# Does Retirement Increase Stock Market Participation? Evidence from a Fuzzy Regression Discontinuity Design

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# Motivation

- Limited stock market participation has been a puzzle since 1960 (Mankiw and Zeldes, 1991; Haliassos and Bertaut, 1995)
  - Over half of U.S. households do not hold stocks
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- A vast and rapidly growing literature on important determinants of stock market participation
  - e.g., risk aversion, awareness of financial assets, trust, political preferences and activism, financial literacy, wealth, sociality, corporate scandals
- However, the high levels of non-participation, even among the wealthy, is still unexplained

# This Paper

- Proposes retirement as an alternative important determinant
  - As an important life-cycle event, does retirement cause a greater tendency to stock market participation?
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# This Paper

- Proposes retirement as an alternative important determinant
  - As an important life-cycle event, does retirement cause a greater tendency to stock market participation?
    - Key insight: retirement relaxes the time constraint and provides more time flexibility
  - Empirical challenge: retirement and stock market participation decisions are jointly determined
    - Identification: fuzzy regression discontinuity (FRD) design to exploit the age eligibility for claiming social security benefits
    - Especially the early eligibility age (EEA) at 62

# What We Find

- Estimated (early) retirement effect on stock market participation is around 61 percentage points
- The result is mainly driven by the medium wealth households
- The underlying mechanism is the relaxation of time constraint on tracking the market
- In addition, (early) retirement increases the share of risky assets by approximately 37 percentage points

# Literature

- Determinants of stock market participation
  - Financial literacy (Van Rooij et al., 2011); IQ (Grinblatt et al., 2011); trust (Guiso et al., 2008; Georgarakos and Pasini, 2011); sociability (Georgarakos and Pasini, 2011); political factors (Kaustia and Torstilla, 2011; Bonaparte and Kumar, 2013); homeownership (Vestman, 2019)
- Portfolio rebalance around retirement
  - Farhi and Panageas (2007); Yogo (2016); Addoum (2017); Fagereng et al., (2017)

