Impact of Retirement and Re-employment on Health of Older Adults

Jong-Wha Lee[++] and Do Won Kwak[+]

Abstract

Increasing life expectancy poses significant challenges to the employment and quality of life of older adults. This study examines the impact of retirement and re-employment on the health of older adults in Korea, utilizing longitudinal data from 2008 to 2020. We employ the instrumental variables method to estimate causal effects by leveraging variations in pension eligibility age and benefit amounts. The results reveal that retirement leads to a significant deterioration in health outcomes, including self-rated health, chronic diseases, and depression among older individuals. Conversely, re-employment after retirement is associated with a notable improvement in overall health. We find that retirement and re-employment influenced retirees' health by changing their engagement in physical and social activities. These results suggest that policies encouraging late retirement or facilitating new employment opportunities and social activities post-retirement may mitigate or delay adverse health outcomes among older adults.

Keywords: aging, depression, health, retirement, re-employment

JEL Classification Codes: I12, J14, J26

Declaration of Interest
The authors declare that they have no conflict of interest.

Acknowledgments
The authors express their gratitude to two anonymous reviewers, Hal Hill, Alex Hollingsworth, Kwanho Shin and seminar participants at Korea University and Singapore Economic Review Conference 2024 for their helpful comments, and Serim Shin for research assistance.

Funding
This work was supported by a grant from Korea University (K2404621).

[+] Correspondence: Graduate School of International Studies, Korea University, 145 Anam-ro, Seongbuk-gu, Seoul 02841, Republic of Korea. E-mail: dwkwak@korea.ac.kr

[++] Economics Department, Korea University, 145 Anam-ro, Seongbuk-gu, Seoul 02841, Republic of Korea. E-mail: jongwha@korea.ac.kr. https://orcid.org/0000-0002-3152-4961

1. Introduction

Rising life expectancy poses significant challenges to the health and quality of life of older adults. This issue is particularly pronounced in the Republic of Korea (hereafter Korea), which is experiencing a rapid demographic shift toward a super-aged society. In 2022, citizens aged over 65 accounted for 17% of the population (over 9 million people), with the figure projected to increase to 34% (over 17 million) by 2040 (Figure 1). Although this suggests the potential for prolonged well-being, it also poses serious challenges for seniors who face inadequate income and declining health after retirement (Deaton, 2008; Banerjee et al., 2023). The high suicide rate of older individuals in Korea, which stood at 46.1 per 100,000 people aged above 70 in 2022, underscores the challenges faced by seniors. The figure is significantly higher than the average for younger age groups and remains one of the highest among Organisation for Economic Co-operation and Development (OECD) countries. Factors contributing to the high suicide rate include financial constraints, inadequate social safety nets, and social isolation, particularly in rural areas, where access to medical and mental health services is limited (Jang et al., 2022).

The rising older population has generated increasing social interest regarding Korean seniors, particularly in terms of labor force participation. Despite their willingness to work, many older adults in South Korea struggle to find suitable jobs. It is common for Koreans to retire from their primary jobs well ahead of their legal retirement age, with retirees often pursuing new employment. Consequently, we observed an increase in employment rates among individuals aged 55 and above, from 44.3% in 2010 to 51.7% in 2022. Similarly, among the population aged 65 and above, employment rates rose from 29% to 36.2% during the same period (Figure 2).

Retirement can positively affect seniors' health and quality of life by reducing work-related stress and providing additional time for physical activity and well-being, particularly in Korea, where work intensity is high. However, retirement also poses certain challenges, considering that it often involves the loss of financial and social resources, which could negatively affect health and quality of life. Therefore, it is crucial to address both the physical and mental health challenges associated with retirement to ensure the overall well-being of seniors.

This study investigates the impact of retirement and re-employment after retirement on health outcomes, including self-rated health, daily living difficulties, chronic diseases, and depression. We utilize longitudinal data from the Korean Longitudinal Study of Ageing (KLoSA) from 2008 to 2020, sourced from the Korea Employment Information Service (2021). To estimate the causal effects of retirement and re-employment on health, we employ the instrumental variables method, including statutory eligibility ages for retirement pension benefits and their amounts as instruments for retirement and re-employment decisions, while controlling for various individual characteristics known to influence health. Specifically, we leverage the exogenous variation in public pension eligibility age and pension benefit amount resulting from pension reforms introduced in 1997 and 2008.[1] These reforms increased the pension eligibility age for later-born cohorts while also reducing the monetary value of pension benefits. In 1997, the national pension was reformed to reduce the income replacement ratio from 70% to 60% and to gradually increase the pensionable age from 60 to 65 over the period from 2013 to 2033. In 2008, the income replacement rate was further reduced to 50%, with an incremental decrease of 0.5 percentage

[1] Korea operates a multi-tier pension system consisting of the mandatory National Pension Scheme (NPS) and various forms of private pensions. The NPS, established in 1988, is an earnings-related, mandatory public pension scheme covering all citizens aged 18 to 59. Private pensions include occupational pension plans, where employers offer either a severance pay plan or a retirement pension plan, and voluntary personal pension plans. Our analysis focuses on the NPS and Specific Corporate Pensions for groups such as private school teachers, government employees, military personnel, and postal workers, which operate under similar principles. Private pensions, which have expanded since the introduction of tax-advantaged retirement pension plans in 2005, are voluntary, relatively limited in scope, and vary in structure. For further detailed information, see the National Pension Service homepage (https://www.nps.or.kr/jsppage/english/scheme/scheme_01.jsp) and OECD (2022).

points each year, reaching 42% in 2024. These reforms, which determine the eligibility age and benefits for retirement pension, are unlikely to be related to individuals' health status. The less generous pension benefits for later-born cohorts reflect changes in demographic structure and government budget constraints over the years.

Furthermore, this study aims to investigate the channels through which retirement and re-employment affect health, focusing on activities such as smoking, alcohol consumption, leisure, physical activity, and social interactions. Using data on older individuals' engagement in these areas, we assess whether these activities change after retirement or re-employment.

Existing literature indicates both positive and negative effects of retirement on the physical and mental well-being of older individuals through various channels. Economic theory views health as a crucial human capital that influences productivity and income (Grossman, 1972). Although aging typically leads to a decline in health, investing more time and resources can improve it. While retirement provides more time for health-related activities, it can also reduce health investment driven by financial constraints. Retirement can alleviate work-related stress (Minkler, 1981; Westerlund et al., 2009; Coursolle et al., 2010) but may also introduce new stressors that negatively impact health. Regular work shapes self-identity and psychological resources (Taylor and Bengtson, 2001), and fosters social activities that enhance health and satisfaction (House, Landis & Umberson, 1988). Retirement-induced isolation can disrupt healthy habits and lead to depression.

Empirical studies have shown varied effects of retirement on health. Some studies have reported the positive effects of increased health investment and reduced stress (Charles, 2004; Neuman, 2008; van der Heide et al., 2013; Atalay and Barrett, 2014; Insler, 2014; Eibich, 2015; Kämpfen & Maurer, 2016; Celidoni et al., 2017; Müller & Shaikh, 2018), while others highlight negative effects driven by increased stress and reduced health investment (Dave et al., 2008; Mazzonna & Peracchi, 2012; Behncke, 2012; Bonsang et al., 2012; Calvo et al., 2013; de Grip et al., 2015). These discrepancies may stem from different data sources, methods, or variations in retirement and social systems. Research on the impact of retirement on health in Korea is also mixed. Some studies have demonstrated a decline in self-reported health post-retirement (Choi et al., 2008; Lee and Kim, 2017; Kim and Choi, 2017), suggesting income loss, weakened social networks, and increased stress. Conversely, other studies indicate that retirement can improve physical health by promoting physical activity and reducing smoking (Kim et al., 2016; Kim and Jeong, 2022). Findings on mental health outcomes are also mixed, with some showing higher depressive symptoms post-retirement (Lee and Smith, 2009), while others found no significant effect (Jang et al., 2009; Ha, 2015).

This paper extends the existing literature by making several contributions. First, in addition to utilizing reforms in the statutory eligibility ages for retirement pension benefits, which gradually increased, we construct a new instrument based on the monetary value of pension benefits, which gradually decreased in later-born cohorts. Pension benefit eligibility ages have been widely used as an instrument of retirement in a substantial body of literature (Charles, 2004; Coe & Zamarro, 2011; Behncke, 2012; Kämpfen & Maurer, 2016; Kuusi et al., 2020; Kim & Jeong, 2021). However, using variations in pension benefit amounts resulting from pension reforms as an instrument to investigate the causal impact of retirement on health is a novel approach. Regarding the income replacement rate, there were two sudden and substantial reductions in pension benefits—one in 1998 and another in 2008—followed by a gradual reduction of 0.5 percentage points per year since 2009. These changes are highly unlikely to be related to health status over time. [2]

Second, our study examines whether re-employment after retirement has symmetric effects in the opposite direction or whether limitations exist in reversing the health outcomes of retirement. We compare individuals who sought re-employment after retirement with those who remained continuously retired, providing further insights into the dynamic effects of retirement on health outcomes, specifically when retirees reverse their decision and become re-employed. Limited research has examined the change in health status of individuals who have exited and re-entered the labor market (Schuring et al., 2011; Carlier et al., 2013). To the best of our knowledge, this is the first study to examine the causal effect of re-employment on the health outcomes among retirees using a new instrument based on the monetary value of pension benefit.

Third, we investigate the channels through which retirement and re-employment influence health outcomes. A few studies have examined intermediate outcomes through which retirement affects health, such as health-related behaviors (Insler, 2014; Eibich, 2015), weight and body mass index (BMI) (Feng et al., 2020), physical activities (Kämpfen & Maurer, 2016; Godard, 2016), and intra-household bargaining power (Chen, 2022; Messe & Wolff, 2019; Müller & Shaikh, 2018; Zang, 2020). Building on these studies and utilizing the rich information in our dataset on personal and social activities as intermediate variables, we analyze data on the frequency of smoking,

[2] Our measure of retirement pension benefits excludes Disability Insurance payments and Public Assistance Benefits—similar to U.S. Medicaid—as these programs serve different purposes and target distinct populations. The Disability Insurance program provides financial support to individuals with qualifying disabilities and transitions to old-age pensions once recipients reach the standard retirement age. Public Assistance Benefits refer to income support under the Basic Livelihood Security Program, which offers low-income individuals livelihood, medical, housing, and other in-kind assistance. These benefits represent a relatively small portion of total pension income in our sample. However, to ensure robustness, we re-estimated all models using total pension benefits—including Disability Insurance payments and Public Assistance Benefits—as additional control variables. The results remain consistent with and without these benefits as controls, supporting the robustness of our main findings.

alcohol consumption, and physical activity as well as interactions with social groups, including religious gatherings, leisure and sports associations, alumni associations, and volunteer groups.

The remainder of the paper is organized as follows: Section 2 explains the dataset for the empirical analysis. Section 3 explores the effects of retirement on older adults' health in South Korea. Section 4 assesses the health consequences of re-employment for older adults. Section 5 examines changes in personal and social activities that influence health outcomes post-retirement and re-employment. Section 6 presents a sensitivity analysis to confirm the robustness of the findings. Finally, Section 7 presents concluding remarks and policy implications.

2. Data

We utilized panel data from The Korean Longitudinal Study of Aging (KLoSA), a nationally representative survey of Koreans aged 45 and older. The sample was randomly selected through multistage stratified probability sampling and included 10,254 adults aged 45 or older in 2006. Subsequent surveys were conducted biennially, with the eighth survey concluding in 2020. As of wave 8, the retention rate of the original sample remained stable at 77.1%. An additional 920 individuals were added to the sample in 2014 as part of the replenishment cohort, of whom 771 remained valid in Wave 8.

We restricted the sample to individuals aged 55 and older who responded to all questions, related to health outcome measures and explanatory variables, resulting in a final analytical sample of 8,088 individuals. The dataset includes 42,976 person-wave observations across seven survey waves from 2008 to 2020. Employment status in the 2006 survey was used as a reference point to identify pre-2008 employment history. Among the 8,088 individuals, 2,505 individuals form a balanced panel, while 2,727 individuals died during the study period and 2,856 either exited the sample or refused to answer key questions. For the analysis of re-employment effects, we further restricted the sample to individuals who had not retired at the beginning of the observation period and who subsequently retired and remained retired for at least two years following their first retirement.

The sample was categorized into two groups: "retired" and "economically active or never worked. The "retired" group included individuals who were not currently working, lacked income-earning activities, and had no intention of working unless there is a significant change in circumstances.[3] The "economically active or never worked" group included those who were employed, unemployed, or had never worked. Of the total observations, 40% were in the "retired" category, with 4,864 (61%) of the 8,088 individuals reporting retirement at any time. Within the retired group, the "re-employed" subset included those who had reported retirement in an earlier survey but were re-employed in the current survey. This subset constituted 11% of the total observations, with only 870 individuals reporting re-employment at any time. The KLoSA dataset also provides detailed information on demographics, family characteristics, health, employment, income, and assets (KLoSA, 2023).

The survey provides four health outcomes: self-rated overall health, difficulty in performing daily activities, chronic diseases, and mental health status. Self-rated health is based on a five-point scale, with a lower number indicating better health. Difficulties in daily activities are measured using indices for Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL), with a combined index ranging from 0 to 17. Chronic diseases include major

[3] Retirement refers to having ceased income-earning activities and currently not working or engaging only in light, non-committal work (e.g., pastime jobs). Retirees are understood to have no earned income, which includes wages, income from self-employment or one's own business, or income from a secondary job. However, they may still receive unearned income, such as returns from financial or real assets (e.g., rents, dividends, interest, or capital gains), public transfers, private pension benefits, and other non-labor income sources.

illnesses, such as hypertension, diabetes, and cancer, with scores ranging from 0 to 7. Mental health is assessed using the CES-D10, a 10-item questionnaire that measures depressive symptoms, with scores ranging from 0 to 10. The survey also captures personal and social activities that impact health, including smoking, alcohol consumption, physical activity, and participation in social groups, such as religious gatherings, leisure/culture/sports-related activities, alumni associations/hometown communities, and volunteer groups. Binary indicators (1 for participation and 0 for non-participation) were used for these activities.

Table 1 presents respondents' basic statistics. On average, the respondents were 70.4 years old, with females accounting for 57%; 41% lived in metropolitan areas. Regarding educational attainment, 24% were high school graduates and 9% held college degrees. The average household income and net assets were 24.6 million and 245.1 million won, respectively. Health outcomes showed an average self-rated health score of 3.84, a daily living difficulty index of 0.96, a depression measure of 1.85, and 1.34 chronic diseases on average. The activity participation rates were 12% for smoking, 31% for alcohol consumption, 36% for physical activity, 17% for religious gatherings, 5% for leisure/culture/sports-related activities, 13% for alumni associations/hometown communities, and 1% for volunteer groups. Table 1 also illustrates the characteristics of retired individuals and those re-employed based on a balanced panel. Retired individuals showed higher average values for health indicators, indicating poorer health, while re-employed individuals demonstrated better health than the overall retired group.

[Insert Table 1 here]

3. Effects of Retirement on Older Individuals' Health

We examine the impact of retirement on the health of older individuals using the following model:

(1) $Health_{i,t} = \alpha + \beta_1 Retire_{i,t} + \boldsymbol{X}_{i,t}\beta_2 + u_i + \mu_t + e_{i,t}$

where $Health_{i,t}$ denotes the health outcome of individual i at time t (the year of the survey); $Retire_{i,t}$ is the retirement indicator, taking the value of 1 when individual i reported being retired at time t and 0 otherwise; and $\boldsymbol{X}_{i,t}$ represents a vector of individual characteristics influencing health outcomes, including educational attainment, gender, age, number of unmarried children, marital status, household income, and household net assets.[4] This specification incorporates controls for the individual and time (survey–year) fixed effects.

Table 3 presents the regression results for each of the four health outcome variables based on Equation (1): self-rated overall health, daily living difficulties, chronic diseases, and depression. We provide both panel ordinary least squares (OLS) results, with and without controlling for individual fixed effects (FE).

Columns (1) and (2) of Table 3 display the regression results for self-rated overall health variables. In Column (1), without individual fixed effects (FE), the coefficient on retirement is 0.193 and statistically significant at the 1% level. This implies that retirement is associated with a decline of approximately 0.19 points in an older adult's self-rated overall health status. In Column (2), where individual FE is included, the coefficient on retirement decreases to 0.105 but remains

[4] We do not include variables for medical insurance coverage or access to healthcare services (e.g., doctors per capita by region) in the regression, as healthcare access is largely universal and uniform across Korea. The main results reported in Tables 3 and 4 remain robust both with and without the inclusion of medical insurance variables. Korea operates a universal healthcare system centered on the National Health Insurance Service (NHIS), which is a mandatory public insurance program covering all residents, including retirees. All residents must be enrolled in either the National Health Insurance program, which covers employees and the self-employed, or the Medical Aid Program, which provides free or heavily subsidized care to low-income individuals. Upon retirement, individuals automatically transition to the NHIS as self-employed (regional) subscribers and pay premiums based on their pension income and assets. For further information, see the NHIS English website: https://www.nhis.or.kr/english/index.do.

significant at the 1% level. The results in Columns (1) and (2) also show that older individuals with higher income levels tend to report better health outcomes than those with lower income levels. All other individual characteristics, except for household income, are statistically insignificant in the FE estimation.

