

An Empirical Study on the Health of Retirement to the Working Population

—Based on China Health and Retirement Longitudinal Study

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Abstract

With the aging of Chinese intensified, the demographic dividend is gradually less, the phenomenon of large pension gap, delay retirement to discuss fiercer. Most of the articles on the study of retirement problems, from a healthy perspective are often neglected on the basis of combing the theory of the relationship between retirement with health and the literature on the impact of retirement on health from the perspective of health empirical analysis on the effect of retirement for the elderly health. In this paper, using the China Health and Retirement Longitudinal Study (CHARLS), mandatory retirement ages as instrumental variable, to study the effect of retirement for the elderly health by fuzzy regression discontinuity design (FRD). The main conclusions of this paper: First, Chinese compulsory retirement system has a significant negative impact on male health; there is no impact on female health. Second, the impact of retirement on men is mainly caused by the impact of male mental health; retirement will increase the degree of depression in men and lead to mental health decline. Thirdly, based on men's health behavior, time use and medical use, we found that retirement does not improve the utilization medical of male; it also does not change men smoking habits and their physical exercise, but retirement will change male drinking habits, and increase their leisure time. Finally, this paper raises corresponding policy recommendations to improve personal health and better implementation of delayed retirement policies.

Keywords

Retirement, Health, Fuzzy Regression Discontinuity, Sub-Sample, Delayed Retirement

1. Introduction

At present, there is more literature on the impact of retirement on health. Pal-

more *et al.* argue that retirement has no significant effect on health and that early retirement is greater than the effect of normal retirement on health [1]. Bosse *et al.* found that retirement reduced their stress after a survey of 1516 men [2]. Kerkhofs *et al.* based on the Michigan State Research Center's retirement and health survey data, argues that there is a large endogeneity between health and retirement, and subjective health measures exaggerate the health effects of retirement [3] [4]. In the early retirement of the crowd, this subjective health measurement indicators will be more serious impact. Charles used the idea of instrumental variables to study the relationship between retirement and well-being in the study of American retirement and health problems. But does not mean that there is a causal relationship between the two [5]. In recent years, with the prevalence of breakpoint regression, some researchers have begun to use breakpoint regression to solve endogeneity. Johnston & Lee used the breakpoint regression to estimate the health effects of the British retirement, and found that retirement would improve the mental health of the elderly and had no effect on health. The results also show that retirement has no effect on personal public health expenditure. But the authors also pointed out that this is only for short-term health effects, not suitable for long-term research [6].

Most of the research on retirement in China focused on consumption and labor participation rate, the health is concentrated in the health of the elderly after retirement, the impact of retirement on health effects are less. Lei Xiaoyan using self-rated health indicators in the breakpoint regression design under the normal age of retirement has a significant negative impact on male health, no impact on women, and early retirement for men and women have no effect on health [7]. Dong Xiayan using tool variables in the study of the impact of retirement on health in China found that retirement has a significant negative impact on the elderly, and retired on women's self-evaluation of health and cognition, male depression, low level of education. The negative impact of the crowd between 45 - 54 years of age is more pronounced. And further introduction of retirement mainly through the impact of individual social activities and rest time to affect the personal health situation [8]. Deng Tinghe based on the Chinese family tracking data to study the health status of retired men, found that retirement can improve the mental health of men, but no effect on health. Further introduction from the perspective of the channel is to reduce the reduction of male stress, while improving the individual's cognitive ability, memory and satisfaction with life to improve mental health [9].

The novelty and purpose of this paper is as follows: First, the use of fuzzy regression discontinuity design can effectively solve the endogenous problem, the relationship between retirement and health can also be a good solution to the causal relationship; second, through the use of rich health indicators to explore the impact of compulsory retirement system on male and female health; third, to further study the impact of different people on their health retirement.

The outline of this paper is as follows: Firstly, it introduces the data sources

and variables in this paper. Secondly, it introduces the compulsory retirement system in China, the measurement model used in this paper, and the effect of retirement on the health of the working population. Third, the validity of the test and conclusions.

2. Data and Summary Statistics

2.1. Data

The data used in this paper comes from the China Health and Retirement Longitudinal Study (CHARLS). CHARLS is a survey conducted by the China Center for Economic Research of the National Development Research Institute of Peking University for Chinese middle-aged and elderly people who are randomly selected from the 45-year-old and above. CHARLS survey sample distribution in 28 provinces and autonomous regions of the 150 county-level units, 450 village-level units. Generally on behalf of the Chinese elderly population. Including the pre-survey of the two provinces in 2008, the national baseline survey in 2011, the two provinces in 2012, and the national follow-up survey in 2013. Due to 2008 and 2012 only two provinces of the survey data, we only used the 2011 and 2013 two years of the national survey of mixed panel data.