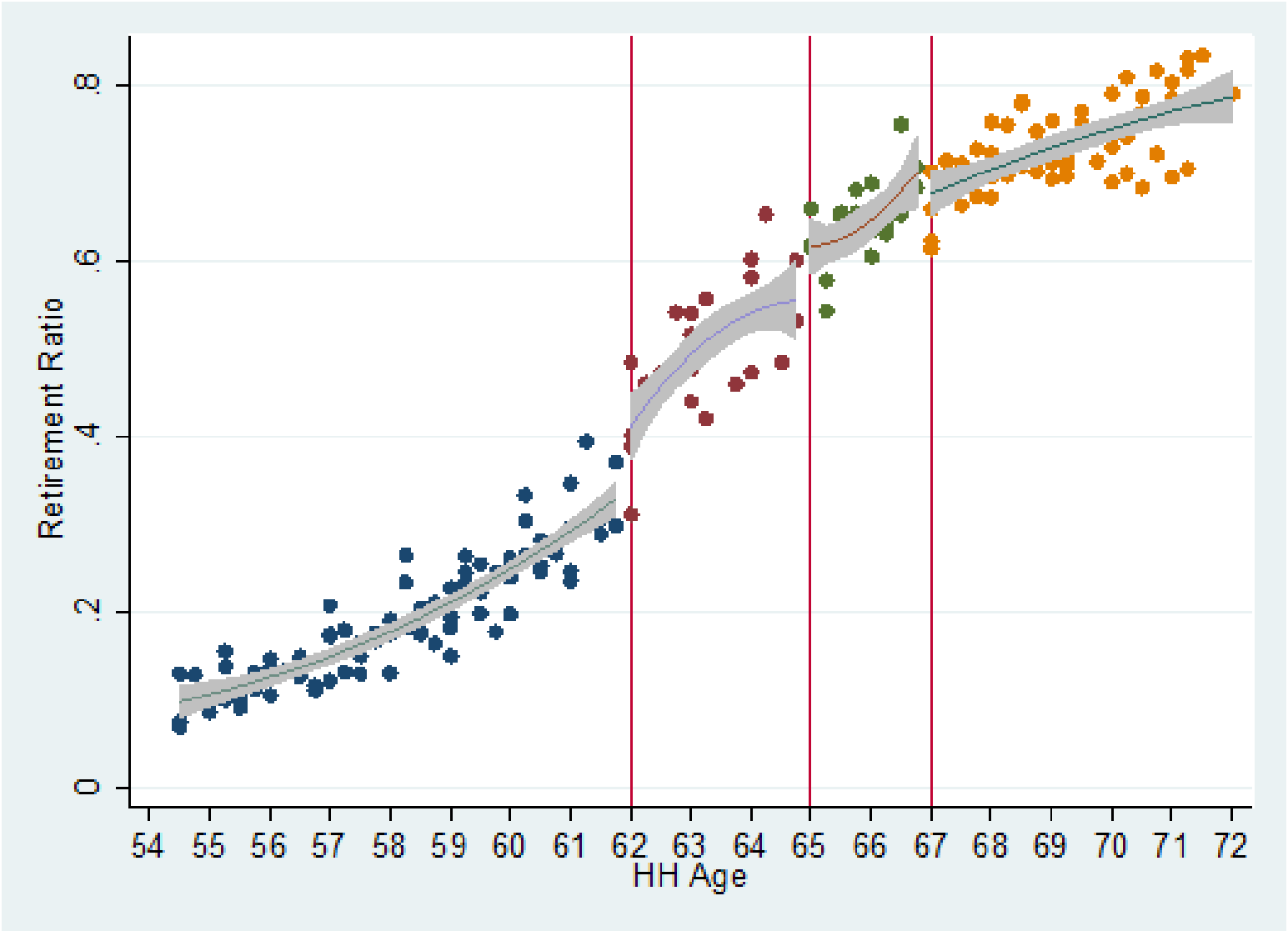
# Outline of the talk

- Institutional Background and Methodology
- Data
- Results
- Robustness Checks and Validity Tests
- Conclusion

# Age Requirement for Retirement Benefits

| Year of Birth | Full (normal) Retirement Age | At Age 62 | | | | |
|---|---|---|---|---|---|---|
| | | Months between age 62 and the FRA | A $1000 retirement benefit would be reduced to | The retirement benefit is reduced by | A $500 spouse's benefit would be reduced to | The spouse's benefit is reduced by |
| 1937 or earlier | 65 | 36 | $800 | 20% | $375 | 25% |
| 1938 | 65 and 2 months | 38 | $791 | 20.83% | $370 | 25.83% |
| 1939 | 65 and 4 months | 40 | $783 | 21.67% | $366 | 26.67% |
| 1940 | 65 and 6 months | 42 | $775 | 22.5% | $362 | 27.5% |
| 1941 | 65 and 8 months | 44 | $766 | 23.33% | $358 | 28.33% |
| 1942 | 65 and 10 months | 46 | $758 | 24.17% | $354 | 29.17% |
| 1943-1954 | 66 | 48 | $750 | 0.25 | $350 | 0.3 |
| 1955 | 66 and 2 months | 50 | $741 | 25.83% | $345 | 30.83% |
| 1956 | 66 and 4 months | 52 | $733 | 26.67% | $341 | 31.67% |
| 1957 | 66 and 6 months | 54 | $725 | 27.5% | $337 | 32.5% |
| 1958 | 66 and 8 months | 56 | $716 | 28.33% | $333 | 33.33% |
| 1959 | 66 and 10 months | 58 | $708 | 29.17% | $329 | 34.17% |
| 1960 and later | 67 | 60 | $700 | 30% | $325 | 35% |

# Retirement Ratio by Age



# Methodology: Fuzzy Regression Discontinuity Design

- Discontinuity to be used: age 62, the early eligibility for retirement benefits
  - The first-stage

$$\beta_{1st}^{U} = \lim_{\varepsilon \downarrow 0} \mathbb{E}\left[R_{it} | X_{it} = c + \varepsilon\right] - \lim_{\varepsilon \uparrow 0} \mathbb{E}\left[R_{it} | X_{it} = c - \varepsilon\right].$$