Columns (3) and (4) present regressions for the daily living difficulty variable, with and without individual FE. In both cases, the coefficients on retirement are statistically significant—0.465 and 0.267, respectively—indicating that retirement is associated with increased difficulties in daily living among older individuals. Columns (5) and (6) present regressions for the number of chronic diseases. The coefficients on retirement are also positive and statistically significant—0.279 and 0.066, respectively, suggesting that retirement is linked to an increase in chronic conditions, thereby contributing to a decline in overall health outcomes for older adults. The effects of retirement on depression are also statistically significant and positive at 0.114 and 0.066 in Columns (7) and (8), respectively. This suggests that, in both the OLS and FE estimations, mental health—proxied by depression—tends to worsen among older individuals following retirement.

[Insert Table 3 here]

The OLS and fixed effects (FE) estimators face unresolved identification issues when examining the effects of retirement on health due to confounding factors. In addition to omitted variable bias, there is the potential for reverse causality between retirement (or re-employment) and health outcomes. Individuals in poor health are more likely to retire, and unobserved factors may simultaneously influence both retirement decisions and health status. As a result, although retirement may appear to negatively affect health, the direction of causality may plausibly run the other way. This complicates causal inference using OLS or FE models, which, although they control for observable characteristics, cannot fully account for unobserved confounders.

To address reverse causality and other endogeneity concerns, we use instrumental variable (IV) estimation to generate exogenous variation in retirement. Our two main instruments are (1) the statutory pension eligibility age—determined by birth cohort—and (2) the expected monetary value of future pension benefits, which became suddenly and gradually less generous for certain later cohorts. Our identification strategy exploits the exogenous variation introduced by pension reforms, which delayed benefit eligibility for younger cohorts. This variation is illustrated in Table 2, which shows a gradual increase in the pension eligibility age—from 60 for those born before 1953 to 65 for those born after 1968.[5]

[Insert Table 2 here]

In Figure 3, we plot the average retirement rate by age around the onset of pension eligibility for the first three cohorts listed in Table 2. The figure shows a clear, discrete jump in the share of retired individuals occurring only in the first year of eligibility for retirement pension benefits. In addition to age-based eligibility, we use the monetary value of pension benefits as an instrument, controlling for current household income and assets. This continuous measure provides greater variation and improves estimation precision. As pension benefits become less generous for later-born cohorts, we utilize both the binary age-based transition and the variation in pension benefit amounts as sources of exogenous variations. A series of pension reforms has contributed to changes in benefit levels, including two major reductions in the income replacement rate as well

[5] Korea allows for early retirement for individuals who have contributed to the pension system for at least 10 years, are within five years of the statutory pension eligibility age and are not engaged in income-earning activities. These individuals are eligible for an 'early old-age pension,' although the benefits are reduced due to the longer expected duration of payouts. Some complications may arise when using the statutory pension eligibility age as an instrumental variable if individuals are receiving early retirement pensions. However, as shown in Figure 3, we find that the probability of retirement does not change significantly before reaching the official pension eligibility age—possibly because only about 10% of retirees receive early pensions. In contrast, there is a substantial increase in retirement probability after individuals reach the eligibility age.

as several gradual decreases since 2009. These changes reflect declining generosity in pension benefits over time, driven by demographic shifts and increasing fiscal pressures on the government. In Figure 4, we also plot average retirement pension benefits by age for the first three cohorts. Similar to retirement rates, the figure reveals a discrete jump in average pension benefits only in the first year of eligibility.

[Insert Figures 3&4 here]

To validate our instruments, pension eligibility must strongly correlate with retirement decisions. Higher pension benefits make retirement more viable, with F-tests indicating a strong positive correlation. Previous studies (Kim and Jeong, 2021; Kwak & Lee, 2024; Atalay and Barrett, 2014; Kuusi et al., 2020; Charles, 2004; Kämpfen and Maurer, 2016) also report strong correlations between pension eligibility and retirement. In addition, pension eligibility age and benefit amounts must be uncorrelated with unobserved health determinants. These factors affect health status only through retirement. For instance, those born in 1952 were eligible for pension benefits at age 60, while those born in 1953 were not, indicating differences in pension amounts across cohorts. Moreover, reductions in pension benefit amounts for later cohorts are not systematically related to health determinants.

To validate our instrumental variables method, we conduct two statistical tests: the weak instruments test (Stock and Yogo, 2005) and over-identification (OID) test (Hansen, 1982; Hahn and Hausman, 2002). For the OID tests, we used the pension benefits eligibility status, and the product of eligibility and pension benefits amount as instruments.

Table 4 presents the results of the two-stage least squares (2SLS) analysis for the four health outcome variables: self-rated overall health, difficulty in daily living, number of chronic diseases, and depression. These results are derived by estimating Equation (2), which excludes individual FE owing to the lack of overtime variation in the instruments, leading to less precise coefficient estimates.[6] Furthermore, Equation (2) does not include age and age-squared variables because the eligibility age for pension benefits is determined solely by age, and including these variables would cause a weak instrument problem.[7]

$$(2)\ Health_{i,t} = \alpha + \beta_1 Retire_{i,t} + \boldsymbol{X}_{i,t}\beta_2 + \mu_t + e_{i,t}.$$

In the odd-numbered columns, we use the retirement pension eligibility age as an instrument for retirement. In the even-numbered columns, we employ both the retirement pension eligibility age and the amount of pension benefits as instruments. Columns (1) and (2) present the 2SLS estimation results for self-rated overall health variables. In Column (1), the coefficient of retirement is statistically significant at the 1% level, with a magnitude of 2.1, which is 10 times greater than the OLS estimates. This suggests that retirement reduces the self-rated overall health status of older adults significantly, with an average decline of 2.1 points (with 1 standard deviation being 0.88 points, as shown in Table 1), compared to older individuals who have not retired or had never worked.

In Column (2), when we use both pension eligibility and pension amounts as instruments, we obtain similar results with an almost identical estimate of 2.1. The justification of the 2SLS method is supported by F-test statistics of 234.1 and 118.7 for Columns (1) and (2) respectively, which are greater than the rule of thumb of 10, indicating no weak IV problem. With the same first stages for all outcomes in Columns (1) to (8), there is no weak IV problem for any of the estimates

[6] In the 2SLS estimation with individual fixed effects, we do not observe sufficient variation in the instruments, as indicated by low F-statistics in the first-stage regressions. The F-statistics are below 1.5 for both instruments—eligibility and expected benefit amounts—across all four outcome variables. This is well below the commonly used rule-of-thumb threshold of 10, suggesting the presence of weak instrument problems.

[7] The coefficient estimates on retirement in the OLS regressions in Table 4 remain stable when Age and Age squared variables are excluded. It is also worth noting that the coefficient estimates on retirement in the 2SLS regressions in Table 4 also remain largely unchanged when Age and Age squared variables are included, despite encountering a weak IV problem.

presented in Table 4. The first-stage regression results are presented in Table 5. Furthermore, in Column (2), Hansen's J-test yields a p-value of 0.41. significantly greater than 0.1; therefore, it also passes the OID test, not rejecting the null hypothesis of no correlation between the error term and instruments.

[Insert Tables 4&5 here]

Columns (3) and (4) present the results for the daily living difficulty variable. In Column (3), the coefficient for retirement is statistically insignificant. In Column (4), while the effect of retirement is statistically significant, it fails the OID test with a p-value of 0.01. Consequently, the 2SLS estimate for the daily living difficulty variable cannot be justified. Columns (5) and (6) present the regression results for the number of chronic diseases with both weak IV and OID tests passed. Column (5) shows that retirement significantly increases chronic diseases by 2.8 (with 1 standard deviation being 1.22). Column (6) indicates that retirement significantly increased chronic diseases by 2.9. Columns (7) and (8) focus on depression, with both weak IV and OID tests passed. These columns show positive and statistically significant coefficients for retirement, indicating that retirement significantly raises the depression index by 3.1 and 3.0 (with 1 standard deviation being 2.2).

In summary, the 2SLS results reveal that both OLS and FE estimates tend to substantially underestimate the negative impact of retirement on various health-related outcomes such as self-rated overall health, chronic diseases, and depression. Therefore, we interpret our 2SLS results with caution. If the effect of retirement on health is heterogeneous, the 2SLS estimate can be interpreted as a local average treatment effect that applies only to the complier group. Compliers are individuals whose treatment status (in this case, retirement) responds to the instrument (such as pension eligibility or benefit amount). In our context, compliers are those near the pension eligibility threshold who choose to retire in response to becoming eligible for pension benefits or receiving sufficient benefits—individuals who would not have retired in the absence of such incentives. This implies that our estimates do not apply to always-takers who would retire regardless of pension benefits or to never-takers who do not retire irrespective of pension benefits. Therefore, our estimate may indicate a substantially greater effect for the complier group, whose behaviors are more responsive to income changes, while always-takers may have a more stable life plan, suggesting a lower influence of retirement or other events on health outcomes.

4. Effects of Re-employment after Retirement Reversion on the Health Outcomes

In this section, we explore the effects of re-employment on health outcomes. To evaluate these effects, we exclude individuals who died during the sample period, those in the replenishment sample, and those with intermittently missing variables. Since re-employment is defined only for individuals who have retired—and for most individuals, retirement due to reaching the eligibility age occurs only in the later survey waves—we focus on individuals from the balanced panel who are observed continuously from the beginning to the end of the sample period.

Since re-employment reverses retirement, we hypothesize that the effect of re-employment on health outcomes is opposite to the impact of retirement. To explore the effect of re-employment on health outcomes, we first adopt OLS and FE techniques as follows:

(3) $Health_{i,t} = \alpha + \beta_1 Reemploy_{i,t} + \beta_3 X_{i,t} + u_i + \mu_t + e_{i,t}$

where $Reemploy_{i,t}$ is the re-employment indicator, which is 1 if individual i is reported as re-employed at time t after retirement during the sample period, and 0 otherwise.

Columns (1) and (2) of Table 6 show an improvement in self-rated overall health when retirees are re-employed. The coefficients for re-employment are -0.111 without FE and -0.061

with FE, showing moderately smaller absolute magnitudes compared with the retirement coefficients in Columns (1) and (2) of Table 3 (0.188 and 0.070, respectively). The smaller effect can be attributed to the fact that post-retirement jobs are typically not as favorable as pre-retirement jobs.

[Insert Table 6 here]

Columns (3) and (4) present the OLS and FE regression results, respectively, for difficulties in daily living. In Column (3), the coefficient on re-employment is -0.332 and statistically significant at the 5% level, indicating that re-employment is associated with reduced difficulty in performing daily activities. However, in Column (4), the coefficient becomes statistically insignificant. Columns (5) and (6) present the OLS and FE regressions for the number of chronic diseases, respectively. The coefficient of re-employment is statistically significant at -0.092 in Column (5) but becomes insignificant in Column (6). Columns (7) and (8) display regression results for depression symptoms, showing improved mental health following re-employment. The coefficients are -0.224 and -0.177 in the OLS and FE estimations, respectively, which are opposite in sign to the retirement coefficients (0.114 and 0.066), in Table 3.

As highlighted in Section 3, OLS and FE estimations face identification issues when assessing the effects of re-employment on health. To address this, we propose using current and lagged pension amounts as instruments for re-employment status. These instruments must be strongly correlated with re-employment and uncorrelated with unobserved health factors. In addition to current pension amounts we add lagged pension amounts as instruments for re-employment status because we argue that generous past pension benefits may enable retirees to seek re-employment more actively, justifying the strength of the IV. To ensure validity, we control for current and past household income and assets by exploiting variations in pension reforms that changed eligible ages and benefit amounts. This approach uses pension value variations, while holding household income and assets constant. The key aspect for the validity of pension amount as an instrument is that more generous benefits for earlier cohorts are more likely to increase re-employment chances without directly affecting health determinants. The reduction in pension amounts can be primarily attributed to government budget constraints and is not related to health factors of the cohort.

We estimate the following equation by 2SLS:

(4) $Health_{i,t} = \alpha + \beta_1 Reemploy_{i,t} + \beta_3 X_{i,t} + \mu_t + e_{i,t}$.

Table 7 presents the 2SLS results from estimating Equation (4) using both current and past values of retirement pension benefits as instruments for re-employment. The odd-numbered columns use the current and past values (t and t-4), while the even-numbered columns rely solely on past values (t-2, t-4). This approach is justified because re-employment after retirement often involves job search and acquiring new skills, which could take several years. We present the results with lag periods for instruments based on the highest first-stage F-statistics. However, the results are not very sensitive to the selection of two out of three values (t, t-2, and t-4). All estimations for the four outcome variables in Table 7 pass the weak IV tests. The first-stage regression results are presented in Table 8. However, while OID tests show large p-values for self-rated overall health, chronic diseases, and depression, indicating no rejection of the null hypothesis for correlation between the instruments and error terms, the p-values for difficulty in performing daily activities are as low as 0.02 and 0.03, indicating a failure to pass the OID tests.

In Columns (1) and (2), re-employment significantly improves self-rated overall health by -2.2 and -2.5 points, respectively (with 1 standard deviation being 0.84 points), which is approximately 10 times greater in magnitude compared to the OLS estimate.[8]

[Insert Table 7&8 here]

Columns (3) and (4) present the 2SLS results for difficulties with daily living. However, because the OID tests had p-values smaller than 0.05, the instruments are not valid. Columns (5) and (6), which pass both weak IV and OID tests, show that re-employment reduces the number of chronic diseases by 2.4 and 3.2, respectively (with 1 standard deviation being 1.19). The coefficient estimate of re-employment in Column (6) is highly significant. In Columns (7) and (8), which pass both the weak IV and OID tests, re-employment significantly reduces depressive symptoms by 4.6 and 4.5, respectively (with 1 standard deviation being 1.72).

In summary, the 2SLS regressions for all three outcomes—self-rated overall health, chronic disease, and depression—consistently show that health status improves when a retiree becomes re-employed. However, these results apply only to the complier group: individuals who initially retired due to pension eligibility and subsequently returned to work as a result of pension benefit availability. This means that the estimates do not apply to always-takers (those who are re-employed regardless of pension benefits) or never-takers (those who are not re-employed regardless of benefits). The substantial effect observed for compliers may be attributed to their significant effort in job searching and skill acquisition, leading to a more positive response when they succeed.

[8] The coefficient estimates on retirement in the OLS regressions in Table 4 remain stable when Age and Age squared variables are excluded. It is also worth noting that the coefficient estimates on retirement in the 2SLS regressions in Table 7 also remain largely unchanged when Age and Age squared variables are included, despite encountering a weak IV problem.

5. Channels for effects of retirement and re-employment on health

This section explores potential channels for the negative effects of retirement and the positive effects of re-employment on health outcomes. The KLoSA data provide information on the frequency of individuals' engagement in activities, such as smoking, alcohol consumption, physical activity, and involvement in social groups. This allows us to examine changes in personal activities and social interactions based on employment status.

For personal activities, we use data on the frequency of smoking, alcohol consumption, and physical activity. Social group interactions include religious (Religion), leisure/culture/sports-related (Leisure), alumni associations/hometown communities (Alumni), and volunteer groups (Volunteer). We investigate whether retired individuals experience significant changes in these seven activities post-retirement. Additionally, we analyze eight combined activity outcomes created by summing the four social activity measures. Examples include "Religion+Alumni" and "Religion+Alumni+Leisure+Volunteer" (see Table 8 for details). Combining these measures allows for a more precise estimation of the effects of retirement and re-employment. Using these measures for individual and social activities as outcome variables, we estimate Equation (2) for retirement and Equation (4) for re-employment.

Table 9 presents the 2SLS results obtained by estimating Equation (2). Odd-numbered columns use retirement pension eligibility and the current values of retirement pension as instruments, whereas even-numbered columns use retirement pension eligibility alone. All 30 2SLS estimations for the 15 individual and combined activity outcome variables pass weak IV tests. However, five outcome variables—Religion, Leisure, Alumni, Religion+Volunteer, and Alumni+Leisure+Volunteer—fail the OID test at the 10% significance level. Regarding the outcomes that pass both tests, retirement significantly reduces activities, such as smoking, alcohol consumption, physical activity, and participation in alumni activities. Specifically, Columns (3) and (5) show retirement decreases alcohol consumption and physical activity by 0.84 (with 1 standard deviation being 0.46) and 0.43 (1 standard deviation being 0.61), respectively. For social interaction outcomes, retirement significantly reduced alumni activities by 0.35 (with 1 standard deviation being 0.33). Among combined activity outcomes that pass both tests, retirement significantly reduces "Religion+Alumni,", "Religion+Alumni+Volunteer,", "Religion+Alumni+Leisure", " Alumni+Leisure+Volunteer", and "Religion+Alumni+ Leisure+Volunteer" by 0.27, 0.30, 0.29, 0.39, and 0.31, respectively (with 1 standard deviation being 0.50, 0.43, 0.56, 0.43 and 0.57).