Since the compulsory retirement system is mainly applicable to residents who have urban hukou, the residents of rural areas have a strong selectivity when they withdraw from the labor market and can not reflect the effect of the retirement system. Therefore, we have removed the respondents from the rural areas, leaving only the urban population of the crowd as our research object. In addition, from the career planning point of view, compared with the private sector, individual enterprises, state organs and institutions, state-owned enterprises, collective enterprises to implement the retirement system to be more standardized. Therefore, this article further limits the sample in the respondents before the employment status is the state organs and institutions, state-owned enterprises, the scope of collective enterprises.

2.1.1. Dependent Variable

1) Satisfactory Health. In the CHARLS data on the Satisfactory Health of the original five-point variable: "very good", "good", "general", "bad", "very bad", for analysis, We define the first three terms as healthy and the rest are defined as unhealthy, assigned them to 1 and 0.

2) Mental health. In the CHARLS survey, respondents were asked about the length of time in the past 10 weeks: the length of the following 10 conditions: trouble because of small things, work hard to concentrate, depressed, do anything very hard, the future No hope, fear, sleep is not good, feeling bad, feel lonely, that can not live. According to the length of time each question has four options: less than 1 day, 1 - 2 days, 3 - 4 days, 5 - 7 days, respectively, as 1 - 4 points. Finally add the total score to determine the degree of individual depression. Taking into account the main study of this study is the impact of retirement on health, not to the level of mental health is divided into two categories,

so this article on the number of depressions by taking the number of standardized processing to facilitate the study.

3) Healthy body. Internationally used body mass index BMI (Body Mass Index) to measure the degree of individual obesity, and then determine the individual physical condition. The specific calculation method is $BMI = \text{weight (kg)} \div \text{height}^2 \text{ (m)}$. At the same time, the questionnaire also has a measure of daily activity capacity (ADL/IADL). As with the CES-D method, we calculate the total score of the individual's daily activity, and score for 6 points we value 1, the rest is 0.

4) Healthy behavior. We use two dummy variables to indicate whether the respondents were drinking, smoking. If the respondents drinking, smoking is 1, otherwise 0. And whether the respondents spend more than 2 hours on recreation and exercise. Greater than 2 hours, the value is 1, otherwise 0.

5) Medical use. We sorted out the number of respondents who had lived in the past year and the number of visits in the past month to study the impact of retirement on the health utilization of the elderly.

2.1.2. Control Variable

Control variables: We selected the demographic variables of the respondents: marital status, educational level, housing size, position, and provincial and year dummy variables.

Marital status: There are up to 7 options for marital status in the sample: married cohabitation, married different living, separation, divorce, widowed, unmarried, cohabitation. In this paper, the marriage status of the individual is set as the binary dummy variable, and the value is 0 for the separated, divorced, widowed and unmarried. The rest is 1; the educational level: There are 11 options for education in the questionnaire. For the sake of our study, we will organize the individual education level into three types: primary or primary school, high school and junior high school, college; Housing size: selected the family housing area in the questionnaire; In this paper, the individual job status is set to a binary dummy variable, with the average staff as the base group, the value is 0; the other is set as the control group, the value is 1; province: sample Data from the 28 provinces and autonomous regions, in order to avoid multiple collinearity, the introduction of 27 binary dummy variables to be controlled; Year: This article selected a total of 2011 and 2013 data, so the introduction of a binary dummy variable control.

2.1.3. Independent Variable

Age: Because Chinese compulsory retirement system is based on the age of the individual, we use the age of the individual minus the statutory retirement age as our independent variable, which is:

$$X_i = x_i - c_i$$

where x_i is the actual age of the individual, c_i is the legal retirement age, X_i is our independent variable.