  - The retirement effect of interest

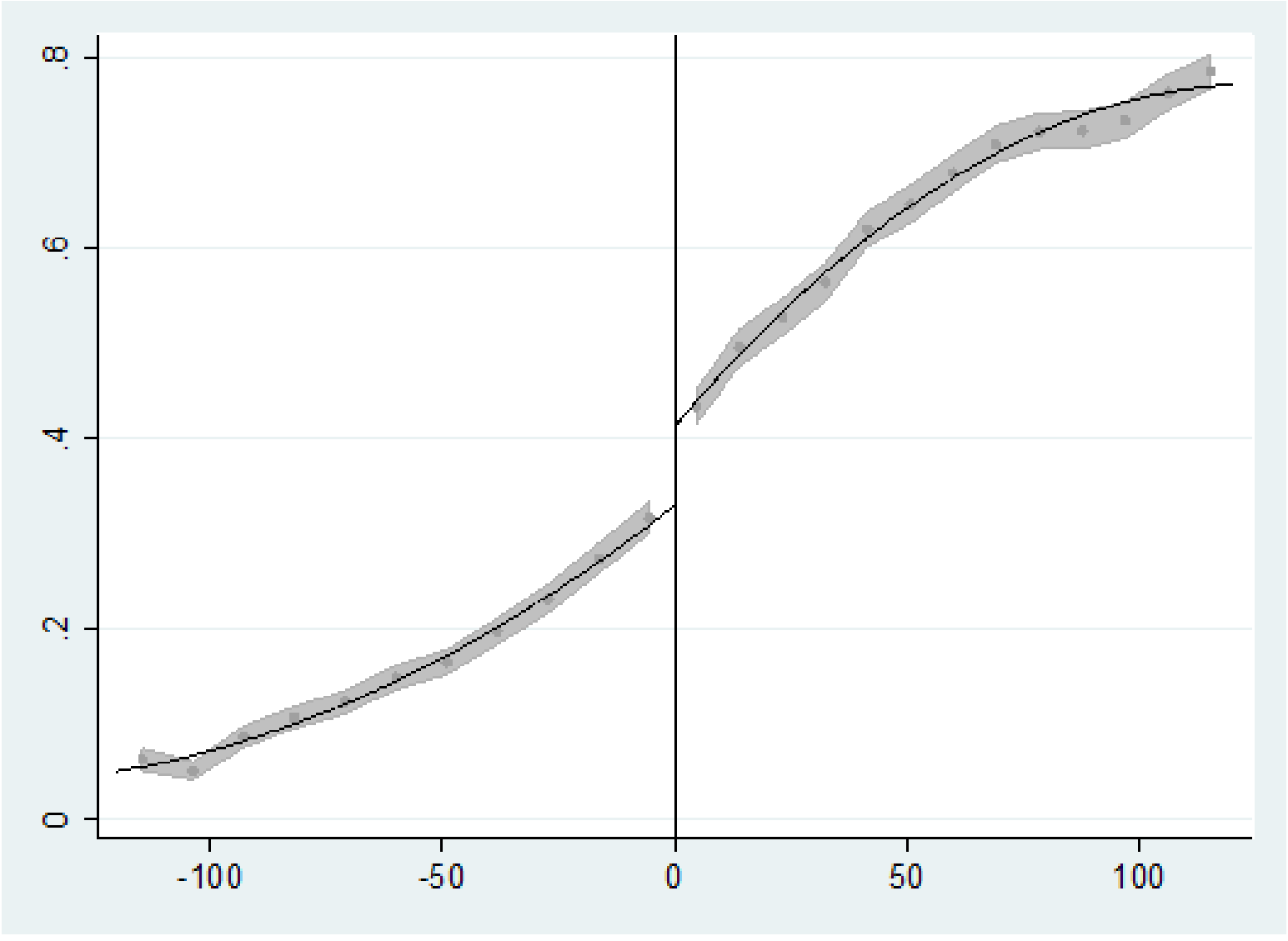
$$\tau_{FRD}^{U} = \frac{\lim_{\varepsilon \downarrow 0} \mathbb{E}\left[SMP_{it} | X_{it} = c + \varepsilon\right] - \lim_{\varepsilon \uparrow 0} \mathbb{E}\left[SMP_{it} | X_{it} = c - \varepsilon\right]}{\lim_{\varepsilon \downarrow 0} \mathbb{E}\left[R_{it} | X_{it} = c + \varepsilon\right] - \lim_{\varepsilon \uparrow 0} \mathbb{E}\left[R_{it} | X_{it} = c - \varepsilon\right].}$$

