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DOES RETIREMENT LEAD TO LIFE SATISFACTION? CAUSAL EVIDENCE FROM FIXED EFFECT INSTRUMENTAL VARIABLE MODELS

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NON-TECHNICAL SUMMARY

Retirement is a major life transition for working adults. It typically leads to changes in finances, health, social relations and time allocation, and hence in one's satisfaction with various aspects of life. In this paper, we explore the causal impact of retirement on different domains of life satisfaction, wellbeing and happiness. While understanding the effect of retirement on personal wellbeing is clearly of interest to individuals and policy makers, there exists limited and mixed evidence on the topic. Our study provides the first empirical evidence from Australia.

This paper presents robust evidence that retirement causally improves overall life satisfaction which is subsequently explained by improvements in satisfaction with one's financial situation, free time, health, and participation in local community activities. Furthermore, while the positive wellbeing impact of retirement is sizable initially, it fades after the first 3 years. We find that the improvements in financial satisfaction upon retirement are only observed for low-income individuals. However, the wellbeing impact of retirement does not differ by gender, educational, occupational, economic or marital backgrounds. We also explore several potential explanations for our findings.

Our findings on the impact of retirement on overall life satisfaction and various aspects of satisfaction have some potentially important methodological and policy implications. Methodologically, our results indicate that failing to adequately account for the endogeneity of retirement would result in a downward-biased estimate of a positive wellbeing impact of retirement. From a policy point of view, our finding of the differential retirement impact on financial satisfaction by income groups suggests that policies to increase retirement ages would also delay the retirement induced wellbeing improvements for many older people, especially those from a low socio-economic background. Furthermore, given our finding that the beneficial impact of retirement on wellbeing is short-lived, we recommend governments to consider broader support of organized group activities for seniors, and targeted communications about the availability of such activities to support the wellbeing of retirees, especially those who have been retired for 3 years or longer.

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ABSTRACT

This paper presents robust evidence that retirement causally improves overall life satisfaction which is subsequently explained by improvements in satisfaction with one's financial situation, free time, health, and participation in local community activities. Furthermore, while the positive wellbeing impact of retirement is sizable initially, it fades after the first 3 years. We find that the improvements in financial satisfaction upon retirement are only observed for low-income individuals. However, the wellbeing impact of retirement does not differ by gender, educational, occupational, economic or marital backgrounds. We also explore several potential explanations for our findings. This paper employs a fixed effect instrumental variable model, which exploits the discontinuity in the eligibility ages for state pension to construct an instrument for retirement, and 18 waves of high-quality Australian panel data. The results also suggest that failing to adequately account for the endogeneity of retirement would result in a downward-biased estimate of a positive wellbeing impact of retirement.

Keywords: retirement; wellbeing; life satisfaction; instrumental variable; age threshold; Australia

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1. Introduction

Retirement is a major life transition for working adults. It typically leads to changes in finances, health, social relations and time allocation, and hence in one's satisfaction with various aspects of life. In this paper, we explore the causal impact of retirement on different domains of life satisfaction, wellbeing and happiness.[1] The topic is particularly relevant to not only individuals but public policy makers. Thanks to medical advances and improvements in living conditions, people live longer and many of them will spend an increasing proportion of their life in retirement. To deal with issues associated with the population ageing, many countries in the world have increased retirement ages (OECD 2019). From a public policy point of view, it is imperative to know how such policies influence the individual's retirement choices and how retirement affects their wellbeing.

While understanding the effect of retirement on personal wellbeing is clearly of interest to individuals and policy makers, there exists limited and mixed evidence on the topic (see Section 2 for an overview of related studies). This current study offers six main contributions to the small literature on the wellbeing impact of retirement. Our study provides the first empirical evidence from Australia. Multi-country research by Horner (2014) indicates the impact of retirement may differ by country, suggesting that previous international evidence may not necessarily apply to Australia. Second, following a UK (Kesavayuth *et al*. 2016) and a US study (Gorry *et al*. 2018), this is the third study to employ a Fixed Effect Instrumental Variable (FE-IV) model, which is arguably the most robust method to date (Nishimura *et al*. 2018), to examine the causal effect of retirement on wellbeing. Third, we explore the impact of retirement via the richest set of satisfaction measures used by any study to date. In particular, we consider not only overall life satisfaction, as most of current studies do, but various other satisfaction domains, including satisfaction with one's financial situation, free (or leisure) time, home, community, neighbourhood, personal safety and health.