2.2. Summary Statistics

Table 1 gives a summary statistics of the variables used in this article. **Table 1** provides the number of samples, mean, standard deviation, minimum, maximum. Panel A shows the male individual characteristics. The average age of 60 years old, 64% of the individual at the time of the questionnaire was retired, the average family housing area of 101 square meters, and the standard deviation of 67.76, Indicating that the housing area between the individual differences quite different; 96% of the marital status has been Marriage, 15% of the education level for college and above, 76% for secondary school, indicating that the respondents the level of education is low, the cultural level is relatively low. 62% for managers. Panel B shows the health characteristics of male individuals as well as medical use. 65% of men were satisfactory, with an average depression index of 15.4 and a body mass index of 24.6. 14% of the respondents had ADL/IADL dysfunction, 13% of whom had lived in the past year. The average number of visits in a month was 0.3. Panel C shows the health behavior of male individuals. Of which 61% of men drank alcohol in the past year, 56% smoked, and men spent 20% more than 2 hours on recreation and spent more than 2 hours on exercise 11%.

Table 1. Summary statistics of male.

Variable	N	Mean	SD	Min	Max
Panel A					
Age	1788	60.39	5.880	50	70
Retired	1788	0.640	0.480	0	1
Housing size	1788	101.3	67.76	0	1000
Married	1788	0.955	0.208	0	1
Education (College or higher)	1788	0.145	0.352	0	1
Education (Secondary)	1788	0.758	0.428	0	1
position	1788	0.614	0.487	0	1
Panel B					
Satisfactory Health	1788	0.653	0.476	0	1
Mental Health	1788	15.40	4.564	10	38
BMI	1788	24.64	3.723	15.28	57.06
Adl/IADL	1788	0.139	0.346	0	1
Hospital stay	1788	0.128	0.334	0	1
Number of doctor visits	1788	0.328	1.481	0	30
Panel C					
Drinking	1788	0.606	0.489	0	1
Smoking	1788	0.559	0.497	0	1
Leisure time	1788	0.190	0.393	0	1
Exercise time	1788	0.110	0.313	0	1

Table 2 gives a descriptive statistic of the variables used in this article. **Table 2** provides the number of samples, mean, standard deviation, minimum, maximum. The Panel A shows the female individual characteristics. The average age of 53 years old, 66% of the individual in the questionnaire was retired, the average family housing size of 90 square meters, and the standard deviation of 54.32, indicating that the housing size between the individual difference; 91% of the marital status has been Marriage, 12% of the education level for college and above, 73% for secondary school, indicating that the education level of respondents as low as men. 76% for managers. Panel B shows the health characteristics of women and the use of medical care. 73% of the respondents were satisfactory, with an average depression index of 16.3 and a body mass index of 24.9. 12% of the respondents had ADL/IADL dysfunction, 9% of whom had lived in the past year, The average number of visits in the past month was 0.4. Panel C shows the health behavior of female individuals. Which women spend more than 2 hours on recreation for 16% and spend only 4% of the time spent on exercise for more than 2 hours.

3. Empirical Analysis

3.1. Chinese Compulsory Retirement System Background

Since the founding of new China, has developed a number of retirement system. At present, Chinese retirement system mainly comes from the 1954 State Council's

Table 2. Summary statistics of female.

Variable	N	Mean	SD	Min	Max
Panel A					
Age	1713	53.27	4.386	45	60
Retired	1713	0.657	0.475	0	1
Housing size	1713	90.31	54.32	0	500
Married	1713	0.915	0.279	0	1
Education (College or higher)	1713	0.119	0.323	0	1
Education (Secondary)	1713	0.734	0.442	0	1
Position	1713	0.756	0.430	0	1
Panel B					
Satisfactory Health	1713	0.726	0.446	0	1
Mental Health	1713	16.29	5.019	10	40
BMI	1713	24.92	4.196	15.12	60.97
Adl/IADL	1713	0.124	0.330	0	1
Hospital stay	1713	0.0940	0.292	0	1
Number of doctor visits	1713	0.426	1.487	0	30
Panel C					
Leisure time	1713	0.163	0.370	0	1
Exercise time	1713	0.04	0.196	0	1

Labor Insurance Regulations of the People's Republic of China, the Interim Provisions of the State Council on the Retirement of Workers and Staff in 1958, and the State Council's Arrangement on the placement of old and weak diseases Interim Measures for the Remuneration of Cadres "and" Interim Measures of the State Council on Retirement of Workers' Retirement". The specific provisions are as follows:

1) Under normal circumstances. Age stipulates: party and government organs, mass organizations, enterprises, institutions of cadres, retirement age men over 60 years old, women over 55 years old; and for the ownership of enterprises, institutions and party and government organs, mass groups of workers, men At least 60 years old, women over 50 years old. Length of service: cadres and workers, whether according to the provisions of normal retirement, or because of the nature of work, labor intensity and physical condition early retirement, must be working time for 10 years. There are different working hours for cadres and workers, cadres are working days, and workers are working hours.