- Estimation: A nonparametric method developed by Calonico, Cattaneo and Titiunik (2014a,b)

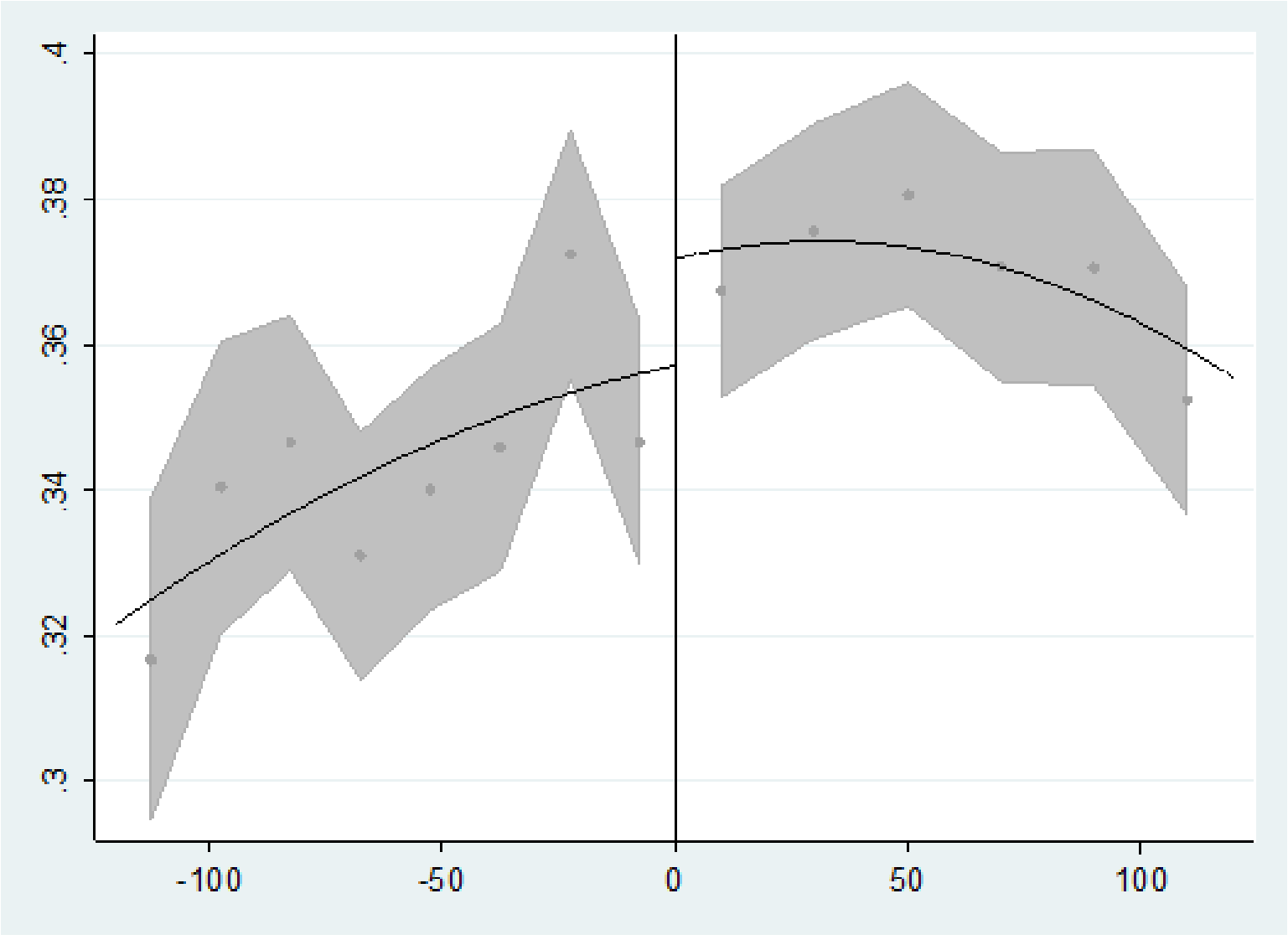
# Data

- Health and Retirement Study (HRS) 1992-2014
  - A national biannual survey since 1992
  - Detailed demographic information like age, education, family size, employment and retirement status
  - Financial information includes assets and debts from different classes