[1] Following the literature, we use life satisfaction, subjective wellbeing, and happiness terms interchangeably in this paper (Frey & Stutzer 2002; Kahneman & Krueger 2006).

Fourth, most studies in this field are only able to report post- retirement outcomes over a short term, whereas we consider outcomes for seven years post- retirement. This gives our study greater insight into post- retirement wellbeing trajectories. Fifth, by comparing the wellbeing impact of retirement for various sub-groups, defined relative to several characteristics such as gender, education, occupation, marital status and income, this study offers the most comprehensive heterogenous analysis available to this literature. Sixth, we are the first to explore the potential mechanisms behind our findings on the wellbeing impact of retirement.

By employing a FE-IV model, which exploits the discontinuity in the gender-specific eligibility ages for state pension to construct an instrument for retirement, and 18 waves of high-quality Australian panel data our study yields five key results. First, we show that retirement delivers a positive and sizable improvement in overall life satisfaction for most individuals. Second, we demonstrate that this is mainly accrued from improvements in satisfaction with one's financial situation, free time, health, and participation in local community activities. Third, the positive impact of retirement on wellbeing outcomes tends to fade rapidly and is only observed within the first 3 years of retirement. Fourth, the wellbeing impact does not differ between males and females, or between people with different educational, occupational, economic or marital backgrounds. One exception is that only low-income individuals feel more satisfied with their financial situation when they retire. Fifth, we provide some suggestive channels through which retirement may influence life satisfaction domains. For example, consistent with our novel finding of a positive retirement effect on financial satisfaction for low-income persons, our extra results suggest that, to cope with a reduction in income due to retirement, individuals may have to reduce saving to maintain the same level of expenditure. Likewise, we additionally find that retirement improves health outcomes, a result which helps explain why individuals are more satisfied with their health upon retirement.

We proceed as follows: in Section 2 we review related studies around life satisfaction and retirement. After discussing our empirical models in Section 3, we introduce our data in Section 4. We present our results in Section 5. Section 5 also provides results from several robustness checks while Section 6 discusses potential mechanisms behind our findings. Section 7 concludes.

2. Previous related studies

This paper explores the causal impact of retirement on wellbeing and hence relates itself to two extant strands of literature. The first and more extensive of these studies the socio-economic aspects of subjective wellbeing (SWB). This literature demonstrates the validity and reliability of SWB as a measure and describes a large set of factors as contributing to it (Frey & Stutzer 2002; Kahneman & Krueger 2006; Clark 2018). The relationship between unemployment and life satisfaction has long been of interest to the labour economics literature. The evidence from this line of work consistently shows that unemployment is usually associated with lower levels of wellbeing (see, for example, Winkelmann (2014) for a review).[2]

Our study diverges from this line of literature by investigating the impact of retirement on wellbeing. Unemployment and retirement, while both conceptually referring to a transition from work to non-work, are not the same. One apparent difference between them is that 'unemployment' usually relates to people who are searching for work and who are under the eligibility age for state-funded age pensions, whereas 'retirement' mainly concerns individuals who meet the age eligibility requirements for an age pension, though they may be ineligible for a state pension due to exceeding caps on private income or wealth. It has been widely shown that individuals display varying levels of wellbeing over their lives (Cheng *et al*. 2017), indicating that retirement and unemployment may have differential effects on

[2] In the absence of randomized controlled trials, studies in this line of work often rely on panel data (Winkelmann & Winkelmann 1998) or "quasi-random" unemployment events such as plant closures or mass layoffs (Kassenboehmer & Haisken-DeNew 2009; Nikolova & Ayhan 2019) to draw a causal relationship between unemployment and happiness.

wellbeing of the same individuals. Furthermore, in developed economies such as those in the OECD, governments expect all able-bodied persons of working age to be employed or searching for work at any given time, while such an expectation does not apply to people of retirement age (Hetschko *et al.* 2014).[3] This difference in social norms between the two groups paired with evidence that the impact of unemployment on wellbeing differs according to the social norm that one should adhere to (Andrew E. Clark 2003; Shields *et al.* 2009) also suggest a differential wellbeing impact between retirement and unemployment.