2) Special provisions for early retirement. For men engaged in underground, high altitude, high temperature, especially heavy manual labor and harmful to the health of the work, men over 55 years old, women over 45 years old, continuous age of 10 years, you can retire early. For workers and workers who are deprived of their ability to work because of disability, men and women can retire early to 45 years old and 45 years old, and those who are deprived of work due to disability are male and female. To 50 years old and 45 years old to retire.

The above provisions are mainly used for urban areas in China, rural residents can decide according to their actual situation when to withdraw from the labor market, there is no legal way of retirement. At present, China is the implementation of mandatory retirement system, the normal retirement is to apply for retirement procedures, including normal retirement, early retirement, retreat and other forms.

3.2. Econometric Models

First, we examined the change in the rate of retirement among men at all ages. The horizontal axis of **Figure 1** represents the age of the male individual and the vertical axis represents the retirement rate. The points in the graph represent the average rate of retirement at each age point. As shown in the figure, male individuals at the age of 50, the retirement rate of less than 10%, at the age of 59, the retirement rate gradually increased to 47%, but when at the age of 61, the retirement rate as high as 88%, male retirement rate has been a significant jump, after the retirement rate close to 100%. **Figure 1** shows that the male individual retirement rate of urban residents before and after the age of 60 there is a clear jump, so we can take a 60-year-old breakpoint in regression analysis, the use of forced retirement system in the retirement age to identify the continuity the causal relationship between retirement and health. In order to avoid the ambiguity of the mandatory retirement policy on the retirement age policy, we excluded 60-year-old male respondents from the model estimates.

As with the practice of male, we examined the change in the rate of retirement among female at all ages. The horizontal axis of **Figure 2** represents the age of the female individual, and the vertical axis represents the retirement rate. As shown in the figure, female individuals at the age of 45, the retirement rate of 7%, less than 10%, at the age of 49, the retirement rate gradually increased to 16%, but when the age of 51 years of age, the retirement rate as high as 57%, Indicating that between 49 - 51 years old, women's retirement rate has been a clear jump. Since then when the female age to 54, the retirement rate of 70%, at the age of 56, the retirement rate of 76%, since the retirement rate gradually close to

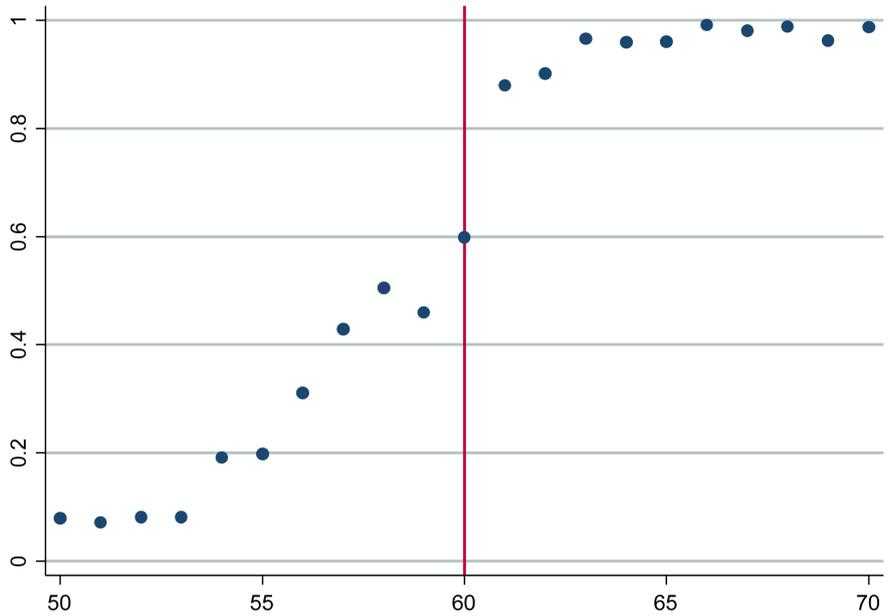


Figure 1. Male retirement rate and age.