# Graphical Evidence: Discontinuity on Retirement



# Graphical Evidence: Discontinuity on Stock Market Participation



# The FRD of Retirement on the SMP

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| **Panel A. HD Retirment (First-Stage)** | | | | | |
| $\beta$ | 0.0719*** | 0.0748*** | 0.0738*** | 0.0767*** | 0.0794** |
| | [0.0179] | [0.0176] | [0.0171] | [0.0171] | [0.0172] |
| **Panel B. Stock Market Participation (Second-Stage)** | | | | | |
| $\tau$ | 0.610** | 0.559** | 0.680*** | 0.658*** | 0.684*** |
| | [0.286] | [0.254] | [0.260] | [0.246] | [0.243] |
| Respondent Characteristics | N | Y | Y | Y | Y |
| Household Characteristics | N | N | Y | Y | Y |
| Wave Dummies | N | N | N | Y | Y |
| Spouse Characteristics | N | N | N | N | Y |
| Observations | 59,718 | 59,718 | 59,717 | 59,717 | 58,540 |
| Effective left | 6478 | 6478 | 6478 | 6478 | 6346 |
| Effective right | 6702 | 6702 | 6702 | 6702 | 6571 |

# Heterogeneity by Wealth

| **Panel A. Low Wealth** | | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| HD Retirement (First Stage) | 0.041 | 0.047 | 0.049* | 0.052* | 0.050* |
| | [0.030] | [0.029] | [0.029] | [0.028] | [0.028] |
| Stock Market Participation (Second Stage) | 0.008 | 0.016 | -0.003 | 0.056 | 0.145 |
| | [0.453] | [0.393] | [0.362] | [0.343] | [0.361] |
| **Panel B. Medium Wealth** | | | | | |
| | (1) | (2) | (3) | (4) | (5) |
| HD Retirement (First Stage) | 0.150*** | 0.160*** | 0.158*** | 0.157*** | 0.155*** |
| | [0.031] | [0.030] | [0.030] | [0.029] | [0.029] |
| Stock Market Participation (Second Stage) | 0.829*** | 0.720*** | 0.677*** | 0.647*** | 0.689*** |
| | [0.268] | [0.232] | [0.224] | [0.222] | [0.231] |
| **Panel C. High Wealth** | | | | | |
| | (1) | (2) | (3) | (4) | (5) |
| HD Retirement (First Stage) | 0.031 | 0.028 | 0.005 | 0.006 | 0.007 |
| | [0.032] | [0.031] | [0.030] | [0.030] | [0.030] |
| Stock Market Participation (Second Stage) | 1.386 | 1.41 | 8.319 | 7.615 | 8.732 |
| | [1.778] | [1.876] | [48.96] | [34.90] | [39.24] |

# Mechanism: Time Spending

**Table:** The FRD Regression of Retirement on Time Spending on Tracking the Stock Market

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| HD Retirement | 20.99** | 12.56** | 6.108*** | 5.163*** | 3.643*** |
| | [8.974] | [4.981] | [2.211] | [1.836] | [1.176] |
| Respondent Characteristics | N | Y | Y | Y | Y |
| Household Characteristics | N | N | Y | Y | Y |
| Wave Dummies | N | N | N | Y | Y |
| Spouse Characteristics | N | N | N | N | Y |
| Observations | 20,876 | 20,876 | 20,876 | 20,876 | 20,412 |
| Effective left | 2021 | 2021 | 2021 | 2021 | 1962 |
| Effective right | 2321 | 2321 | 2321 | 2321 | 2269 |

# Mechanism: Time Spending

**Table:** The FRD Regression of Retirement on Time Spendings on Various Activities Using American Time Usage Survey (ATUS) Data

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Retirement | Financial | Media | Reading | Copmuter | Political |
| Above EEA | 0.115*** | | | | | |
| | [0.0106] | | | | | |
| HD Retirement | | 1.315** | 4.722*** | 16.93*** | 5.132*** | -11.30*** |
| | | [0.580] | [0.0379] | [1.724] | [1.084] | [0.0189] |
| Respondent Characteristics | Y | Y | Y | Y | Y | Y |
| Household Characteristics | Y | Y | Y | Y | Y | Y |
| Wave Dummies | Y | Y | Y | Y | Y | Y |
| Observations | 37,946 | 37,946 | 37,946 | 37,946 | 37,946 | 37,946 |
| Effective left | 5855 | 5855 | 5855 | 5855 | 5855 | 5855 |
| Effective right | 6990 | 6990 | 6990 | 6990 | 6990 | 6990 |