Overall, the findings reveal a decline in activities that could contribute to improved health at both the individual and societal levels following retirement, with the notable exception of reduced smoking and alcohol consumption. The reduction in alcohol consumption is likely linked to Korea's drinking culture, which is closely associated with work-related and social settings. Upon retirement, decreased social interaction in these contexts leads to reduced alcohol consumption. However, the health impact of alcohol consumption is complex and depends on factors such as the amount and frequency of consumption, individual health status, and genetic predispositions. Moderate alcohol consumption, particularly red wine, may offer health benefits, such as a reduced risk of heart disease and stroke, while excessive consumption of alcohol is harmful.

[Insert Table 9 here]

Table 10 presents the 2SLS results from estimating Equation (4) to examine the impact of re-employment on personal and social activities. In the odd-numbered columns, we use current and past values of retirement pension benefits (t, t-2) as instruments, while in the even-numbered columns, we use past values (t-2, t-4). The table includes results for 15 outcome variables: 7 individual activities and 8 combined activities. All 30 estimates pass the F-test, indicating no weak IV problems. Among the seven individual activity outcomes, all pass the OID tests in the odd-numbered columns, while five pass in the even-numbered columns, with smoking and religion failing in the even-numbered columns. Therefore, we focus on interpreting the results in the odd-numbered columns that pass both weak IV and OID tests.

Re-employment significantly increases workout frequency by 0.80 (with 1 standard deviation being 0.47). Regarding social activities, re-employment significantly increases religious participation by 0.67 (with 1 standard deviation being 0.38). Among the combined activity outcomes, the results in Columns (15), (19), (21), (25), and (29) pass the OID tests. Re-employment boosts activities in "Religion+Alumni," "Religion+Volunteer," "Religion+Alumni+Volunteer," "Religion+Alumni+Leisure," and "Religion+Alumni+ Leisure+Volunteer" by 0.76, 0.66, 0.75, 0.65, and 0.64, respectively (with 1 standard deviation being 0.50, 0.39, 0.52, 0.56, and 0.58). Overall, our findings support the notion that re-employment increases both personal and social activities that enhance health.

[Insert Table 10 here]

The overall findings indicate that retirement reduces participation in social activities that may enhance life outside of work. Previous studies have suggested a positive relationship between social connectedness and health (House, Landis & Umberson, 1988; Ertel, Glymour, & Berkman, 2009; Everson-Rose & Lewis, 2005; Uchino, 2006; Umberson and Montez, 2010; Martino, Pegg, & Frates, 2017; Lem et al., 2021; Holt-Lunstad, 2022). Our study confirms these findings, suggesting that reduced social participation contributes to poor health among retired older adults. However, when retired individuals are re-employed, their social activities resume. Given the close relationship between social activities and health, this increase can explain the positive relationship between re-employment and health outcomes.

6. Robustness Tests

We assess the robustness of our findings through sensitivity analyses for both retirement and re-employment. The main results are summarized, with detailed findings provided in the Appendix. We begin by presenting the results of the sensitivity analyses for retirement.

6.1. Restricted Sample Analyses

For the first sensitivity analysis for retirement, we use three alternative samples consisting of individuals within narrower age ranges, centered around the age at which pension eligibility begins. For the three alternative samples, which correspond to the three restricted samples with narrower age windows, we consistently find significant negative effects of retirement on three health outcomes: self-rated health, number of chronic diseases, and depression (Table A1). All estimations successfully pass the weak IV tests, and the OID tests are satisfactory for the three health outcome variables. This confirms the robustness of the main findings reported in Table 4.

6.2. Heterogeneous Effects Analyses

We examine whether the effects of retirement on health are robust across different groups of individuals. First, we estimate the heterogeneous effects of retirement on health among individuals depending their concerns about income or wealth after retirement. For instance, Pransky et al. (2005) and Leigh & DeVogli (2016) suggest that low wages can negatively affect health, suggesting lower-income individuals may experience greater financial stress upon retirement, potentially exacerbating adverse health outcomes. Assuming that the negative health effects of retirement are partly driven by reduced income and wealth, we expect a smaller impact among those without financial concerns. Conversely, we define a low-income group to examine whether the adverse health effects of retirement are particularly strong for them, and whether such adverse effects remain statistically significant even among individuals with higher income levels. Our findings confirm that this effect is significantly greater for the low-income group (Table A2, Panel B), but the adverse effects are also statistically significant and substantial in magnitude for the high-income group (Table A2, Panel A). While reduced income may contribute to declining health, other channels must also play a role, as the high-income group experiences negative health effects from retirement as well.

Second, as previous studies suggest that retirement decisions and their associations with health outcomes differ considerably by gender, we examine whether our results are robust across both genders. Women tend to have distinct employment patterns, lower lifetime earnings, and longer life expectancies compared to men, all of which pose greater challenges in preparing for retirement. In addition, women are generally more risk-averse and more likely to assume caregiving responsibilities—factors that can influence both the timing of retirement and subsequent health outcomes (Bernasek & Shwiff, 2001; Charness & Gneezy, 2012). Research also shows that a spouse's health has a stronger influence on women's retirement decisions than on men's (Talaga & Beehr, 1995), and that the negative impact of retirement on cognitive functioning is more pronounced among women (Lei & Liu, 2018).

In Appendix Table A3, we test whether the effects of retirement on health differ significantly by gender. Our 2SLS results indicate that the adverse effects of retirement are greater for females than for males across all four health measures. Although the effects for males are comparatively smaller, they remain significantly negative, indicating that retirement consistently harms health outcomes for both genders. Consequently, our findings provide robust evidence of the negative health effects of retirement , with stronger impacts observed among females.

Third, retirement decisions and their interactions with health outcomes may also differ considerably by marital status. For instance, Kim and Moen (2002) find that marital status interacts with retirement to influence health outcomes. Single (unmarried) individuals, who may lack the social support typically provided by spouses, could be more vulnerable to negative health effects after retirement.

We examine whether the effects of retirement on health differ significantly by marital status. In Table A4, we find that the adverse effects of retirement are greater for single individuals across all four health measures. Although the effects are slightly smaller for married individuals, they remain highly significant across all measures. In all eight columns for married subsamples, the instruments show high F-statistics, indicating no issues with weak instruments, and generally pass the overidentification (OID) tests, except for the "Daily living difficulty" measure. Based on the 2SLS results, we conclude that the adverse effects of retirement are significant for both single and married individuals, though the magnitude is slightly greater for singles.

Furthermore, we combine income and marital status to examine heterogeneous effects. Rather than employing triple interaction terms involving retirement, income, and marital status simultaneously, we utilize interaction term models to assess income-specific effects and conduct subsample estimations for marital status-specific effects. In Table A5, among both married and single individuals, adverse effects are greater for the low-income group. However, income-based differences in these effects are notably more pronounced among single individuals. Thus, being single and having a low income both contribute to greater adverse effects of retirement, with the strongest effects observed among single, low-income individuals.

6.3. Placebo Tests

We also conduct a placebo test using the placebo-eligibility age variable. We remove observations for ages eligible for retirement pension benefits and generate a placebo- eligibility age using a non-eligible age sample. We consider ages more than two years before eligibility as non-eligible and ages between zero and two before eligibility as placebo-eligible. We found no significant difference in retirement status or health outcomes by birth cohort before the retirement eligibility age for any of the four health outcome variables (Table A6). This indicates that for individuals younger than the retirement eligibility age, there were no statistically significant differences in retirement status or health outcomes by age cohort. By introducing an arbitrary eligibility age, we show that the observed effects do not stem from differences in age cohorts.

6.4. Sensitivity analyses for re-employment

Similar to our approach for retirement, we examine the robustness of the positive effects of re-employment on health outcomes with three sets of sensitivity analyses: alternative samples with narrower age windows, conducting a placebo test, and heterogeneous effects. First, we use alternative samples within wider age ranges centered around the eligibility age, reflecting the extended time needed for individuals to retire and re-enter the workforce. We observe consistent positive effects of re-employment on health outcomes, which become more significant and greater in magnitude with wider age windows (Table A7).

Second, we conduct placebo tests using a restricted sample of re-employed workers eligible for retirement pension benefits, focusing on the period between retirement and re-employment. Observations during this period are categorized as placebo-eligible (the final two or three years before re-employment) and non-eligible ages. This division captures any changes in health outcomes over time after retirement as an effect of placebo re-employment. We find no significant differences in health outcomes between the start of eligibility and immediately before re-employment for any of the four health outcome variables (Table A8). This suggests that the health effect of re-employment is only realized after individuals have been re-employed.

Finally, we compare the health effects of re-employment between hired and self-employed individuals. We hypothesize that self-employed individuals may experience fewer changes in work-related social networks than hired employees. By examining these differences, we aim to determine the extent to which the health effects of re-employment are attributed to rejoining work-related groups. We expect the positive health effects of re-employment to be smaller for self-employed individuals. We find significant positive effects of re-employment for both hired employees and self-employed groups, but the effects are significantly smaller for the self-employed (Table A9).

7. Concluding remarks

The increasing elderly population has increased social interest in the well-being of seniors. This study investigated the influences of work and retirement on the health of older individuals in Korea. Using survey data from 2008 to 2020, we examined how retirement and subsequent re-employment impacted various health measures, including self-rated overall health, daily living difficulties, chronic illnesses, and depression levels. To mitigate endogeneity issues arising from reverse causality and omitted variables, we used statutory retirement pension eligibility ages and pension amounts as instrumental variables for retirement and re-employment decisions. Our study revealed that retirement caused a notable decline in self-rated overall health, an increase in chronic diseases, and a decrease in mental well-being among older adults. Conversely, returning to work after retirement led to significant improvements in overall health.

Furthermore, we investigated the potential channels through which retirement and re-employment influenced health outcomes. Our results suggested that retirement negatively affected retirees' physical and mental health by reducing physical exercise and social engagement, including participation in religious gatherings, alumni associations, and volunteer groups. Conversely, re-employment positively impacted health by fostering increased involvement in these activities.

Our study emphasizes the potential enhancement of physical and mental health among older adults through prolonged employment or the pursuit of new job opportunities post-retirement. Accordingly, it is crucial for the government to explore effective policies that encourage delayed retirement or facilitating post-retirement employment. In Korea, seniority-based wage and promotion systems often lead firms, particularly those operating with tight margins, to encourage early retirement among older employees. Introducing more flexible approaches, such as performance appraisals, promotion criteria adjustments, and adaptable work arrangements, may help older workers remain in the workforce longer. However, careful consideration is needed, as performance-based systems can also create high-pressure environments that may negatively impact worker well-being (DeVaro and Heywood, 2017; Baktash et al., 2024). In addition, strengthening lifelong education and training programs tailored for middle-aged and older workers to attain new skills can also help enhance their productivity and employment prospects, ultimately leading to health benefits. Our findings also suggest that providing retirees with more opportunities for engagement with various social groups such as religion, sports, leisure, and volunteering could help prevent their health from deteriorating.[9]

---

[9] Our findings also highlight the important role of retirement income in shaping health outcomes, as higher income levels are consistently associated with better health. While increasing pension benefits may appear to be a straightforward way to improve health in retirement, pension systems must balance multiple objectives, including

We acknowledge that our study has certain limitations. First, we did not examine the specific decision-making processes of adults with diverse characteristics. It is important to recognize that the impact of retirement and re-employment on health may vary based on individual and work-related factors. For instance, individuals with limited family support, unsatisfactory leisure activities and may experience a more pronounced decline in health following retirement. Additionally, the distinct levels of stress and risks associated with jobs may differentially influence the effects of retirement or re-employment on health outcomes. A comprehensive examination of the causal effects of different retirement and re-employment decisions on health, contingent on individual and job characteristics, necessitates additional data that fall beyond the scope of our study.

Second, we did not examine in detail the processes by which layoffs or re-employment decisions are made. The health effects of employment transitions may vary depending on whether unemployment is voluntary or involuntary. Exploring this distinction would contribute to a better understanding of the heterogeneity in retirement experiences and their health implications, offering a valuable direction for future research.

Third, this study refines the causal link between retirement and health using instrumental variables based on pension eligibility age and benefit levels. While the instruments pass standard validity tests—including weak instrument, over-identification, and falsification tests—they are not without limitations. The IV approach mitigates endogeneity from reverse causality and omitted variables but may not fully eliminate bias. For example, if health trajectories affect both retirement timing and responsiveness to pension eligibility in ways not captured by our instruments, residual

fiscal sustainability, intergenerational equity, and labor market incentives. Recent reforms to Korea's National Pension Act in 2025—such as raising the income replacement rate and contribution levels—reflect growing policy recognition of the need to enhance retirement income adequacy while addressing these multiple objectives.

bias may persist. Likewise, health improvements may increase re-employment, introducing further bias. Additionally, our estimates reflect the effects for compliers—those influenced by pension eligibility rules—rather than the entire population. These limitations highlight the need for further research using more robust causal identification strategies.

References

Atalay, K., Barrett, G.F., The causal effect of retirement on health: New evidence from Australian pension reform. Econ. Lett. 125 (2014) 392–395. https://doi.org/10.1016/j.econlet.2014.10.028.

Baktash, Mehrzad B., John S. Heywood, and Uwe Jirjahn. Does performance pay increase the risk of marital instability?. Review of Economics of the Household (2024): 1-32.

Banerjee, A., Duflo, E., Grela, E., McKelway, M., Schilbach, F., Sharma, G., Vaidyanathan, G., Depression and loneliness among the elderly in low- and middle-income countries. J. Econ. Perspect. 37 (2023) 179–202. https://doi.org/10.1257/jep.37.2.179.

Bernasek, A., Stephanie S., Gender, risk, and retirement. *Journal of economic issues* 35 (2001): 345-356.

Behncke, S., Does retirement trigger ill health? Health Econ. 21, (2012) 282–300. Https://doi.org/10.1002/hec.1712.

Bonsang, E., Adam, S., Perelman, S., Does retirement affect cognitive functioning? J. Health Econ. 31 (2012) 490–501. https://doi.org/10.1016/j.jhealeco.2012.03.005.

Calvo, E., Sarkisian, N., Tamborini, C.R., Causal effects of retirement timing on subjective physical and emotional health. J. Gerontol. B Psychol. Sci. Soc. Sci. 68 (2013) 73–84. https://doi.org/10.1093/geronb/gbs097.

Carlier, B.E., Schuring, M., Lötters, F.J., Bakker, B., Borgers, N., Burdorf, A., The influence of re-employment on quality of life and self-rated health, a longitudinal study among unemployed persons in the Netherlands. BMC Public Health. 13 (2013) 503. Https://doi.org/10.1186/1471-2458-13-503.

Celidoni, M., Dal Bianco, C., Weber, G., Retirement and cognitive decline. A longitudinal analysis using SHARE data. J. Health Econ. 56 (2017) 113–125. https://doi.org/10.1016/j.jhealeco.2017.09.003.

Charles, K.K., Is retirement depressing?: Labor force inactivity and psychological well-being in later life, in: Accounting for Worker Well-Being. Emerald Group Publishing Limited, 2004, pp. 269–299. https://doi.org/10.1016/S0147-9121(04)23008-4.

Charness, G., and Gneezy U., Strong evidence for gender differences in risk taking." *Journal of economic behavior & organization* 83 (2012): 50-58.

Chen, Xi. "The impact of spousal and own retirement on health: Evidence from urban China." World Development 159 (2022): 106025. https://doi.org/10.1016/j.worlddev.2022.106025

Choi, S.S., Lee, G.R., Lee, S.M., Effect of social networks and retirement on health of the Korean elderly. J. Korean Gerontol. Soc. 28 (2008) 291–307.

Coe, N.B., Zamarro, G., Retirement effects on health in Europe. J. Health Econ. 30 (2011) 77–86. https://doi.org/10.1016/j.jhealeco.2010.11.002.

Coursolle, K.M., Sweeney, M.M., Raymo, J.M., Ho, J.H., The association between retirement and emotional well-being: Does prior work–family conflict matter? J. Gerontol. B Psychol. Sci. Soc. Sci. 65 (2010) 609–620. https://doi.org/10.1093/geronb/gbp116.

Dave, D., Rashad, I., Spasojevic, J., The effects of retirement on physical and mental health outcomes. South. Econ. J. 75 (2008) 497–523. https://doi.org/10.1002/j.2325-8012.2008.tb00916.x.