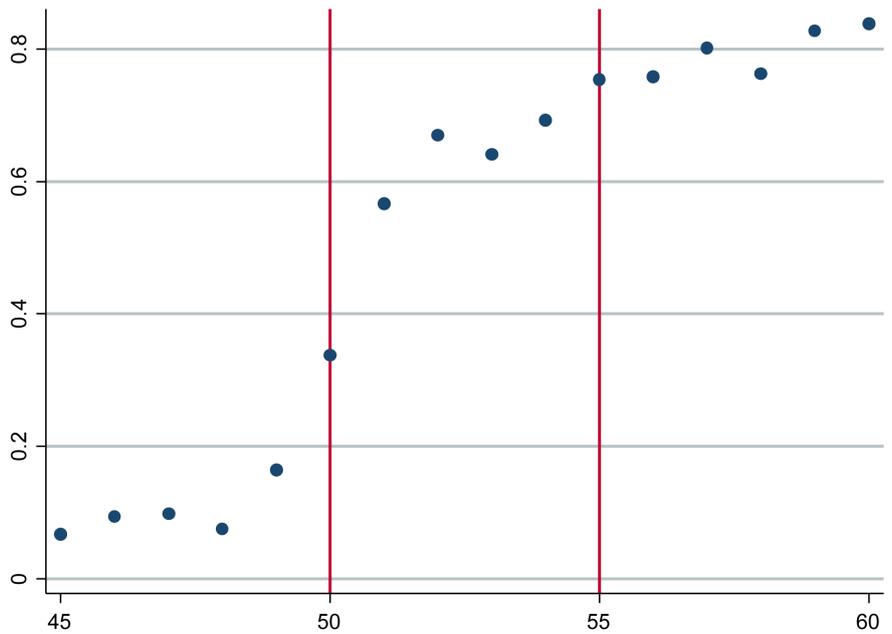


Figure 2. Female retirement rate and age.

100%. In China, women’s retirement age is more complex than men, and there may be multiple age breakpoints. As shown in **Figure 2**, according to the data presented in this paper, there may be two age breakpoints, 50 and 55 years for female retirement rates. Therefore, in the following analysis, we are 50 years old and 55 years old as the female age breakpoints were studied, the same to avoid ambiguity of the mandatory retirement policy on the retirement age policy, we were excluded 50 years old and 55 years old female respondents.

We suppose:

$$D_i = \begin{cases} 1 & \text{if } x_i \geq c_i \\ 0 & \text{if } x_i < c_i \end{cases}$$

where D_i is the processing variable, indicating the retired state of the respondent i ; x_i is the driving variable, indicating the age of the interviewee i ; c_i is the age breakpoint. When the individual is greater than or equal to c_p , D_i is equal to 1, we said the individual has retired, otherwise there is no retirement.

Imben and Lemieux argue that the use of simple nuclear regression will produce a large deviation, relatively speaking, the use of local linear regression method can reduce this bias [10]. Similarly, when the dependent variable and the processing variable use different bandwidth, the accuracy of the estimation can be improved, but also the progressive deviation. Therefore, we use the local linear regression method in the regression estimates of the dependent variables and the processing variables and use a uniform bandwidth reduction bias. Specifically:

First, for the dependent variable Y , we use the local linear regression method to estimate the regression function on both sides of the breakpoint:

$$\begin{aligned} (\hat{\alpha}_{yl}, \hat{\beta}_{yl}) &= \arg \min_{\alpha_{yl}, \beta_{yl}} \sum_{c-h \leq X_i < c} (Y_i - \alpha_{yl} - \beta_{yl}(x_i - c) - \gamma(x_i - c)^2)^2 \\ (\hat{\alpha}_{yr}, \hat{\beta}_{yr}) &= \arg \min_{\alpha_{yr}, \beta_{yr}} \sum_{c < X_i \leq c+h} (Y_i - \alpha_{yr} - \beta_{yr}(x_i - c) - \gamma(x_i - c)^2)^2 \end{aligned}$$

The size of the breakpoint estimate in the regression function can be expressed $\hat{\tau}_y = \hat{\alpha}_{yr} - \hat{\alpha}_{yl}$ for the individual health condition Y . $x_i - c$ for age breakpoints (respondents age - legal retirement age). For the retired variable D , we consider the following two local linear regression:

$$\begin{aligned} (\hat{\alpha}_{wl}, \hat{\beta}_{wl}) &= \arg \min_{\alpha_{wl}, \beta_{wl}} \sum_{c-h \leq X_i < c} (Y_i - \alpha_{wl} - \beta_{wl}(x_i - c) - \gamma(x_i - c)^2)^2 \\ (\hat{\alpha}_{wr}, \hat{\beta}_{wr}) &= \arg \min_{\alpha_{wr}, \beta_{wr}} \sum_{c < X_i \leq c+h} (Y_i - \alpha_{wr} - \beta_{wr}(x_i - c) - \gamma(x_i - c)^2)^2 \end{aligned}$$