# Heterogeneous Effects on Taking Financial Advices When Making Investment Decisions Using Survey of Consumer Finances (SCF) Data

| | Before Retirement | | After Retirement | |
|---|---|---|---|---|
| | Broad Adv | Narrow Adv | Broad Adv | Narrow Adv |
| High Wealth | 0.235*** | 0.266*** | 0.193*** | 0.214*** |
| | [0.004] | [0.004] | [0.009] | [0.007] |
| Medium Wealth | 0.129*** | 0.172*** | 0.090*** | 0.120*** |
| | [0.004] | [0.004] | [0.008] | [0.007] |
| Age | 0.002*** | 0 | -0.001* | -0.004*** |
| | [0.000] | [0.000] | [0.001] | [0.000] |
| Married | 0.064*** | 0.043*** | 0.121*** | 0.131*** |
| | [0.006] | [0.006] | [0.011] | [0.012] |
| HH Size | -0.006*** | -0.011*** | -0.022*** | -0.036*** |
| | [0.001] | [0.001] | [0.004] | [0.004] |
| Male | -0.040*** | -0.068*** | -0.071*** | -0.113*** |
| | [0.006] | [0.006] | [0.011] | [0.012] |
| Wave Dummies | Y | Y | Y | Y |
| Observations | 75,007 | 75,007 | 19,768 | 19,768 |

# Robustness with Different Orders and Bandwidths

**Panel A. Retirement**

| | BW=12 | BW=18 | BW=24 | BW=30 | BW=36 | BW=42 | BW=48 |
|---|---|---|---|---|---|---|---|
| Ord=0 | 0.111*** | 0.131*** | 0.146*** | 0.160*** | 0.174*** | 0.189*** | 0.202*** |
| | [0.0128] | [0.0105] | [0.00914] | [0.00819] | [0.00748] | [0.00692] | [0.00647] |
| Ord=1 | 0.0617** | 0.0691*** | 0.0794*** | 0.0819*** | 0.0842*** | 0.0840*** | 0.0866*** |
| | [0.0240] | [0.0198] | [0.0172] | [0.0154] | [0.0141] | [0.0131] | [0.0122] |
| Ord=2 | 0.0568 | 0.0577** | 0.0580** | 0.0683*** | 0.0710*** | 0.0763*** | 0.0751*** |
| | [0.0364] | [0.0291] | [0.0251] | [0.0225] | [0.0206] | [0.0190] | [0.0178] |