Deaton, A., Income, health, and well-being around the world: Evidence from the Gallup World Poll. J. Econ. Perspect. 22 (2008) 53–72. https://doi.org/10.1257/jep.22.2.53.

de Grip, A., Dupuy, A., Jolles, J., van Boxtel, M., Retirement and cognitive development in the Netherlands: Are the retired really inactive? Econ. Hum. Biol. 19 (2015) 157–169. https://doi.org/10.1016/j.ehb.2015.08.004.

DeVaro, Jed, and John S. Heywood. Performance pay and work-related health problems: A longitudinal study of establishments. ILR Review 70.3 (2017): 670-703.

Eibich, P., Understanding the effect of retirement on health: Mechanisms and heterogeneity. J. Health Econ. 43 (2015) 1–12. https://doi.org/10.1016/j.jhealeco.2015.05.001.

Ertel, K.A., Glymour, M.M., Berkman, L.F., Social networks and health: A life course perspective integrating observational and experimental evidence. J. Soc. Personal Relat. 26 (2009) 73–92. https://doi.org/10.1177/0265407509105523.

Everson-Rose, S.A., Lewis, T.T., Psychosocial factors and cardiovascular diseases. Annu. Rev. Public Health. 26 (2005) 469–500. https://doi.org/10.1146/annurev.publhealth.26.021304.144542.

Feng, Jin, Qin Li, and James P. Smith. "Retirement effect on health status and health behaviors in urban China." World Development 126 (2020): 104702. https://doi.org/10.1016/j.worlddev.2019.104702

Godard, Mathilde. "Gaining weight through retirement? Results from the SHARE survey." Journal of Health Economics 45 (2016): 27-46. https://doi.org/10.1016/j.jhealeco.2015.11.002

Grossman, M., On the concept of health capital and the demand for health. J. Pol. Econ. 80 (1972) 223–255. https://doi.org/10.1086/259880.

Ha, M., The effect of retirement on cognitive functioning: Difference-in-difference analysis using propensity score matching (in Korean). J. Korean Gerontol. Soc. 35 (2015) 337–354.

Hahn, J., Hausman, J.A., A new specification test for the validity of instrumental variables. Econometrica. 70 (2002) 163–189. https://doi.org/10.1111/1468-0262.00272.

Hansen, L.P., Large sample properties of generalized method of moments estimators. Econometrica. 50 (1982) 1029–1054. https://doi.org/10.2307/1912775.

Holt-Lunstad, J., The major health implications of social connection. Curr. Dir. Psychol. Sci. 30 (2021) 251–259. https://doi.org/10.1177/0963721421999630.

House, J.S., Landis, K.R., Umberson, D., Social relationships and health. Science. 241 (1988) 540–545. https://doi.org/10.1126/science.3399889.

Insler, M., The health consequences of retirement. J. Hum. Resour. 49 (2014) 195–233.

Jang, H., Lee, W., Kim, Y.O., Kim, H., Suicide rate and social environment characteristics in South Korea: The roles of socioeconomic, demographic, urbanicity, general health behaviors, and other environmental factors on suicide rate. BMC Public Health. 22 (2022) 410. https://doi.org/10.1186/s12889-022-12843-4.

Jang, S.N., Cho, S.I., Chang, J., Boo, K., Shin, H.G., Lee, H., Berkman, L.F., Employment status and depressive symptoms in Koreans: Results from a baseline survey of the Korean Longitudinal Study of Aging. J. Gerontol. B Psychol. Sci. Soc. Sci. 64 (2009 677–683. https://doi.org/10.1093/geronb/gbp014.

Kämpfen, F., Maurer, J., Time to burn (calories)? The impact of retirement on physical activity among mature Americans. J. Health Econ. 45 (2016) 91–102. https://doi.org/10.1016/j.jhealeco.2015.12.001.

Kim, B., Choi, E.-y., Effects of retirement on health and life satisfaction (in Korean). Q. J. Lab. Policy. 17 (2017) 85–107.

Kim, J., Cha, S.E., Kawachi, I., Lee, S., Does retirement promote healthy behaviors in young elderly Korean people? J. Behav. Health. 5 (2016) 45–54. https://doi.org/10.5455/jbh.20160120043149.

Kim, J. E., Moen, P.. Retirement transitions, gender, and psychological well-being: A life-course, ecological model. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *57*, (2002) 212-222.

Kim, J., Jeong, S.Y., Impact of retirement on health (in Korean). J. Korean Econ. Anal. 27 (2021) 1–30.

Korea Employment Information Service, User's Guide for the 2020 Korean Longitudinal Study of Ageing (KLoSA) Wave 8 (2021). https://survey.keis.or.kr/eng/klosa/userguide/List.jsp (accessed 01 July 2023).

Kuusi, T., Martikainen, P., & Valkonen, T.. The influence of old-age retirement on health: Causal evidence from the Finnish register data. The Journal of the Economics of Ageing, 17 (2020) 100257. https://doi.org/10.1016/j.jeoa.2020.100257.

Kwak, D., Lee, J.-W., Impact of retirement and re-employment on the life satisfaction of older adults in Korea. Jpn. Econ. Rev. (2024).

Lee, J., Kim, M.H., The effect of employment transitions on physical health among the elderly in South Korea: A longitudinal analysis of the Korean Retirement and Income Study. Soc. Sci. Med. 181 (2017) 122–130. https://doi.org/10.1016/j.socscimed.2017.04.002.

Lee, J., Smith, J.P., Work, retirement, and depression. J. Popul. Ageing. 2 (2009) 57–71. https://doi.org/10.1007/s12062-010-9018-0.

Lei, X., Liu, H. Gender difference in the impact of retirement on cognitive abilities: Evidence from urban China. *Journal of Comparative Economics*, *46* (2018), 1425-1446.

Leigh, J. P., De Vogli, R. Low wages as occupational health hazards. *Journal of Occupational and Environmental Medicine*, *58* (2016), 444-447.

Lem, K., McGilton, K.S., Aelick, K., Iaboni, A., Babineau, J., Hewitt Colborne, D., Edwards, C., Bretzlaff, M., Lender, D., Gibson, J.L., Bethell, J., Social connection and physical health outcomes among long-term care home residents: A scoping review. BMC Geriatr. 21 (2021) 722. https://doi.org/10.1186/s12877-021-02638-4.

Martino, J., Pegg, J., Frates, E.P., The connection prescription: Using the power of social interactions and the deep desire for connectedness to empower health and wellness. Am. J. Lifestyle Med. 11 (2017) 466–475. https://doi.org/10.1177/1559827615608788.

Mazzonna, F., Peracchi, F., Unhealthy retirement? J. Hum. Resour. 52 (2017) 128–151. https://doi.org/10.3368/jhr.52.1.0914-6627R1.

Messe, Pierre-Jean, and François-Charles Wolff. "The short-term effects of retirement on health within couples: Evidence from France." Social Science & Medicine 221 (2019): 27-39. https://doi.org/10.1016/j.socscimed.2018.12.008

Müller, T., Shaikh, M., Your retirement and my health behavior: Evidence on retirement externalities from a fuzzy regression discontinuity design. J. Health Econ. 57 (2018) 45–59. https://doi.org/10.1016/j.jhealeco.2017.10.005.

Neuman, K., Quit your job and live longer? The effect of retirement on health. J. Lab. Res. 29 (2008) 177–201. https://doi.org/10.1007/s12122-007-9036-8.

National Statistics Office (NSO), The Annual Report on the Economic Active Population Survey, 2023.

National Statistics Office (NSO), Population Projections and Summary Indicators (Korea), KOSIS (Accessed March 10, 2024).

OECD (2022), OECD Reviews of Pension Systems: Korea, OECD Reviews of Pension Systems, OECD Publishing, Paris, https://doi.org/10.1787/2f1643f9-en.

Pransky, G. S., Benjamin, K. L., Savageau, J. A., Currivan, D., Fletcher, K. Outcomes in work-related injuries: A comparison of older and younger workers. *American journal of industrial medicine*, *47* (2005) 104-112.

Schuring, M., Mackenbach, J., Voorham, T., Burdorf, A., The effect of re-employment on perceived health. J. Epidemiol. Community Health. 65 (2011) 639–644. https://doi.org/10.1136/jech.2009.103838.

Stock, J.H., Yogo, M., Testing for weak instruments in linear, in: Andrews, D., Stock, J.H. (Eds.). Identification and Inference for Econometric Models IV Regressions. Cambridge University Press, Cambridge, 2005, pp. 80–108.

Talaga, J., Beehr, T., Are there gender differences in predicting retirement decisions?. *Journal of Applied Psychology* 80 (1995): 16.

Taylor, B.A., Bengtson, V.L., Sociological perspectives on productive aging, in: Morrow-Howell, N., Hinterlong, J., Sherraden, M.W. (Eds.). Productive Aging: Concepts and Challenges. Johns Hopkins University, Baltimore, Maryland, 2001, pp. 120–144.

Uchino, B.N., Social support and health: A review of physiological processes potentially underlying links to disease outcomes. J. Behav. Med. 29 (2006) 377–387. https://doi.org/10.1007/s10865-006-9056-5.

Umberson, D., & Karas Montez, J.. Social relationships and health: A flashpoint for health policy. Journal of Health and Social Behavior, 51(1_suppl) (2010) S54-S66.

van der Heide, I., van Rijn, R.M., Robroek, S.J., Burdorf, A., Proper, K.I., Is retirement good for your health? A systematic review of longitudinal studies. BMC Public Health. 13 (2013) 1180. https://doi.org/10.1186/1471-2458-13-1180.

Westerlund, H., Kivimäki, M., Singh-Manoux, A., Melchior, M., Ferrie, J.E., Pentti, J., Jokela, M., Leineweber, C., Goldberg, M., Zins, M., Vahtera, J., Self-rated health before and after retirement in France (GAZEL): A cohort study. Lancet. 374 (2009) 1889–1896. https://doi.org/10.1016/S0140-6736(09)61570-1

Zang, Emma. "Spillover effects of a husband's retirement on a woman's health: Evidence from urban China." Social Science & Medicine 245 (2020): 112684. https://doi.org/10.1016/j.socscimed.2019.112684

Table 1 Descriptive Statistics of Our Sample (2008–2020)

Sample	**All**		**Ever Retired**		**Ever Re-employed**	
Observations	42,976		13,608		3,024	
	Mean	SD	Mean	SD	Mean	SD
Retirement (1 if retired, 0 otherwise)	0.396	0.49	0.690	0.46	0.49	0.50
Logarithm of Retirement pension amount	0.300	1.32	2.050	3.847	2.382	3.839
Re-employment (1 if re-employed, 0 otherwise)	0.064	0.25	0.088	0.28	0.33	0.47
Self-rated overall health (1= excellent, 5= poor)	3.84	0.88	3.88	0.86	3.72	0.84
Daily living difficulty (ADL+IADL, 0 to 17 scale)	0.96	3.16	0.67	2.47	0.26	1.20
Number of chronic diseases	1.34	1.22	1.53	1.27	1.41	1.19
Depression (0 to 10 scale)	1.85	2.16	1.76	2.04	1.47	1.72
Age	70.37	8.94	71.72	7.89	68.62	6.89
Gender (1 if male, 0 if female)	0.43	0.43	0.50	0.50	0.56	0.50
High school (1 if the highest level of education is high school, 0 otherwise)	0.24	0.43	0.23	0.42	0.25	0.44
College (1 if the highest level of education is college and above)	0.09	0.29	0.10	0.30	0.09	0.29
Marriage (1 if married and living with spouse, 0 otherwise)	0.73	0.44	0.75	0.43	0.81	0.39
Unmarried child (1 if living with unmarried children, 0 otherwise)	0.21	0.41	0.19	0.39	0.22	0.41
City (1 if residing in metropolitan area, 0 if residing in city or town)	0.41	0.49	0.44	0.50	0.43	0.49
The total amount of household income (10 million won)	2.46	2.56	2.04	2.27	2.31	3.26
The total amount of household net assets (assets–debts, 10 million won)	24.51	34.37	23.18	32.94	21.46	29.78
Smoking (0/1)	0.12	0.33	0.12	0.33	0.16	0.37
Alcohol consumption (0/1)	0.31	0.46	0.33	0.47	0.44	0.50
Physical activity (0/1)	0.36	0.61	0.40	0.49	0.40	0.49
Religious gatherings (0/1)	0.17	0.38	0.18	0.39	0.20	0.40
Leisure/culture/sports-related groups (0/1)	0.05	0.21	0.05	0.22	0.05	0.20
Alumni associations/hometown communities (0/1)	0.13	0.33	0.13	0.34	0.15	0.36
Volunteer groups (0/1)	0.01	0.08	0.01	0.09	0.01	0.10

Note. Data are sourced from the Korean Longitudinal Study of Aging. For the full sample, we use an unbalanced panel, whereas for the "ever-retired" and "ever re-employed" samples, we use a balanced panel. The unbalanced panel comprises 8,088 adults aged 55 or older, tracked across seven survey waves from 2008 to 2020.

Table 2. Pension Eligibility Age by Birthday

Birthday	Pension Eligibility Age
~ Dec 31, 1952	60
Jan 1, 1953 ~ Dec 31, 1956	61
Jan 1, 1957 ~ Dec 31, 1960	62
Jan 1, 1961 ~ Dec 31, 1964	63
Jan 1, 1965 ~ Dec 31, 1968	64
Jan 1, 1969 ~	65

Table 3. Impact of Retirement on Health Outcomes

Dependent Variable	Self-rated overall health		Daily living difficulty		Number of chronic diseases		Depression	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Retirement	0.193*** (0.0116)	0.105*** (0.0106)	0.465*** (0.0486)	0.267*** (0.0390)	0.279*** (0.0205)	0.0661*** (0.00852)	0.114*** (0.0315)	0.0657** (0.0289)
Gender	-0.149*** (0.0142)		0.149** (0.0494)		-0.108*** (0.0272)		-0.122*** (0.0355)	
High school	-0.207*** (0.0164)	0.0145 (0.0897)	-0.177*** (0.0533)	-0.129 (0.255)	-0.0773* (0.0313)	0.0726 (0.0705)	-0.278*** (0.0398)	-0.124 (0.184)
College	-0.304*** (0.0243)	0.0790 (0.106)	-0.337*** (0.0727)	0.159 (0.399)	-0.226*** (0.0444)	0.0940 (0.0970)	-0.260*** (0.0523)	0.463 (0.256)
Age	0.0688*** (0.00856)	-0.00827 (0.0106)	-0.937*** (0.0497)	-1.056*** (0.0501)	0.256*** (0.0163)	0.0222* (0.0103)	0.00966 (0.0255)	-0.0230 (0.0293)
Age square	-0.000307*** (0.0000586)	0.000209** (0.0000736)	0.00718*** (0.000356)	0.00810*** (0.000368)	-0.00155*** (0.000114)	0.000327*** (0.0000721)	0.000131 (0.000178)	-0.000000746 (0.000208)
Married	-0.0286 (0.0161)	0.0299 (0.0236)	-0.00384 (0.0596)	0.0604 (0.0890)	-0.0552 (0.0303)	-0.00959 (0.0219)	-0.348*** (0.0442)	-0.177* (0.0718)
Unmarried child	0.0723*** (0.0147)	-0.0317 (0.0167)	0.0576 (0.0537)	-0.0581 (0.0469)	-0.00440 (0.0265)	0.00635 (0.0136)	0.175*** (0.0384)	-0.0818* (0.0413)
Metropolitan city	-0.0334** (0.0127)	-0.0693 (0.0392)	0.0579 (0.0481)	-0.188 (0.125)	0.0124 (0.0247)	-0.00646 (0.0355)	-0.127*** (0.0327)	-0.157 (0.114)
Household income	-0.0295*** (0.00347)	-0.00440* (0.00218)	0.0139 (0.00791)	0.00212 (0.00545)	-0.0223*** (0.00424)	0.00106 (0.00144)	-0.0518*** (0.00720)	-0.00495 (0.00438)
Household assets	-0.00133*** (0.000201)	-0.000207 (0.000198)	-0.00254*** (0.000519)	0.000120 (0.000508)	0.000278 (0.000342)	0.000257 (0.000158)	-0.00134** (0.000431)	-0.00156*** (0.000424)
Constant	0.734* (0.311)	3.348*** (0.382)	30.59*** (1.718)	34.50*** (1.687)	-8.827*** (0.581)	-1.912*** (0.370)	1.065 (0.903)	3.716*** (1.033)
Individual FE	No	Yes	No	Yes	No	Yes	No	Yes
R-squared	42,976	42,976	42,975	42,975	42,976	42,976	42,976	42,976
Observations	0.181	0.476	0.141	0.525	0.128	0.873	0.0533	0.401

Note. Data are sourced from the KLoSA . The sample comprises an unbalanced panel of 8,088 adults aged 55 or older from 2008 to 2020, spanning seven survey waves. The dependent variables are the respondents' health indicators. All regressions are controlled for survey-year fixed effects. Fixed effects (FE) estimation controls for individual fixed effects. Robust standard errors are reported in the parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 4. Impact of Retirement on Health Outcomes (2SLS Estimates)