The size of the breakpoint estimate in the regression function can be used for the retired variable D . Finally, we estimate that the experimental effect of FRD is the ratio of the above two estimates:

$$\hat{\tau}_{FRD} = \frac{\hat{\tau}_y}{\hat{\tau}_w} = \frac{\hat{\alpha}_{yr} - \hat{\alpha}_{yl}}{\hat{\alpha}_{wr} - \hat{\alpha}_{wl}}$$

In nonparametric estimators, the choice of bandwidth is related to the accu-

racy and error of the estimate. On the one hand, the choice of large bandwidth makes the estimate more accurate, but the error will increase, on the other hand select a small bandwidth makes the error reduced, while the accuracy will decline. So Imben and Lemieux (2008) argue that this progressive deviation can be avoided by choosing the minimum bandwidth in the dependent variable and the processing variable regression by cross validation [10].

3.3. The Impact of Retirement on Male and Female Retirement Rates

As mentioned earlier, we can see from **Figure 1** that male have a significant jump at the normal retirement age (60 years) of compulsory retirement policy. The regression results also confirm our previous analysis. **Table 3** gives the results of a local linear regression estimate of the effects of forced retirement systems on male retirement. The explained variable is the retirement rate at each age point. Among the models (1) and (2) we selected the sample space is 50 - 70 years old, the model (3) and (4) we selected the sample space is 55 - 65 years old. At the same time, we also add different age order to construct the nonlinear relationship for RD estimation. From the estimates, we can see that the impact of the age dummy variable on the retirement rate in the models (1) - (4) is significantly positive at the 1% level, indicating that the increase in the retirement rate of the retirement age have a significant impact. For male, in the normal retirement age, the retirement rate is about 38% of the jump.

From **Figure 2**, we can see that female are significantly jumping at the age of 50 at the normal retirement age of the mandatory retirement policy, and the 55-year-old jump is not very obvious. This is due to the small ratio of female cadres to all women. The regression results also confirm our previous analysis. **Table 4** gives the results of a local linear regression estimate of the effects of forced retirement systems on female retirement. The explanatory variable is the retirement rate at each age point. Model (1) - (4), we estimate the results of a local linear regression with a 50-year-old breakpoint, Model (5) - (8) We estimate the results of a local linear regression with a 55-year-old breakpoint. As with men's estimates, we also added different age order to construct nonlinear relationships for RD estimation. From the estimates, we can see that the impact of age dummy variables on retirement rates is significantly positive at 1% in models (1) - (4) with a breakpoint of 50 years old, indicating that policy Retirement age

Table 3. The effect of retirement on male retirement rate.

	Explained variable: retired			
	(1)	(2)	(3)	(4)
Age	0.380*** (0.125)	0.384*** (0.065)	0.384*** (0.125)	0.386*** (0.065)
Polynomial of age	Second	Third	Second	Third
N	1788	1788	1118	1118

Notes: Robust standard errors in brackets, *, **, ***significance: $p < 0.1$, $p < 0.05$, $p < 0.01$.

has a significant impact on the increase in female retirement rates. Indicating that for women, in the normal 50-year-old retirement age, retirement rate of about 38% - 42% of the jump. In the model (5) - (8) with a 55-year-old breakpoint, the effect of age dummy variables on retirement rates was significantly positive at the 10% level, indicating that in the 55-year-old retirement age, the retirement rate was approximately 32% - 41% of the jump.

From **Table 3** and **Table 4**, the impact of retirement system on male and female retirement rates, is equivalent to the first stage of the FRD. In the estimation we have taken different age intervals and age control functions to verify the stability of the estimation results. The results show that China's compulsory retirement system for men and women had different degrees of significant impact. Next, we focus on the impact of retirement in the second stage on male and female health.

3.4. The Impact of Retirement on Male and Female Health

Table 5 reports the impact of retirement on satisfactory health, mental health and physical health. And Lei Xiaoyan (2010) study found that the retirement age in the normal retirement age of male satisfactory health has a significant negative impact. As can be seen from **Table 5** (1), the estimated coefficient of male satisfactory health is -0.586 , which is significantly negative at the 5% level, indicating that 58.6% of the male population will reduce their satisfactory health after retirement coefficient. Next, we analyze the impact of retirement on different health aspects of male. Model (2) showed that the degree of depression in men

Table 4. The effect of retirement on female retirement rate.

