we fail to reject the null hypothesis that retirement has no effects on mental health.

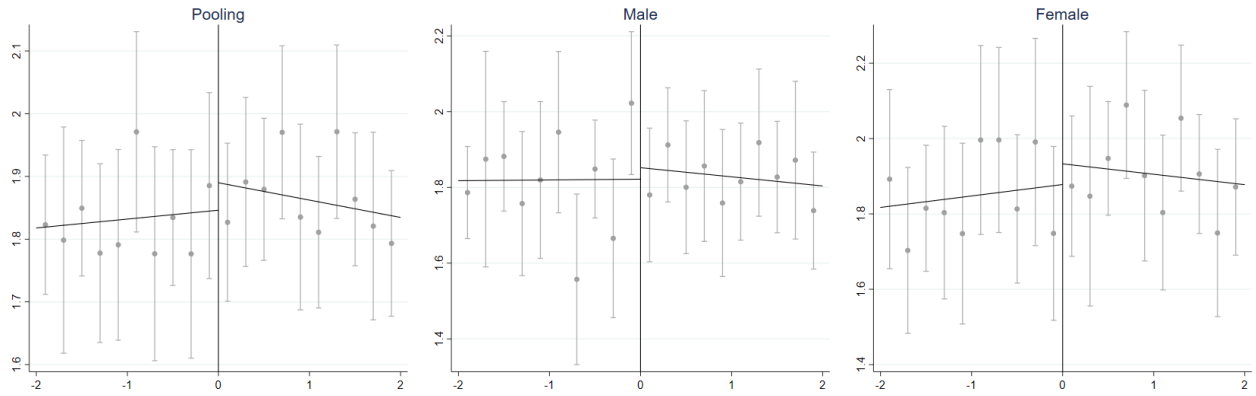

Figure 6: Retirement's Impacts on Mental Health

Each point plots an average value within a bin. The solid line plots a local linear regression and grey lines show 90% confidence intervals. there are merely negligible jumps of depression level across retirement age, and the 90% confidence intervals on each side mostly overlap with each other.

For robustness, we change the bandwidth from 2 years to 1 year in column (3), and add years of education and marriage status into regression in column (4) and (5)[6]. Given a bandwidth of 1 year, the negative signs in Panel B implies that men seem to be happier right after retirement, while women become more depressed. Although these results are again not statistically significant, they indicate that, if we look at a sufficient small interval around the retirement age, men could have different attitudes toward retirement from women, for example, retirement releases men's duty to work as a major source of income in families.

It is unsurprising that the RD estimates are not significant. There are three possible explanations. First, the CHARLES only provides limited data on retirement and depression, and a small sample may have insufficient variations that make the standard errors too high, especially for RD

variables bias cancels a downward attenuation bias—or the OLS could be a biased estimate of an average treatment effect that is different from the local average treatment effect estimated by the IV.

[6] As RD could be regarded as an ideal local randomized control trial, adding control variables that are not correlated with treatment variable could hopefully increase the precision of estimated, and at the same time keep the estimators almost the same.

design. While there are hundreds of observations at each side of the cutoff, it demands more in future research to achieve a sound conclusion.

Second, by defining the treatment variables as retirement status, we are implicitly studying a whole basket of effects of retirement, whereas retirement could affect mental health in various ways. For instance, a reduction in income makes people more depressed, and an increase in leisure time makes people happier. Indeed, the insignificant results in RD merely imply that a change in retirement status, as a whole, does not affect people's mental health, but it does not mean that the changes in other dimensions resulting from retirement make no difference. And more likely, these various impacts from other dimensions, such as income and leisure time, are counterbalanced, and in the end make retirement neutral to mental health.

Third, as statutory retirement age is public information, people foresee their retirement (and relevant changes in income, social status, leisure time, etc., because of retirement), and they might self-adjust their mental health prior to retirement to avoid being depressed later. It is therefore unsurprising that we do not observe significant changes in depression at a bandwidth of one or two years around retirement status, for they might have been psychologically prepared for it long before the cutoff. Logically, it would help if we extend the bandwidth so as to capture the long-term changes in depression (which might explains the significant OLS results in the column (1) of Table 5), but there could be too many disturbances that affect mental health in a large interval and a simple OLS may suffer severe endogenous problems.

4 Conclusion

This study examines the retirement's effects on people's depressive disorder levels in China. Overall, retirement tends to make people less happier, and it may have opposite effects between men and women in the short-term right before and after retirement. However, RD results are not statistically significant which we hope could shed lights on future studies, as the need for richer datasets, thorough analysis of various channels that affect depressive disorders, and research on retirement's long-term on mental health, remains imperative.

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