Dependent Variable	Self-rated overall health		Daily living difficulty		Number of chronic diseases		Depression	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Retirement	2.057***	2.084***	5.811***	5.523***	2.840***	2.908***	3.102***	3.044***
	(0.168)	(0.170)	(0.472)	(0.455)	(0.242)	(0.245)	(0.342)	(0.331)
Gender	-0.345***	-0.350***	-0.389***	-0.343***	-0.410***	-0.421***	-0.474***	-0.465***
	(0.0332)	(0.0337)	(0.102)	(0.0986)	(0.0509)	(0.0517)	(0.0697)	(0.0683)
High school	-0.256***	-0.255***	-0.323***	-0.330***	-0.211***	-0.209***	-0.230***	-0.231***
	(0.0225)	(0.0227)	(0.0700)	(0.0684)	(0.0377)	(0.0380)	(0.0470)	(0.0467)
College	-0.485***	-0.487***	-0.801***	-0.782***	-0.594***	-0.598***	-0.434***	-0.430***
	(0.0361)	(0.0363)	(0.106)	(0.103)	(0.0573)	(0.0578)	(0.0729)	(0.0722)
Married	-0.0340	-0.0318	-0.439***	-0.462***	0.000416	0.00584	-0.328***	-0.333***
	(0.0250)	(0.0252)	(0.0873)	(0.0858)	(0.0397)	(0.0401)	(0.0561)	(0.0555)
Unmarried child	0.0753***	0.0769***	0.0999	0.0836	0.00431	0.00819	0.208***	0.204***
	(0.0213)	(0.0215)	(0.0723)	(0.0709)	(0.0336)	(0.0339)	(0.0468)	(0.0465)
Metropolitan city	-0.166***	-0.168***	-0.333***	-0.313***	-0.163***	-0.168***	-0.350***	-0.346***
	(0.0216)	(0.0218)	(0.0692)	(0.0676)	(0.0344)	(0.0347)	(0.0467)	(0.0461)
Household income	-0.00617	-0.00568	0.117***	0.112***	-0.00532	-0.00411	0.00308	0.00206
	(0.00463)	(0.00467)	(0.0181)	(0.0175)	(0.00701)	(0.00709)	(0.00908)	(0.00893)
Household assets	-0.00144***	-0.00145***	-0.00324***	-0.00312***	-0.000152	-0.000180	-0.00126*	-0.00123*
	(0.000277)	(0.000279)	(0.000786)	(0.000764)	(0.000461)	(0.000465)	(0.000573)	(0.000569)
Constant	3.483***	3.473***	-0.556**	-0.446*	0.768***	0.742***	1.077***	1.099***
	(0.0690)	(0.0698)	(0.198)	(0.192)	(0.100)	(0.102)	(0.140)	(0.136)
IVs	Z	Z, Z*V	Z	Z, Z*V	Z	Z, Z*V	Z	Z, Z*V
F-stat (1st Stage)	234.10	118.71	234.10	118.71	234.10	118.71	234.10	118.71
Hasen's J, p-value (OID test)		0.41		0.01**		0.17		0.32
Observations	42,976	42,976	42,975	42,975	42,976	42,976	42,976	42,976

Note: Z is pension eligibility and V is the value of received pension benefits. The sample comprises an unbalanced panel of 8,088 adults aged 55 or older from 2008 to 2020, spanning seven survey waves. The dependent variables are the respondents' health indicators. All regressions include survey-year fixed effects. Robust standard errors clustered at the individual level are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 5. Impact of Pension Eligibility Age and Pension Amounts on Retirement (1st Stage of 2SLS)

Dependent Variable	Retirement	
	(1)	(2)
Pension Eligibility Age Indicator	0.213***	0.175***
	(0.00741)	(0.00767)
Pension Amounts		0.0000774***
		(0.00000590)
Gender	0.122***	0.101***
	(0.00826)	(0.00840)
High school	-0.00358	-0.0145
	(0.00961)	(0.00953)
College	0.112***	0.0726***
	(0.0154)	(0.0149)
Married	-0.0717***	-0.0652***
	(0.00856)	(0.00853)
Unmarried child	-0.0496***	-0.0474***
	(0.00865)	(0.00858)
Metropolitan city	0.0736***	0.0732***
	(0.00748)	(0.00743)
Household income	-0.0188***	-0.0197***
	(0.00206)	(0.00214)
Household assets	0.0000664	0.0000602
	(0.000110)	(0.000112)
Constant	3.483***	3.473***
	(0.0690)	(0.0698)
Observations	42,976	42,976

Note. Data are sourced from the KLoSA. The sample comprises an unbalanced panel of 8,088 adults aged 55 or older from 2008 to 2020, spanning seven survey waves. The dependent variables are the respondents' retirement indicator. All regressions are controlled for survey-year fixed effects. Robust standard errors clustered at the individual level are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels.

Table 6. Impact of Re-employment on Health Outcomes

Dependent Variable	Self-rated overall health		Daily living difficulty		Number of chronic diseases		Depression	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Re-employment	-0.111*** (0.0247)	-0.0611** (0.0261)	-0.332*** (0.0730)	-0.0955 (0.0735)	-0.0918** (0.0372)	-0.0124 (0.0202)	-0.224*** (0.0618)	-0.177*** (0.0673)
Gender	-0.172*** (0.0158)		0.206*** (0.0467)		-0.117*** (0.0238)		-0.159*** (0.0396)	
High school	-0.200*** (0.0180)	0.0596 (0.225)	-0.0661 (0.0534)	0.0470 (0.634)	-0.0780*** (0.0272)	0.331* (0.174)	-0.116** (0.0452)	0.524 (0.579)
College	-0.336*** (0.0254)	0.0927 (0.264)	-0.213*** (0.0752)	-0.216 (0.746)	-0.234*** (0.0384)	0.324 (0.205)	-0.287*** (0.0636)	0.783 (0.682)
Age	0.0561*** (0.0134)	0.0175 (0.0151)	-0.751*** (0.0395)	-0.674*** (0.0425)	0.130*** (0.0202)	0.0114 (0.0117)	0.0246 (0.0334)	0.0245 (0.0389)
Age square	-0.000218** (0.000091)	0.000047 (0.000104)	0.00563*** (0.000269)	0.00528*** (0.000293)	-0.000692*** (0.000137)	0.000458*** (0.000081)	0.000056 (0.000228)	-0.000361 (0.000268)
Married	-0.0275 (0.0182)	0.0635* (0.0345)	-0.0194 (0.0538)	0.192** (0.0975)	-0.0235 (0.0274)	0.0252 (0.0268)	-0.319*** (0.0455)	-0.175* (0.0891)
Unmarried child	0.0684*** (0.0190)	-0.0389 (0.0267)	0.00413 (0.0561)	0.0159 (0.0753)	0.0131 (0.0286)	0.00693 (0.0207)	0.106** (0.0476)	-0.0379 (0.0689)
Metropolitan city	-0.0346** (0.0140)	-0.0670 (0.0606)	-0.0588 (0.0413)	0.0454 (0.171)	0.0434** (0.0211)	0.00357 (0.0470)	-0.0963*** (0.0350)	-0.0401 (0.157)
Household income	-0.0283*** (0.00341)	-0.0110*** (0.00355)	0.0194* (0.0101)	0.0171* (0.0100)	-0.0221*** (0.00514)	-0.00141 (0.00275)	-0.0388*** (0.00853)	-0.0114 (0.00917)
Household assets	-0.00122*** (0.000227)	0.000094 (0.000318)	-0.00139** (0.000671)	-0.000083 (0.000897)	-0.000889*** (0.000342)	0.000011 (0.000246)	-0.00217*** (0.000568)	-0.00140* (0.000820)
Constant	1.262*** (0.485)	2.360*** (0.552)	25.10*** (1.432)	21.38*** (1.558)	-4.331*** (0.731)	-1.857*** (0.428)	0.519 (1.212)	1.839 (1.425)
Individual FE	No	Yes	No	Yes	No	Yes	No	Yes
R-squared	0.139	0.031	0.093	0.064	0.111	0.333	0.049	0.010
Observations	13,608	13,608	13,608	13,608	13,608	13,608	13,608	13,608

Note: The sample comprises a balanced panel of 2,505 adults aged 55 or older who were in the sample for all seven survey waves and reported being ever retired in the surveys. The dependent variables are the respondents' health indicators. All regressions are controlled for survey-year fixed effects. Fixed effects (FE) estimation controls for individual fixed effects. Robust standard errors are reported in the parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively

Table 7. Impact of Re-employment on Health Outcomes (2SLS Estimates)

Dependent Variable	Self-rated overall health		Daily living difficulty		Number of chronic diseases		Depression	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Re-employment	-2.231**	-2.536***	-10.91***	-10.10***	-2.401	-3.234**	-4.626**	-4.481**
	(0.738)	(0.664)	(3.108)	(2.538)	(1.259)	(1.131)	(1.727)	(1.464)
Gender	-0.00237	0.00774	0.741***	0.715***	0.0297	0.0573	0.118	0.113
	(0.0427)	(0.0427)	(0.168)	(0.154)	(0.0764)	(0.0773)	(0.0983)	(0.0926)
High school	-0.233***	-0.230***	-0.133	-0.141	-0.145	-0.137	-0.129	-0.130
	(0.0421)	(0.0440)	(0.163)	(0.154)	(0.0738)	(0.0774)	(0.0931)	(0.0916)
College	-0.387***	-0.390***	-0.391	-0.383	-0.346**	-0.354**	-0.356**	-0.355**
	(0.0596)	(0.0628)	(0.223)	(0.213)	(0.108)	(0.113)	(0.125)	(0.124)
Married	-0.100*	-0.0924*	-0.183	-0.204	-0.0784	-0.0570	-0.342***	-0.346***
	(0.0419)	(0.0420)	(0.165)	(0.153)	(0.0736)	(0.0745)	(0.0973)	(0.0932)
Unmarried child	0.0106	0.00712	-0.154	-0.144	-0.0907	-0.100	0.0266	0.0282
	(0.0390)	(0.0405)	(0.155)	(0.148)	(0.0680)	(0.0714)	(0.0866)	(0.0849)
Metropolitan city	-0.0954**	-0.103**	-0.377**	-0.357**	-0.0196	-0.0402	-0.223**	-0.219**
	(0.0353)	(0.0358)	(0.144)	(0.131)	(0.0637)	(0.0649)	(0.0820)	(0.0784)
Household income	-0.00983	-0.00577	0.155**	0.144**	-0.0113	-0.000198	0.00457	0.00265
	(0.0132)	(0.0122)	(0.0521)	(0.0457)	(0.0206)	(0.0190)	(0.0266)	(0.0234)
Household assets	-0.0019***	-0.00203***	-0.00626**	-0.00591**	-0.00176	-0.00213*	-0.00414***	-0.00408***
	(0.000527)	(0.000516)	(0.00219)	(0.00201)	(0.000920)	(0.000919)	(0.00119)	(0.00111)
Constant	4.573***	4.596***	2.510***	2.448***	2.398***	2.463***	2.507***	2.496***
	(0.0655)	(0.0623)	(0.301)	(0.263)	(0.117)	(0.111)	(0.162)	(0.147)
IVs	zv2,zv4	zv,zv4	zv2,zv4	zv,zv4	zv2,zv4	zv,zv4	zv2,zv4	zv,zv4
F-stat (1st Stage)	12.88	15.93	12.88	15.93	12.88	15.93	12.84	15.91
Hasen's J, p-value (OID test)	0.87	0.85	0.02	0.03	0.67	0.39	0.98	0.96
Observations	11664	11664	11664	11664	11664	11664	11636	11636

Note: zv is the value of the pension benefits received contemporaneously, and zv2 and zv4 are the values of the pension benefits received two and four years ago, respectively. The sample consists of a panel of 1,944 adults aged 55 or older who reported being ever retired in the seven survey waves conducted from 2008 to 2020. The dependent variables are the respondents' health indicators. All regressions are controlled for survey-year fixed effects.

Table 8. Impact of Pension Amounts on Re-employment (1st Stage of 2SLS)

Dependent Variable	Re-employment	
	(1)	(2)
Pension Amounts (t)	0.0000383***	
	(0.00000966)	
Pension Amounts (t-4)	-0.0000109	0.000000118
	(0.00000728)	(0.00000626)
Pension Amounts (t-2)		0.0000409***
		(0.0000111)
Gender	0.0174*	0.0160
	(0.00854)	(0.00856)
High school	0.000647	0.000575
	(0.0105)	(0.0105)
College	-0.00767	-0.00743
	(0.0163)	(0.0163)
Married	0.0216**	0.0214**
	(0.00803)	(0.00803)
Unmarried child	-0.00594	-0.00663
	(0.0106)	(0.0106)
Metropolitan city	-0.000428	-0.000457
	(0.00788)	(0.00788)
Household income	0.00598*	0.00600*
	(0.00241)	(0.00243)
Household assets	-0.000480***	-0.000483***
	(0.0000968)	(0.0000969)
Constant	0.0450***	0.0451***
	(0.00882)	(0.00882)
Observations	12525	12525

Note. Data are sourced from the KLoSA. The sample comprises a balanced panel aged 55 or older from 2008 to 2020, spanning seven survey waves. The dependent variables are the respondents' retirement indicator. All regressions are controlled for survey-year fixed effects. *, **, and *** indicate significance at the 10%, 5%, and 1% levels.

Table 9. Impact of Retirement on Personal and Social Activities (2SLS Estimates)

Dependent Variable	Smoke		Alcohol		Workout		Religion		Leisure	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Retirement	-0.482***	-0.486***	-0.839***	-0.835***	-0.432***	-0.405***	0.0782	0.0527	-0.0142	0.00379
	(0.0598)	(0.0599)	(0.0837)	(0.0833)	(0.103)	(0.101)	(0.0561)	(0.0568)	(0.0341)	(0.0313)
IVs	z, zv	z	z, zv	z	z, zv	Z	z, zv	z	z, zv	z
F-stat	118.71	234.10	118.71	234.10	118.71	234.10	118.71	234.10	118.71	234.10
P-value of OID test	0.75		0.78		0.21		0.02		0.06	
Observations	42,976	42,976	42,976	42,976	42,976	42,976	42,976	42,976	42,976	42,976
Dependent Variable	**Alumni**		**Volunteer**		**Religion + Alumni**		**Religion + Leisure**		**Religion + Volunteer**	
	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Retirement	-0.349***	-0.319***	-0.0243*	-0.0290**	-0.273***	-0.269***	0.0621	0.0542	0.0519	0.0213
	(0.0586)	(0.0558)	(0.0140)	(0.0142)	(0.0807)	(0.0793)	(0.0656)	(0.0647)	(0.0578)	(0.0587)
IVs	z, zv	z	z, zv	z	z, zv	Z	z, zv	z	z, zv	z
F-stat	118.71	234.10	118.71	234.10	118.71	234.10	118.71	234.10	118.71	234.10
P-value of OID test	0.07		0.11		0.82		0.59		0.01	
Observations	42,976	42,976	42,976	42,976	42,976	42,976	42,976	42,976	42,976	42,976
Dependent Variable	**Religion +Alumni + Volunteer**		**Religion + Leisure + Volunteer**		**Religion + Alumni + Leisure**		**Alumni + Leisure + Volunteer**		**Religion + Alumni + Leisure + Volunteer**	
	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)
Retirement	-0.298***	-0.298***	0.0377	0.0252	-0.288**	-0.265**	-0.388***	-0.345***	-0.312***	-0.294**
	(0.0826)	(0.0815)	(0.0675)	(0.0667)	(0.0913)	(0.0876)	(0.0751)	(0.0700)	(0.0933)	(0.0898)
IVs	z, zv	z	z, zv	z	z, zv	Z	z, zv	z	z, zv	z
F-stat	118.71	234.10	118.71	234.10	118.71	234.10	118.71	234.10	118.71	234.10
P-value of OID test	0.98		0.41		0.31		0.02		0.43	
Observations	42,976	42,976	42,976	42,976	42,976	42,976	42,976	42,976	42,976	42,976