	Explained variable: retired							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Age	0.394*** (0.111)	0.427*** (0.094)	0.384*** (0.113)	0.419*** (0.096)	0.414* (0.23)	0.325* (0.188)	0.410* (0.222)	0.324* (0.181)
Polynomial of age	Second	Third	Second	Third	Second	Third	Second	Third
N	767	767	512	512	946	946	543	543

Notes: Robust standard errors in brackets, *, **, ***significance: $p < 0.1$, $p < 0.05$, $p < 0.01$.

Table 5. The effect of retirement on male health.

	(1)	(2)	(3)	(4)
	Satisfactory Health	Mental Health	BMI	ADL/IADL
Retired	-0.586^{**} (0.258)	0.302^{**} (0.149)	-0.051 (0.090)	0.204 (0.194)
Polynomial of age	Second	Second	Second	Second
Controls	Yes	Yes	Yes	Yes
N	1788	1788	1788	1788

Notes: Robust standard errors in brackets, *, **, ***significance: $p < 0.1$, $p < 0.05$, $p < 0.01$. 60 years old interviewee has been removed to avoid ambiguities defined before and after policy age. All models includes education, married and housing size.

increased by 30.2% (equivalent to an increase in depression index of 4.7) and was significant at the 5% level. Model (3) showed that the effect of retirement on the body mass index was negative, but not significant at the 10% level. Model (4) also shows that retirement has no significant effect on the individual's ability to live.

In general, the empirical results confirm that retirement will significantly reduce the health of men. Compared with good health, retirement is more likely to affect the level of male mental health. Because health is a multi-dimensional concept, a single indicator can not really reflect the individual's health. Satisfactory health is a complex of physical health and subjective mental health, a general description of the individual's physical condition, so it is difficult for us to analyze how the compulsory retirement system in China affects males through a single dimension of satisfactory health, so even if the results of satisfactory health is significant, we can not determine how retirement affects health. In psychology, a large degree of depression reflects person mental health, a lot of mental illness are from the beginning of depression. And we estimated that the retreat had a significant effect on the mental health of men by estimating the CES-D scale. And the physical condition is a complex measure, even if the BMI and ADL/IADL estimates, the results can not be a good description of the impact of retirement on the health of the body, but according to estimated results, Retirement does not affect male health, so we do not refuse to retire on the health of men have no effect on the conclusions. Therefore, through the estimation of these four indicators, we believe that the retirement system on the health of men have a negative impact, and mainly through the impact of mental health to affect the health of men.

Table 6 reports the impact of retirement on medical use, health behavior and time allocation. In model (1) (2), retirement leads to an increase in the probability of male hospitalization and a reduction in the number of visits, but this result is not significant. This is the current Chinese citizens on their physical examination is not high or consistent with the attention. Model (3) shows the impact of retirement on male drinking behavior, and I found that retirement would reduce

Table 6. The effect of retirement on male health behavior and time use.

	(1)	(2)	(3)	(4)	(5)	(6)
	Hospital	Number of doctor visits	Drinking	Smoking	Leisure time	Exercise time
Retired	0.093 (0.146)	-0.108 (0.178)	-0.531** (0.269)	-0.426 (0.278)	0.540* (0.298)	-0.055 (0.194)
Polynomial of age	Second	Second	Second	Second	Second	Second
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	1788	1788	1788	1788	1547	1547

Notes: Robust standard errors in brackets, *, **, ***significance: $p < 0.1$, $p < 0.05$, $p < 0.01$. 60 years old interviewee has been removed to avoid ambiguities defined before and after policy age. All models includes education, married and housing size.

male drinking behavior by 53 percentage points. And significant at the 5% level. Because male have to drink may be due to work for entertainment, so after retirement, with this part of the activities of the reduction, the frequency of male drinking was leaping decline. Model (4) shows that retirement also reduces male smoking behavior, but is not significant at the 10% level. This may be the work of men relatively easy to develop the habit of smoking, and this habit is generally difficult to change, so after retirement, men will continue this way of life, not because of retirement and a major change. From the model (5) (6), the probability that men will allocate more time to recreation increases by 54% and is significant at the 10% level, and the distribution of men in the exercise time is not Retirement and a significant change. This may be due to the fact that after retirement men are more willing to arrange their own life through leisure and entertainment, and participation in physical exercise is even more difficult.