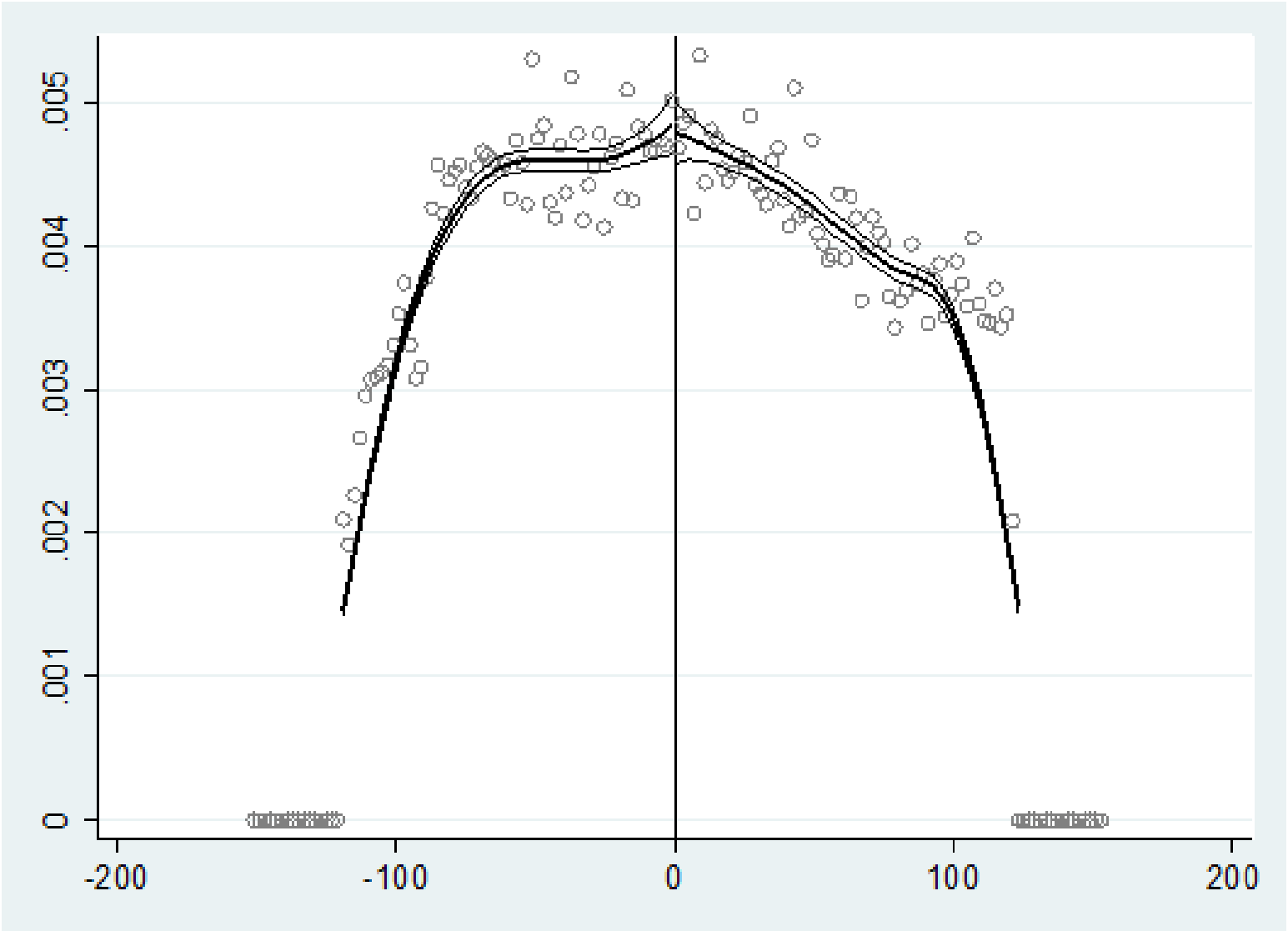
**Panel B. Stock Market Participation**

| | BW=12 | BW=18 | BW=24 | BW=30 | BW=36 | BW=42 | BW=48 |
|---|---|---|---|---|---|---|---|
| Ord=0 | 0.326*** | 0.168** | 0.0972* | 0.0608 | 0.0424 | 0.0322 | 0.0291 |
| | [0.110] | [0.0739] | [0.0573] | [0.0466] | [0.0393] | [0.0336] | [0.0294] |
| Ord=1 | 1.089** | 0.917** | 0.684*** | 0.547*** | 0.425** | 0.337** | 0.246* |
| | [0.552] | [0.366] | [0.243] | [0.197] | [0.167] | [0.150] | [0.133] |
| Ord=2 | 1.353 | 1.346 | 1.316* | 1.086** | 0.979** | 0.831*** | 0.772*** |
| | [1.064] | [0.822] | [0.689] | [0.462] | [0.382] | [0.304] | [0.280] |

# Other Robusness Checks

- Alternative Retirement Definitions
- Excluding crises samples for potential passive holdings
- Local polynomial regression (parametric estimation)
- Different measures of the share of risky assets

# Validity Test: Density of the Forcing Variable



# Other Validity Tests

- Distribution of characteristics around the cutoff: all smooth except for income
- Placebo test: passed
- Tests for the instrument strength
  - Passed the first-stage F-test (F-Stat>10)
  - Passed the Anderson-Rubin test
- Tests on external validity
  - Passed Angrist (2004) test
  - Failed Bertanha-Imbens (2019) test

# Conclusion

- Using the HRS, we identify and estimate the causal effect of retirement on stock market participation
  - (Early) retirement increases the stock market participation by about 61 percentage points
  - The effects are mainly concentrated on the medium wealth households
- The relaxed time constraints can be a possible mechanism
  - Reduced cost of information acquisition
  - increased day-to-day trading