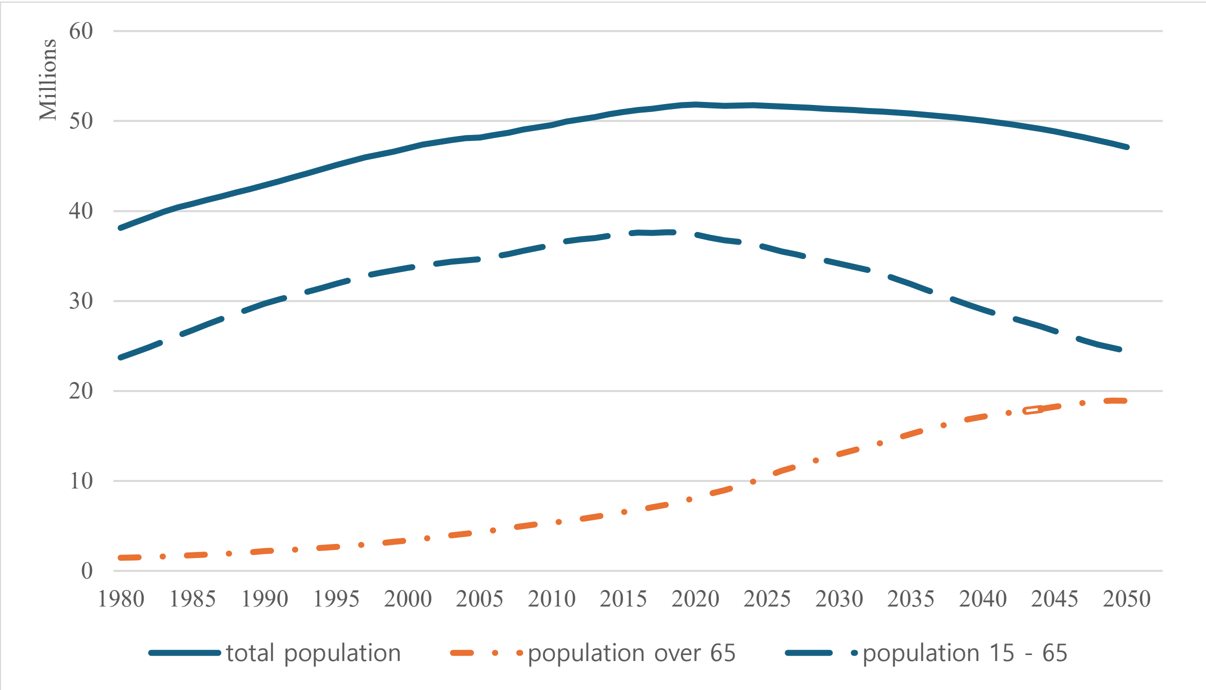
Note: The sample comprises an unbalanced panel of 8,088 adults aged 55 or older from 2008 to 2020, spanning seven survey waves. The dependent variable of combined activities is constructed as the sum of individual activity variables. Z is pension eligibility and V is the value of the received pension benefits. The dependent variables are respondents' social activities and time use. All regressions include the same control variables as in Table 6 and survey-year fixed effects. Robust standard errors clustered at the individual level are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 10. Impact of Re-employment on Personal and Social Activities (2SLS Estimates)

Dependent Variable	**Smoke**		**Alcohol**		**Workout**		**Religion**		**Leisure**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Re-employment	-0.236	-0.211	0.551	0.538	0.801**	0.916**	0.670**	0.635**	-0.104	-0.0680
	(0.238)	(0.254)	(0.351)	(0.381)	(0.323)	(0.364)	(0.279)	(0.306)	(0.125)	(0.136)
IVs	zv, zv2	zv2,zv4	zv, zv2	zv2,zv4	zv, zv2	zv2,zv4	zv, zv2	zv2,zv4	zv, zv2	zv2,zv4
F-stat	15.36	14.72	15.36	14.72	15.36	14.72	15.36	14.72	15.36	14.72
P-value of OID test	0.82	0.03	0.87	0.89	0.20	0.23	0.69	0.01	0.32	0.61
Observations	11664	11664	15232	15232	15232	15232	15232	15232	11664	15232
Dependent Variable	**Alumni**		**Volunteer**		**Religion + Alumni**		**Religion + Leisure**		**Religion + Volunteer**	
	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Re-employment	0.0879	0.134	-0.0106	0.0223	0.758**	0.769**	0.566	0.567	0.660**	0.657*
	(0.165)	(0.188)	(0.0374)	(0.0470)	(0.330)	(0.368)	(0.303)	(0.337)	(0.282)	(0.314)
IVs	zv, zv2	zv2,zv4	zv, zv2	zv2,zv4	zv, zv2	zv2,zv4	zv, zv2	zv2,zv4	zv, zv2	zv2,zv4
F-stat	15.36	14.72	15.36	14.72	15.36	14.72	15.36	14.72	15.36	14.72
P-value of OID test	0.73	0.37	0.17	0.35	0.61	0.14	0.45	0.01	0.52	0.02
Observations	11664	15232	11664	15232	11664	15232	11664	15232	11664	15232
Dependent Variable	**Religion +Alumni + Volunteer**		**Religion + Leisure + Volunteer**		**Religion + Alumni + Leisure**		**Alumni + Leisure + Volunteer**		**Religion + Alumni + Leisure + Volunteer**	
	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)
Re-employment	0.748**	0.791**	0.556	0.589	0.654*	0.701*	-0.0269	0.0879	0.643*	0.723*
	(0.334)	(0.377)	(0.308)	(0.347)	(0.361)	(0.405)	(0.231)	(0.258)	(0.366)	(0.415)
IVs	zv, zv2	zv2,zv4	zv, zv2	zv2,zv4	zv, zv2	zv2,zv4	zv, zv2	zv2,zv4	zv, zv2	zv2,zv4
F-stat	15.36	14.72	15.36	14.72	15.36	14.72	15.36	14.72	15.36	14.72
P-value of OID test	0.48	0.20	0.33	0.02	0.42	0.12	0.29	0.62	0.33	0.17
Observations	11664	11664	11664	11664	11664	11664	11664	11664	11664	11664

Note: The sample consists of a panel of 1,944 adults aged 55 or older who reported being ever retired in the seven survey waves conducted from 2008 to 2020. The dependent variable of combined activities is constructed as the sum of individual activity variables. zv is the value of pension benefits received contemporaneously, and zv2 and zv4 are the values of pension benefits received two and four years ago, respectively. The dependent variables are respondents' social activities and time use. All regressions include the same control variables as in Table 6 and survey-year fixed effects. Robust standard errors clustered at the individual level are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

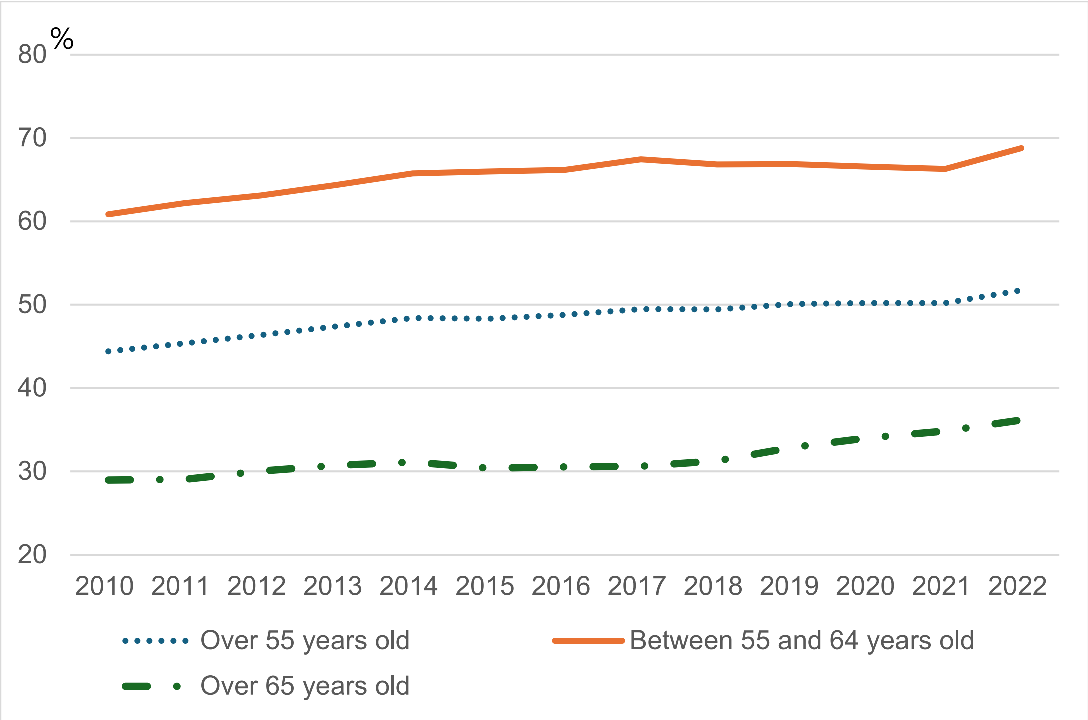
Figure 1: Trend and Projection of Population Aged 65 and Over, 1980~2050



Note: Projections are based on the medium scenario projection.

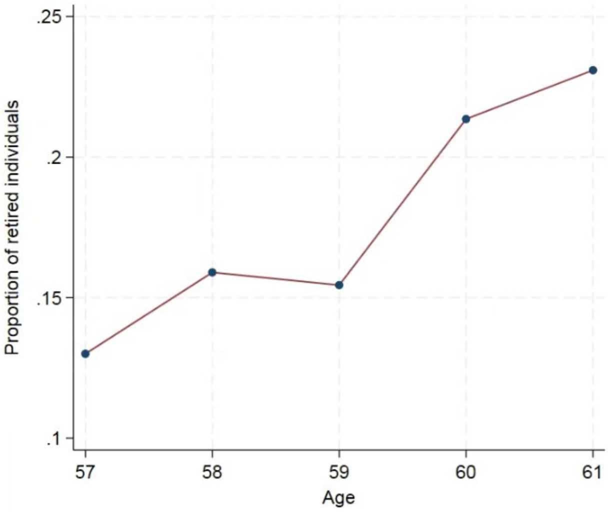
Source: National Statistics Office (NSO), Population Projections and Summary Indicators (Korea), KOSIS (Accessed March 10, 2024).

Figure 2. Trend of the Employment Rate of the Older Population by Age Group (2010–2022)

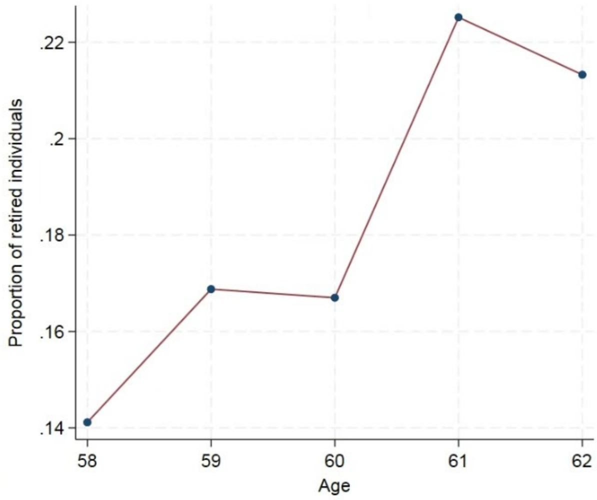


Source: National Statistics Office (NSO), the Annual Report on the Economic Active Population Survey, 2023.

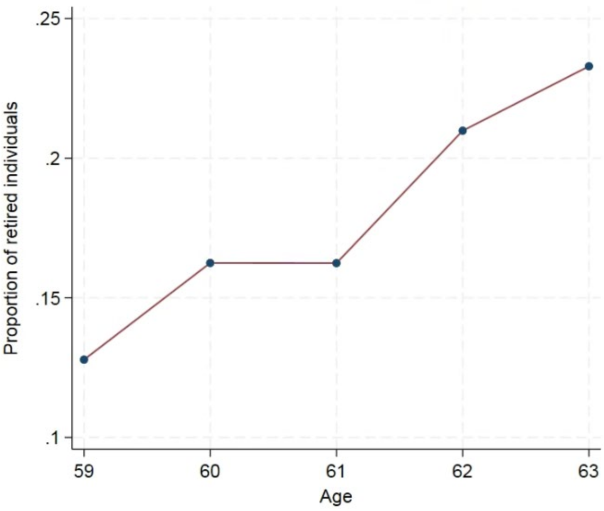
Figure 3. Retirement Rate by Age for Three Distinct Cohorts



(a) Jan 1, 1949 ~ Dec 31, 1952



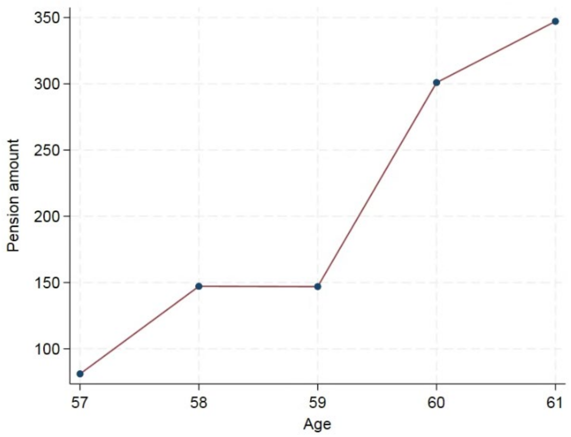
(b) Jan 1, 1953 ~ Dec 31, 1956



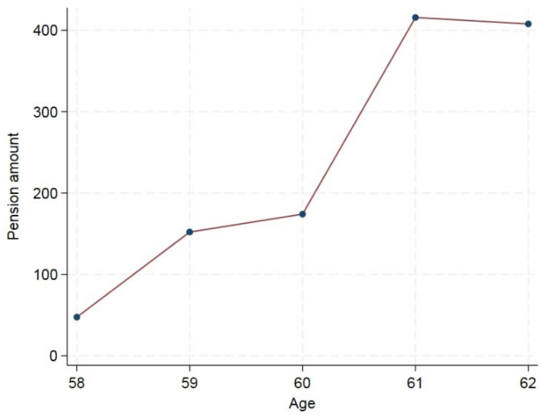
(c) Jan 1, 1957 ~ Dec 31, 1960

Note: The retirement rate indicates the proportion of individuals who retire at each age. For the three cohort groups, we plot the proportion of retired individuals by age. Pension eligibility begins at age 60, 61, and 62 for those born between Jan 1, 1949 – Dec 31, 1952; Jan 1, 1953 – Dec 31, 1956; and Jan 1, 1957 – Dec 31, 1960, respectively.

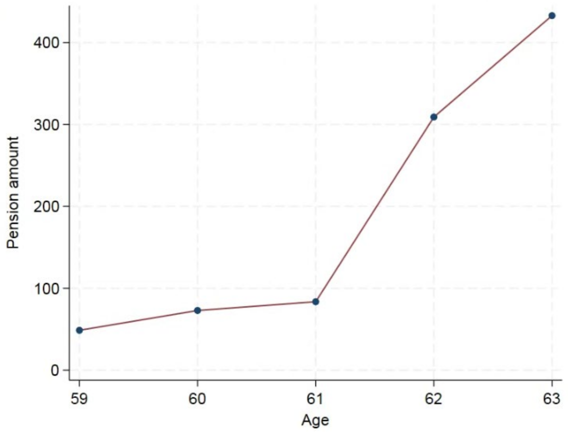
Figure 4. Average Pension Benefits by Age for Three Distinct Cohorts



(a) Jan 1, 1949 ~ Dec 31, 1952



(b) Jan 1, 1953 ~ Dec 31, 1956



(c) Jan 1, 1957 ~ Dec 31, 1960

Note: For the three cohort groups, we plot the average pension amount by age. The pension eligibility age starts at 60, 61, and 62 for individuals born between Jan 1, 1949 – Dec 31, 1952; Jan 1, 1953 – Dec 31, 1956; and Jan 1, 1957 – Dec 31, 1960, respectively.

Online Appendix

Robustness Test

We assess the robustness of our findings through sensitivity analyses for both retirement and re-employment. We begin by presenting the results of the sensitivity analyses for retirement.

First, we present three additional sets of results demonstrating the negative effect of retirement on health outcomes from three different samples: (i) individuals aged within a range of plus or minus 3 years from the eligibility age for retirement pension benefits, (ii) individuals aged within a range of plus or minus 5 years from the eligibility age, and (iii) individuals aged within a range of plus or minus 7 years from the eligibility age. In the three panels of the results in Table A1, which correspond to the three restricted samples with narrower age windows, we consistently find significant negative effects of retirement on three health outcomes: self-rated health, number of chronic diseases, and depression. All the estimations successfully passed the weak IV tests, and the OID tests are satisfactory for the three health outcome variables. This finding confirms the robustness of the main findings presented in Table 4.

[Insert Table A1 here]

Second, we used a survey question on the main reason for retirement to isolate the effects attributable to non-financial sources from the overall effect. Approximately 4.3% of the individuals reported that the main reason for retirement was sufficient income and wealth already accumulated for their retirement. We classify these individuals as belonging to the high-income group. By focusing on retirees within this group, we aim to isolate the negative retirement effect attributed solely to non-financial factors from the overall effect. Assuming that the negative retirement effect on health is mitigated by income and wealth sources, we anticipate a smaller effect in this high-income group. Consequently, we estimate the following specification using an interaction term to estimate the heterogeneous effects:

$$(A1)\ Health_{i,t} = \alpha + \beta_1 Retire_{i,t} + \beta_2 Retire_{i,t} * \mathrm{HI}_i + \boldsymbol{X}_{i,t}\beta_3 + \mu_t + e_{i,t}$$

where $\mathrm{HI}_i = 1$ if individual i belongs to the high-income group and 0 otherwise. We define the high-income group as individuals who reported having accumulated sufficient income and wealth for retirement, based on their responses to the survey question about their reason for retiring. The variable $\boldsymbol{X}_{i,t}$ includes all the explanatory variables used in Table 4, along with HI_i. The effects of retirement on health outcomes for the non-high income and high-income groups are estimated by $\hat{\beta}_1$ and $\hat{\beta}_1 + \hat{\beta}_2$, respectively.