Table 7 reports the impact of retirement on female satisfactory health, mental health and physical health. The model (1) - (4) is estimated at the age of 50, and the model (5) - (8) is estimated at the age of 55. We have found that there is no any influence. May be because, in China, most of the concept of family life is male and female, compared to men, women are not so sensitive to retirement, so after retirement women are more likely to adjust themselves, change their identity, so that their smooth Spent on retirement.

Table 8 reports the impact of retirement on female hospital, number of doctor visits, leisure time and exercise time. The model (1) - (4) is estimated at the age of 50, and the model (5) - (8) is estimated at the age of 55. We have found that there is also no any influence. May be due to the fact that women are already slowly changing their way of life before retirement, so retirement does not have much impact on them.

Table 7. The effect of retirement on female health.

	(1)	(2)	(3)	(4)
	Satisfactory Health	Mental Health	BMI	ADL/IADL
Retired	-0.188 (0.287)	-0.238 (0.194)	-0.147 (0.143)	-0.093 (0.185)
Polynomial of year	Second	Second	Second	Second
Controls	Yes	Yes	Yes	Yes
N	767	767	767	767
	(5)	(6)	(7)	(8)
Retired	0.197 (0.359)	-0.238 (0.194)	0.253 (0.149)	0.798 (0.460)
Polynomial of age	Second	Second	Second	Second
Controls	Yes	Yes	Yes	Yes
N	946	946	946	946

Notes: Robust standard errors in brackets, *, **, ***significance: $p < 0.1$, $p < 0.05$, $p < 0.01$. 50 years old and 55 years old interviewee has been removed to avoid ambiguities defined before and after policy age. All models includes education, married and housing size.

Table 8. The effect of retirement on female health behavior and time use.

	(1)	(2)	(3)	(4)
	Hospital	Number of doctor visits	Leisure time	Exercise time
Retired	0.213 (0.270)	0.875 (1.185)	0.073 (0.519)	-0.106 (0.264)
Polynomial of year	Second	Second	Second	Second
Controls	Yes	Yes	Yes	Yes
N	767	767	767	767
	(5)	(6)	(7)	(8)
Retired	1.730 (2.681)	1.235 (2.603)	-1.872 (3.525)	0.875 (2.039)
Polynomial of age	Second	Second	Second	Second
Controls	Yes	Yes	Yes	Yes
N	946	946	946	946

Notes: Robust standard errors in brackets, *, **, ***significance: $p < 0.1$, $p < 0.05$, $p < 0.01$. 50 years old and 55 years old interviewee has been removed to avoid ambiguities defined before and after policy age. All models includes education, married and housing size.

Through the above empirical study we can get the conclusion: First, in Chinese compulsory retirement system, compared to men, women will appear multiple retirement age breakpoints; second, retirement has no significant impact on female health; thirdly, retirement has a significant negative impact on male health, and mainly through the mental health to affect the health of men. At the same time after retirement, the male lifestyle will also change. Retirement will increase male leisure time, but it will not change their medical use.

4. Validity Test

In order to verify the robustness of our model estimation results and the validity of the fuzzy regression discontinuity design, we have done some necessary tests in this chapter. First, the selection of different RD estimated age range, the impact of retirement on male self-assessment of health and mental health has not changed. Second, in the model estimates to choose the age of the higher order, the impact of retirement on the direction of male health has not changed. Finally, there is no significant result of the continuity of the control variables in the test model at the breakpoint, indicating that these non-retired control variables are continuous at the breakpoint and no jumps occur.

5. Conclusion

On the basis of literature review, this paper analyzes the impact of compulsory retirement system on male and female from the perspective of health. Based on the China Health and Retirement Longitudinal Study (CHARLS), this paper uses the fuzzy regression discontinuity design as a model to solve the endogenous basis. The impact of compulsory retirement system on the health status of the

elderly was investigated using a nonparametric approach.

The empirical results of this paper show that, first, Chinese compulsory retirement system has a significant negative impact on male health; no effect on female health. Second, the impact of retirement on men is mainly through the impact of male mental health. Retirement increases the degree of depression in men, leading to a decline in mental health. Thirdly, retirement will not lead to improved male health care use, nor will it change male smoking habits and their physical exercise. But the retirement will change the male drinking habits, as well as increase their leisure time.

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