In Panel A of Table A2, for the three health outcomes that pass the weak IV and OID tests at the 5% significance level, the negative effects are statistically significant for the high-income group, but are significantly smaller in magnitude compared to those for the non-high-income group. The difference in effects across the high-income and non-high-income groups, measured by $\hat{\beta}_2$, is statistically significant for all three health outcome variables.

We also examine whether the effects of retirement on health differ in low-income households. For instance, Pransky et al. (2005) and Leigh & DeVogli (2016) imply that low wages could negatively affect health, suggesting lower-income individuals may experience greater financial stress upon retirement, potentially exacerbating adverse health outcomes. We estimate the following interaction model to capture the heterogeneous effects by income:

$$(A2)\ Health_{i,t} = \alpha + \beta_1 Retire_{i,t} + \beta_2 Retire_{i,t} * \mathrm{LI}_i + \boldsymbol{X}_{i,t}\beta_3 + \mu_t + e_{i,t}.$$

where $\mathrm{LI}_i = 1$ if individual i belongs to the low-income group, and 0 otherwise. The low-income group is defined as individuals whose household income is less than or equal to the median. The effects of retirement on health outcomes for individuals with household income above the median and below the median are estimated by $\hat{\beta}_1$ and $\hat{\beta}_1 + \hat{\beta}_2$, respectively. In

Panel B of Table A2, for the three health outcomes that pass both the weak IV and overidentification (OID) tests at the 5% significance level, the negative effects of retirement remain statistically significant for the high-income group but are substantially larger in magnitude for the low-income group. The difference in effects across ncome groups, measured by $\hat{\beta}_2$, is statistically significant for all three health outcome variables. These findings suggest that while the adverse effects of retirement are significant and substantial across income groups, they are more severe for individuals in the low-income group.

[Insert Table A2 here]

Third, we also examine whether the results are robust across both genders, as previous studies suggest that retirement decisions and their associations with health outcomes differ considerably by gender. Women tend to have distinct employment patterns, lower lifetime earnings, and longer life expectancies compared to men, all of which pose greater challenges in preparing for retirement. In addition, women are generally more risk-averse and more likely to assume caregiving responsibilities—factors that can influence both the timing of retirement and subsequent health outcomes (Bernasek & Shwiff, 2001; Charness & Gneezy, 2012). Research also shows that a spouse's health has a stronger influence on women's retirement decisions than on men's (Talaga & Beehr, 1995), and that the negative impact of retirement on cognitive functioning is more pronounced among women (Lei & Liu, 2018). In Table A3, we examine whether the effects of retirement on health differ significantly by gender, using gender-specific subsamples. Our 2SLS results indicate that the adverse effects of retirement are greater for females than for males across all four health measures. Although the effects for males are comparatively smaller, they remain significantly negative, indicating that retirement consistently harms health outcomes for both genders. Consequently, our findings provide robust evidence of the negative effects of retirement on health, with stronger impacts observed among females.

[Insert Table A3 here]

Previous studies also suggest that retirement decisions and their interactions with health outcomes may differ considerably by marital status. For instance, Kim and Moen (2002) find that marital status interacts with retirement to influence health outcomes. Single individuals, who may lack the social support typically provided by spouses, could thus be more vulnerable to negative health effects after retirement. Following this literature, we examine whether these effects differ significantly by income level and marital status.

In Table A4, we estimate heterogeneous effects by marital status using subsample analyses. We find that the adverse effects of retirement are greater for individuals who are single across all four health measures. Although the effects are slightly smaller for married individuals, they remain highly significant across all measures. In all eight columns for married subsamples, the instruments show high F-statistics, indicating no issues with weak instruments, and generally pass the overidentification (OID) tests, except for the measure "Daily living difficulty." Based on the 2SLS results, we conclude that the adverse effects of retirement are significant for both single and married individuals, though the magnitude is slightly greater for singles.

[Insert Table A4 here]

Similarly, in Table A5, we examine heterogeneous effects by income and marital status by including an interaction term based on a low-income indicator—defined as household income less than or equal to the median—in two subsamples stratified by marital status. For both married and single individuals, the adverse effects of retirement are greater for the low-income group. However, income-based differences in these effects are notably more pronounced among single individuals. Thus, being single and having a low income both contribute to greater adverse retirement effects, with the strongest effects observed among single, low-income individuals.

[Insert Table A5 here]

We also conduct a placebo test using the placebo eligibility age variable, eliminating all observations corresponding to ages eligible for retirement pension benefits. We then generated a placebo eligibility age using the non-eligible age sample. We considered ages more than two years before the eligibility age as non-eligible and ages between zero and two years before the eligibility age as placebo-eligible. We also created alternative placebo eligibility ages, considering ages more than four years before the eligibility age as non-eligible and ages between zero and four years before the eligibility age as placebo-eligible. These tests determine whether significant differences in health outcomes arise among age cohorts divided by birth year. If no differences in health outcomes are found in the placebo tests, it will be confirmed that any differences in health outcomes arise only for age cohorts divided by retirement eligibility.

In Table A6, we observe very small first-stage F-test statistics, which are less than 1 for all estimations. We also find no significant difference in retirement by birth cohort before the retirement eligibility age for all four health outcome variables. These results imply that for the pre-retirement age groups, which consist of individuals younger than those eligible for retirement, there were no statistically significant differences in retirement status (1st stage significance) or significant differences in health outcomes by age cohort. With the introduction of two arbitrary eligibility ages, we demonstrate that the effect does not originate from differences in age cohorts.

[Insert Table A6 here]

For re-employment, we adopt three sets of sensitivity analyses: alternative samples with narrower age windows, a placebo test and heterogenous effects.

We begin by employing alternative samples that include individuals within narrower age ranges centered on the eligibility age. However, in contrast to the retirement case, we adopted wider age windows surrounding the retirement eligibility age for re-employment. This adjustment reflects the extended time required for individuals to retire and re-enter the workforce after retirement. Consequently, we report three additional sets of results based on three different sample coverages: (i) retired individuals aged within a range of plus or minus 7 years from the eligibility age for retirement pension benefits, (ii) retired individuals aged within a range of plus or minus 10 years from the eligibility age and (iii) retired individuals aged within a range of plus or minus 13 years from the eligibility age. In Table A7, we observe consistent positive effects of re-employment on health outcomes, regardless of the length of the age window. These effects become more significant and greater in magnitude over wider windows. This suggests that individuals who take longer to re-enter the labor market experience a greater increase in social engagement, leading to greater health benefits.

[Insert Table A7 here]

Second, we perform placebo tests using re-employed workers only. For these tests, we use a restricted sample of individuals eligible for retirement pension benefits who were ever re-employed after retirement, focusing on the periods between retirement and re-employment. At the individual level, observations during this period are categorized as placebo-eligible ages and non-eligible ages, with the final two (or three) years of the period being placebo-eligible ages and the remaining observations as non-eligible ages. Given that the division of placebo-eligible ages and non-eligible ages is done by the ages of re-employed individuals, any overtime changes in health outcomes after the beginning of retirement will be captured as the effect of placebo re-employment. In Table A8, for all four health outcome variables, we find no significant difference in health outcomes between the start of eligibility and immediately before re-employment. This further suggests that the health effect of re-employment materializes only after an individual has been re-employed.

[Insert Table A8 here]

Finally, we compare the effects of re-employment across two different types of re-employment—hired employment and self-employment—and examine how the health effects of re-employment vary between individuals hired by employers and those who are self-employed. We argue that self-employed individuals may experience fewer changes in their work-related social networks than hired employees because, by definition, they do not have work-related groups.

Drawing from the findings on the channels of effects in Section 5, we aim to determine the extent to which the health effects of re-employment can be attributed to rejoining work-related groups upon being re-employed. We can do this by comparing the self-employed and hired worker groups. We expect the positive effect of re-employment on health outcomes to be smaller for self-employed individuals than for hired employees. To test this hypothesis, we use the following specification with an interaction term to estimate heterogeneous effects:

$$(A3)\ Health_{i,t} = \alpha + \beta_1 Reemploy_{i,t} + \beta_2 Reemploy_{i,t} * \mathrm{Self-employ}_i + \boldsymbol{X}_{i,t}\beta_3 + \beta_4 \mathrm{Self-employ}_i + \mu_t + e_{i,t}$$

where $\mathrm{Self-employ}_i$ is an indicator equal to 1 if individual i is self-employed when he/she is re-employed, and 0 otherwise. The effects of re-employment on health outcomes for hired employees and self-employed groups are estimated by $\hat{\beta}_1$ and $\hat{\beta}_1 + \hat{\beta}_2$, respectively.

In Panel A of Table A9, weak IV and OID tests are passed for three health outcomes: self-rated health, number of chronic diseases, and depression. We find significant and positive effects of re-employment for both hired employees and self-employed groups. However, these effects are significantly smaller in magnitude for the self-employed group. Furthermore, the difference in effects between hired employees and self-employed groups, measured by $\hat{\beta}_2$, is statistically significant for all four health outcome variables. In Panel B of Table A9, we explore an alternative definition for self-employment using an indicator for individuals who were hired workers before retirement but became self-employed upon re-employment. Therefore, we narrowly defined self-employed by restricting it to individuals who switched from hired to self-employed workers. We find consistent results in terms of the sign of the effect with those in Panel A, although the effects are smaller in magnitude with the alternative definition of the self-employed in Panel B than with the effects in Panel A.

[Insert Table A9 here]

References

Bernasek, A., Stephanie S., Gender, risk, and retirement. Journal of economic issues 35 (2001): 345-356.

Charness, G., and Gneezy U., Strong evidence for gender differences in risk taking." Journal of economic behavior & organization 83 (2012): 50-58.

Kim, J. E., Moen, P.. Retirement transitions, gender, and psychological well-being: A life-course, ecological model. The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 57, (2002) 212-222.

Lei, X., Liu, H. Gender difference in the impact of retirement on cognitive abilities: Evidence from urban China. Journal of Comparative Economics, 46 (2018), 1425-1446.

Leigh, J. P., De Vogli, R. Low wages as occupational health hazards. Journal of Occupational and Environmental Medicine, 58 (2016), 444-447.

Pransky, G. S., Benjamin, K. L., Savageau, J. A., Currivan, D., Fletcher, K. Outcomes in work-related injuries: A comparison of older and younger workers. American journal of industrial medicine, 47 (2005) 104-112.

Talaga, J., Beehr, T., Are there gender differences in predicting retirement decisions?. Journal of Applied Psychology 80 (1995): 16.

Table A1. Impact of Retirement on Health Outcomes (2SLS Estimates), Alternative Samples

Dependent Variable	Self-rated overall health		Daily living difficulty		Number of chronic diseases		Depression	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A. Pension eligibility age +/- 3 years (62~68 years old)							
Retirement	2.194***	2.369***	2.493*	2.327**	4.838***	4.660***	3.591**	3.370**
	(0.575)	(0.574)	(0.972)	(0.837)	(1.081)	(1.005)	(1.178)	(1.035)
IVs	Z	$Z, Z*V$	Z	$Z, Z*V$	Z	$Z, Z*V$	Z	$Z, Z*V$
F-stat (1st Stage)	22.80	12.35	22.80	12.35	22.80	12.35	22.80	12.35
Hasen's J, p-value (OID test)		0.47		0.64		0.67		0.59
Observations	11,102	11,102	11,102	11,102	11,102	11,102	11,102	11,102
	Panel B. Pension eligibility age +/- 5 years (60~70 years old)							
Retirement	2.338***	2.374***	2.232***	2.104***	4.089***	3.973***	3.085***	2.934***
	(0.371)	(0.370)	(0.601)	(0.546)	(0.606)	(0.583)	(0.690)	(0.636)
IVs	Z	$Z, Z*V$	Z	$Z, Z*V$	Z	$Z, Z*V$	Z	$Z, Z*V$
F-stat (1st Stage)	57.36	29.82	57.36	29.82	57.36	29.82	57.36	29.82
Hasen's J, p-value (OID test)		0.77		0.42		0.54		0.42
Observations	17,574	17,574	17,574	17,574	17,574	17,574	17,574	17,574
	Panel C. Pension eligibility age +/- 7 years (58~72 years old)							
Retirement	1.935***	2.148***	3.042***	2.468***	3.207***	3.251***	3.530***	2.917***
	(0.415)	(0.410)	(0.792)	(0.599)	(0.616)	(0.576)	(0.886)	(0.680)
IVs	Z	$Z, Z*V$	Z	$Z, Z*V$	Z	$Z, Z*V$	Z	$Z, Z*V$
F-stat (1st Stage)	38.48	22.89	38.48	22.89	38.48	22.89	38.48	22.89
Hasen's J, p-value (OID test)		0.43		0.16		0.91		0.18
Observations	25,947	25,947	25,947	25,947	25,947	25,947	25,947	25,947

Note: Z is pension eligibility and V is the value of the received pension benefits. The sample comprises an unbalanced panel of 8,088 adults aged 55 or older from 2008 to 2020, spanning seven survey waves. The dependent variable is the respondents' health indicator. All regressions include the same control variables as in Table 4 and survey-year fixed effects. Robust standard errors clustered at the individual level are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table A2. Impact of Retirement on Health Outcomes (2SLS Estimates): Heterogeneous Effects by Income

Dependent Variable	**Self-rated overall health**		**Daily living difficulty**		**Number of chronic diseases**		**Depression**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. high income: having accumulated sufficient income and wealth for retirement								
Retirement (β_1)	2.383***	2.263***	6.975***	5.947***	3.223***	3.056***	3.650***	3.296***
	(0.237)	(0.217)	(0.680)	(0.584)	(0.334)	(0.310)	(0.473)	(0.422)
Retirement × High Income (β_2)	-1.732***	-1.665***	-4.910***	-4.307***	-2.445***	-2.354***	-2.777***	-2.572***
	(0.204)	(0.197)	(0.534)	(0.487)	(0.290)	(0.287)	(0.400)	(0.377)
$\beta_1 + \beta_2$ (ATE for high-income group)	0.651**	0.598**	2.065**	1.640**	0.778*	0.702*	0.873	0.724
	(0.312)	(0.293)	(0.864)	(0.760)	(0.442)	(0.422)	(0.619)	(0.563)
F-stat (1st Stage)	123.58	91.85	123.58	91.85	123.58	91.85	123.58	91.85
Hasen's J, p-value (OID test)		0.01**		0.01**		0.01*		0.11
IVs	Z	Z, Z*V	Z	Z, Z*V	Z	Z, Z*V	Z	Z, Z*V
Observations	42,609	42,609	42,609	42,609	42,609	42,609	42,609	42,609
Dependent Variable	**Self-rated overall health**		**Daily living difficulty**		**Number of chronic diseases**		**Depression**	
Panel B. Low income: below median income								
Retirement (β_1)	0.798*	1.278***	4.640***	4.293***	1.540**	2.173***	2.400**	2.436***
	(0.365)	(0.320)	(1.029)	(0.858)	(0.523)	(0.463)	(0.732)	(0.632)
Retirement × Low income (β_2)	1.754***	1.133***	2.685**	2.429**	1.888***	1.146**	1.443*	1.272*
	(0.314)	(0.289)	(0.906)	(0.752)	(0.436)	(0.410)	(0.656)	(0.573)
$\beta_1 + \beta_2$ (ATE for low-income group)	2.552***	2.411***	7.325***	6.722***	3.428***	3.319***	3.843***	3.708***
	(0.481)	(0.431)	(1.371)	(1.137)	(0.687)	(0.618)	(0.982)	(0.853)
F-stat (1st Stage)	150.95	40.72	150.95	40.72	150.95	40.72	150.95	40.72
Hasen's J, p-value (OID test)		0.45		0.01**		0.14		0.53
IVs	Z	Z, Z*V	Z	Z, Z*V	Z	Z, Z*V	Z	Z, Z*V
Observations	42,609	42,609	42,609	42,609	42,609	42,609	42,609	42,609

Note: The sample comprises an unbalanced panel of 8,088 adults aged 55 or older from 2008 to 2020, spanning seven survey waves. Z is pension eligibility and V is the value of received pension benefits. High income indicates individuals who reported having accumulated sufficient income and wealth for retirement, based on their responses to the survey question regarding the reason for retirement. Among those who answered to this question, 4.3% belong to the high-income group. The dependent variable is the respondents' health indicator. All regressions include the same control variables as in Table 4 and survey-year fixed effects. Robust standard errors clustered at the individual level are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table A3. **Impact of Retirement on Health Outcomes (2SLS Estimates): Heterogeneous Effects by Gender**

Dependent Variable	**Self-rated overall health**		**Daily living difficulty**		**Number of chronic diseases**		**Depression**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. Whole sample								
Retirement	2.475*** (0.249)	2.512*** (0.251)	7.068*** (0.704)	6.588*** (0.665)	3.372*** (0.352)	3.464*** (0.357)	3.658*** (0.483)	3.557*** (0.461)
Observations	42,609	42,609	42,609	42,609	42,609	42,609	42,609	42,609
Pabel B. Female sample								
Retirement	8.543** (3.156)	25.00** (9.301)	10.18** (3.838)	13.77* (5.400)	8.528** (3.150)	25.01** (9.302)	10.16** (3.831)	13.77* (5.398)
F-Stat (1st stage)	7.25	3.63	7.25	3.63	7.25	3.63	7.25	3.63
OID (p-value)		0.45		0.93		0.49		0.90
Observations	24,512	24,512	24,512	24,512	24,512	24,512	24,512	24,512
Panel C. Male sample								
Retirement	1.160*** (0.150)	2.946*** (0.409)	1.858*** (0.221)	1.582*** (0.299)	1.192*** (0.152)	2.936*** (0.408)	1.910*** (0.224)	1.608*** (0.299)
F-Stat (1st stage)	204.38	102.12	204.38	102.12	204.38	102.12	204.38	102.12
OID (p-value)		0.01**		0.72		0.05*		0.19
Observations	18,464	18,464	18,464	18,464	18,464	18,464	18,464	18,464
IVs	Z	Z, Zv	Z	Z, Zv	Z	Z, Zv	Z	Z, Zv

Note: Z is pension eligibility and V is the value of received pension benefits. The dependent variable is the respondents' health indicator. All regressions include the same control variables as in Table 4 and survey-year fixed effects. Robust standard errors clustered at the individual level are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table A4. **Impact of Retirement on Health Outcomes (2SLS Estimates): Heterogeneous Effects by Marital Status**

Dependent Variable	**Self-rated overall health**		**Daily living difficulty**		**Number of chronic diseases**		**Depression**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A, Whole sample								
Retirement	2.475*** (0.249)	2.512*** (0.251)	7.068*** (0.704)	6.588*** (0.665)	3.372*** (0.352)	3.464*** (0.357)	3.658*** (0.483)	3.557*** (0.461)
Observations	42,609	42,609	42,609	42,609	42,609	42,609	42,609	42,609
Panel B. Married sample								
Retirement	2.282*** (0.260)	2.269*** (0.257)	5.380*** (0.634)	4.883*** (0.586)	3.206*** (0.373)	3.251*** (0.370)	3.442*** (0.503)	3.240*** (0.461)
F-Stat (1st stage)	115.10	60.88	115.10	60.88	115.10	60.88	115.10	60.88
OID (p-value)		0.88		0.02**		0.73		0.18
Observations	31,186	31,186	31,186	31,186	31,186	31,186	31,186	31,186
Panel C, Single sample								
Retirement	3.198*** (0.808)	2.961*** (0.757)	11.82*** (2.984)	11.78*** (2.962)	3.750*** (1.031)	3.532*** (0.982)	4.520** (1.606)	4.340** (1.573)
F-Stat (1st stage)	19.05	102.12	19.05	102.12	19.05	9.64	19.05	9.64
OID (p-value)		0.02**		0.92		0.11		0.23
Observations	11,423	11,423	11,423	11,423	11,423	11,423	11,423	11,423
IVs	Z	Z, Zv	Z	Z, Zv	Z	Z, Zv	Z	Z, Zv

Note: The sample comprises an unbalanced panel of 8,088 adults aged 55 or older from 2008 to 2020, spanning seven survey waves. Z is pension eligibility and V is the value of received pension benefits. The dependent variable is the respondents' health indicator. All regressions include the same control variables as in Table 4 and survey-year fixed effects. Robust standard errors clustered at the individual level are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table A5. Impact of Retirement on Health Outcomes (2SLS Estimates): Heterogeneous Effects by Marital status and Income

Dependent Variable	**Self-rated overall health**		**Daily living difficulty**		**Number of chronic diseases**		**Depression**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. Married sample								
Retirement	0.797* (0.378)	1.211*** (0.317)	3.542*** (0.913)	3.238*** (0.730)	1.665** (0.560)	2.168*** (0.474)	2.404** (0.739)	2.258*** (0.603)
Retirement *Low Income	1.542*** (0.309)	1.010*** (0.279)	1.908* (0.748)	1.755** (0.607)	1.600*** (0.445)	1.035* (0.404)	1.077 (0.645)	1.104* (0.548)
Panel B. Single sample								
Retirement	0.493 (0.875)	0.621 (0.814)	3.072 (3.181)	4.169 (2.859)	1.411 (1.057)	1.770 (0.993)	-0.408 (1.769)	0.219 (1.591)
Retirement *Low Income	2.988*** (0.861)	2.804*** (0.790)	9.659*** (2.887)	8.031** (2.555)	2.583* (1.074)	2.057* (1.043)	5.443** (1.711)	4.519** (1.460)
	Z	Z, Zv	Z	Z, Zv	Z	Z, Zv	Z	Z, Zv
Observations	42,609	42,609	42,609	42,609	42,609	42,609	42,609	42,609

Note: The sample comprises an unbalanced panel of 8,088 adults aged 55 or older from 2008 to 2020, spanning seven survey waves. Z is pension eligibility and V is the value of received pension benefits. The dependent variable is the respondent's health indicator. The low-income indicator, used as an interaction term, is defined as 1 if household income is less than or equal to the median, and 0 otherwise. The 'Single' category refers to individuals living alone, including those who are widowed, divorced, or never married. All regressions include the same control variables as in Table 4 and survey-year fixed effects. Robust standard errors clustered at the individual level are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table A6. Impact of Retirement on Health Outcomes (2SLS Estimates): Placebo Tests

Dependent Variable	**Self-rated overall health**		**Daily living difficulty**		**Number of chronic diseases**		**Depression**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A. Placebo-eligibility age is two years before the actual eligibility age							
Retirement (β_1)	9.166	5.414	0.151	4.528	-0.0597	7.197	1.524	1.952
	(18.06)	(8.669)	(4.583)	(6.934)	(4.450)	(11.90)	(7.365)	(4.688)
IVs	Z_{t+2}	Z_{t+2}, $Z*V_{t+2}$	Z_{t+2}	Z_{t+2}, $Z*V_{t+2}$	Z_{t+2}	Z_{t+2}, $Z*V_{t+2}$	Z_{t+2}	Z_{t+2}, $Z*V_{t+2}$
F-stat (1st Stage)	0.24	0.21	0.24	0.21	0.24	0.21	0.26	0.23
Hasen's J, p-value (OID test)		0.71		0.60		0.61		0.94
Observations	1084	1084	1084	1084	1084	1084	1084	1084
	Panel B. Placebo-eligibility age is four years before the actual eligibility age							
Retirement (β_1)	20.07	0.687	-4.685	-2.290	11.90	-1.084	-40.39	0.320
	(113.0)	(0.706)	(34.40)	(1.696)	(65.10)	(1.004)	(223.2)	(1.509)
IVs	Z_{t+4}	Z_{t+4}, $Z*V_{t+4}$	Z_{t+4}	Z_{t+4}, $Z*V_{t+4}$	Z_{t+4}	Z_{t+4}, $Z*V_{t+4}$	Z_{t+4}	Z_{t+4}, $Z*V_{t+4}$
F-stat (1st Stage)	0.03	1.90	0.03	1.90	0.03	1.90	0.03	1.90
Hasen's J, p-value (OID test)		0.11		0.92		0.43		0.05
Observations	1084	1084	1084	1084	1084	1084	1084	1084

Note: The sample is restricted to non-eligible ages; only Z_{t+s} has a value 1 if individuals become eligible for pension benefits s years later, and $Z*V_{t+s}$ is the value of received pension benefits s years later. The sample comprises a balanced panel of 2,505 adults aged 55 or older from 2008 to 2020, spanning seven survey waves. The dependent variable is the respondents' health indicator. All regressions include the same control variables as in Table 4 and survey-year fixed effects. Robust standard errors clustered at the individual level are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table A7. Impact of Re-employment on Health Outcomes (2SLS Estimates): Alternative Samples

Dependent Variable	Self-rated overall health		Daily living difficulty		Number of chronic diseases		Depression	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A. Pension eligibility age +/- 7 years (58~72 years old)							
Re-employment	-0.663	-1.268	-2.031	-2.230	-0.820	-2.121	-1.816	-2.398
	(0.804)	(0.770)	(1.750)	(1.698)	(1.469)	(1.437)	(1.905)	(1.760)
IVs	$Z*V_{t-2}$, $Z*V_{t-4}$	$Z*V_t$, $Z*V_{t-4}$	$Z*V_{t-2}$, $Z*V_{t-4}$	$Z*V_t$, $Z*V_{t-4}$	$Z*V_{t-2}$, $Z*V_{t-4}$	$Z*V_t$, $Z*V_{t-4}$	$Z*V_{t-2}$, $Z*V_{t-4}$	$Z*V_t$, $Z*V_{t-4}$
F-stat (1st Stage)	5.16	6.20	5.16	6.20	5.16	6.20	5.10	6.13
Hasen's J, p-value (OID test)	0.07*	0.05**	0.84	0.94	0.03**	0.02**	0.19	0.18
Observations	5845	5845	5845	5845	5845	5845	5821	5821
	Panel B. Pension eligibility age +/- 10 years (55~75 years old)							
Retirement	-1.032	-1.534	-4.235*	-4.241*	-1.941	-2.978*	-2.526	-2.714
	(0.784)	(0.784)	(2.075)	(1.994)	(1.444)	(1.470)	(1.918)	(1.786)
IVs	$Z*V_{t-2}$, $Z*V_{t-4}$	$Z*V_t$, $Z*V_{t-4}$	$Z*V_{t-2}$, $Z*V_{t-4}$	$Z*V_t$, $Z*V_{t-4}$	$Z*V_{t-2}$, $Z*V_{t-4}$	$Z*V_t$, $Z*V_{t-4}$	$Z*V_{t-2}$, $Z*V_{t-4}$	$Z*V_t$, $Z*V_{t-4}$
F-stat (1st Stage)	7.06	7.40	7.06	7.40	7.06	7.40	7.10	7.35
Hasen's J, p-value (OID test)	0.54	0.45	0.44	0.46	0.57	0.47	0.73	0.72
Observations	7547	7547	7547	7547	7547	7547	7522	7522
	Panel C. Pension eligibility age +/- 13 years (55~78 years old)							
Retirement	-1.444*	-2.025**	-5.007**	-4.988**	-2.395	-3.501**	-3.450*	-3.043*
	(0.839)	(0.806)	(2.277)	(2.023)	(1.514)	(1.464)	(2.022)	(1.720)
IVs	$Z*V_{t-2}$, $Z*V_{t-4}$	$Z*V_t$, $Z*V_{t-4}$	$Z*V_{t-2}$, $Z*V_{t-4}$	$Z*V_t$, $Z*V_{t-4}$	$Z*V_{t-2}$, $Z*V_{t-4}$	$Z*V_t$, $Z*V_{t-4}$	$Z*V_{t-2}$, $Z*V_{t-4}$	$Z*V_t$, $Z*V_{t-4}$
F-stat (1st Stage)	7.41	8.57	7.41	8.57	7.41	8.57	7.36	8.35
Hasen's J, p-value (OID test)	0.81	0.69	0.38	0.41	0.98	0.83	0.55	0.61
Observations	8947	8947	8947	8947	8947	8947	8922	8922

Note: $Z*V_{t-2}$ is the value of the pension benefits received two years ago, and $Z*V_{t-4}$ is the value of the pension benefits received four years ago. The sample comprises a balanced panel of 2,505 adults aged 55 or older from 2008 to 2020, spanning seven survey waves. The dependent variable is the respondents' health indicator. All regressions include the same control variables as in Table 6 and survey-year fixed effects. Robust standard errors clustered at the individual level are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels.

Table A8. Impact of Placebo Eligibility on Health Outcomes for Re-employed Individuals only (Reduced-Form Estimates)

Dependent Variable	**Self-rated overall health**		**Daily living difficulty**		**Number of chronic diseases**		**Depression**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Placebo eligibility for pension benefits	-0.169	-0.0983	0.0791	0.0376	-0.0496	0.00244	-0.761	0.0448
	(0.148)	(0.0867)	(0.184)	(0.115)	(0.186)	(0.119)	(0.406)	(0.191)
Observations	709	667	709	667	709	667	709	667

Note: The sample comprises individuals eligible for retirement pension benefits who were re-employed after retirement, focusing on the period between retirement and re-employment. At the individual level, observations during the study period are categorized as placebo-eligible or non-eligible. Placebo-eligible ages are determined as the final two years in the odd-numbered columns and as the final three years in the even-numbered columns of Table. The dependent variable is the respondents' health indicator. All regressions include the same control variables as in Table 4 and survey-year fixed effects. Robust standard errors clustered at the individual level are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table A9. Impact of Re-employment on Health Outcomes (2SLS Estimates): Heterogeneous Effects by Self-employment Type

Dependent Variable	**Self-rated overall health**		**Daily living difficulty**		**Number of chronic diseases**		**Depression**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A. Self-employment type: self-employed before retirement and self-employed upon re-employment							
Re-employment (β_1)	-4.834***	-3.588*	-15.53*	-10.12	-9.183***	-5.885*	-8.827**	-10.38*
	(1.325)	(1.615)	(6.304)	(5.624)	(2.501)	(2.629)	(2.910)	(4.191)
Re-employment × Self-employ (β_2)	2.567*	2.245	8.667*	6.096	4.850**	3.549	5.017*	7.452*
	(0.997)	(1.325)	(4.336)	(4.560)	(1.849)	(2.232)	(2.163)	(3.634)
$\beta_1 + \beta_2$	-2.268***	-1.343***	-6.860***	-4.019**	-4.333***	-2.335**	-3.810***	-2.929**
	(0.56)	(0.479)	(2.565)	(1.697)	(1.201)	(0.952)	(1.393)	(1.448)
F-stat (1st Stage)	5.12	2.80	5.12	2.80	5.12	2.80	5.11	2.81
Hasen's J, p-value (OID test)	0.02**	0.34	0.10*	0.09	0.01**	0.16	0.15	0.56
	Panel B. Self-employment type: hired employees before retirement and self-employed upon re-employment							
Re-employment (β_1)	-2.835**	-1.696	-10.80*	-6.050*	-7.647**	-4.565**	-6.426**	-4.817*
	(1.095)	(0.913)	(4.208)	(2.767)	(2.345)	(1.486)	(2.453)	(2.167)
Re-employment × Self-employ (β_2)	0.921	0.284	6.926*	3.848	4.493*	2.453	4.815*	3.968
	(0.926)	(0.882)	(3.224)	(2.554)	(1.896)	(1.289)	(1.990)	(2.135)
$\beta_1 + \beta_2$	-1.914***	-1.412***	-3.874***	-2.202***	-3.154***	-2.111***	-1.61**	-0.849
	(0.416)	(0.385)	(1.282)	(0.817)	(0.731)	(0.648)	(0.908)	(0.929)
F-stat (1st Stage)	5.20	4.98	5.20	4.98	5.20	4.98	5.20	4.99
Hasen's J, p-value (OID test)	0.01**	0.07**	0.04**	0.03**	0.01***	0.18	0.01***	0.01***
IVs	$Z*V_{t-2}$, $Z*V_{t-4}$	$Z*V_t$, $Z*V_{t-4}$	$Z*V_{t-2}$, $Z*V_{t-4}$	$Z*V_t$, $Z*V_{t-4}$	$Z*V_{t-2}$, $Z*V_{t-4}$	$Z*V_t$, $Z*V_{t-4}$	$Z*V_{t-2}$, $Z*V_{t-4}$	$Z*V_t$, $Z*V_{t-4}$
Observations	11664	11664	11664	11664	11664	11664	11664	11664

Note: $Z*V_{t-2}$ is the value of the pension benefits received two years ago, and $Z*V_{t-4}$ is the value of the pension benefits received four years ago. Self-employment is an indicator equal to 1 if individual i is self-employed and 0 otherwise. In Panel B, self-employed refers to individuals who were hired workers before retirement but became self-employed upon re-employment. The sample comprises a balanced panel of 2,505 adults aged 55 or older from 2008 to 2020, spanning seven survey waves. The dependent variable is the respondents' health indicator. All regressions include the same control variables as in Table 6 and survey-year fixed effects. Robust standard errors clustered at the individual level are shown in parentheses. *, **, and *** indicate significance at the 10% 5%, and 1% levels.