The second strand of literature examines the impact of retirement on various aspects of the individual's life. Studies in this literature have examined the effect of retirement on a list of outcomes, including health (van der Heide *et al.* 2013; Nishimura *et al.* 2018), health expenditure (Frimmel & Pruckner 2020), health behaviours (Kämpfen & Maurer 2016), home production activities (Stancanelli & Van Soest 2012; Ciani 2016), and cognitive ability (Mazzonna & Peracchi 2012; Atalay *et al.* 2019). Within this literature, our study is more closely related to a small and growing number of studies which primarily focus on the relationship between retirement and wellbeing.[4]

Bonsang & Klein (2012) is the first study in this literature to exclusively examine the effect of retirement on life satisfaction (see Appendix Table A1 for a summary overview of related studies). Using German data and a FE method, they find retirement reduces life satisfaction of men who retire involuntarily. They however do not find any significant effect of retirement on life satisfaction of men who retire voluntarily. These findings are also

[3] The social security systems of developed economies reflect this expectation quite starkly, usually via strict rules around documented search for work in return for receipt of income support payments for unemployed persons. These conditions do not exist for persons meeting age pension eligibility criteria. In developing countries, in the absence of a broad-based pension system, many elderly may rely on their own labour supply or on monetary transfers made by their children (Nguyen *et al.* 2012). As such, social norms toward labour force participation by the elderly may be not the same for developed and developing countries.

[4] This body of the literature is related to but distinct from a growing line of research on the mental health impact of retirement. See, for instance, Nikolova & Ayhan (2019) for a discussion about differences between mental health and wellbeing measures.

supported by another German study by Abolhassani & Alessie (2013) who use the same method and data to look at the retirement effect on wellbeing of both males and females. Other studies also use a FE model and data from various European countries to show that retirement is associated with lower levels in income satisfaction (Palomäki 2019) or life satisfaction (Sohier *et al*. 2020).[5]

To draw a causal effect of retirement on life satisfaction, three studies in this literature employ an instrumental variable method, using retirement age eligibility as instrument (Horner 2014; Kesavayuth *et al*. 2016; Gorry *et al*. 2018). The results from these IV studies reveal a different picture from what is usually observed from FE studies. In particular, Horner (2014) shows that retirement improves life satisfaction of males from 16 countries in Western Europe and the US. Similarly, Gorry *et al*. (2018) find a positive impact of retirement on wellbeing of US males and females in the first 4 years after retirement. Furthermore, FE-IV results from a study by Kesavayuth *et al*. (2016) suggest retirement has no significant impact on wellbeing of males and females in the UK.

In summary, previous research examining wellbeing effects of retirement produces mixed results, probably reflecting differences in modeling choices and datasets. The above review also reveals that this literature mainly focuses on a limited number of life satisfaction aspects and usually concerns short-term wellbeing effects of retirement. Furthermore, none of the reviewed studies explores the mechanisms behind the retirement effect on wellbeing. This current study will fill in these gaps.

3. Empirical models

We employ the following model to examine the effect of retirement on wellbeing outcome Y of individual i at time t:

[5] Sohier *et al*. (2020) did try an IV model. However, they only report FE results because they could not reject the exogeneity of retirement in the life satisfaction equation. Like Sohier *et al*. (2020), we will report results from a test for exogeneity of retirement throughout this paper. Other studies using an IV method do not follow this practice (Horner 2014; Kesavayuth *et al*. 2016; Gorry *et al*. 2018).

$$Y_{i,t} = \alpha + \beta R_{i,t} + X_{i,t}\gamma + \delta_i + \mu_{i,t} \quad (1)$$

where R represents the retirement status, $X_{i,t}$ is a vector of individual or household characteristics, δ_i is the individual-specific error, and $\mu_{i,t}$ indicates an error term. α, β and γ are parameters to be estimated. β is our parameter of interest.

We include in $X_{i,t}$ a rich set of factors contributing to the individual's wellbeing such as the individual characteristics (e.g., gender, age in months (and its square), marital status, migration status, ethnicity and completed qualification),[6] household characteristics (e.g., number of household members at various age groups and home ownership status), and neighbourhood characteristics.[7] We additionally control for temporal or spatial differences in wellbeing by including dummies for years and quarters of survey time and state/territory dummy variables in regressions.

In principle, fixed effect (FE) regression model (1) which controls for time-invariant individual unobservable factors (δ_i), including work ethic, ability, personality traits or optimism, would produce more precise estimates of retirement effects than a simple regression which does not control for individual heterogeneity. However, this FE model cannot account for unobserved time-variant, individual-specific characteristics (for instance, unexpected health shocks) that are correlated with both retirement and wellbeing outcomes, thus biasing the estimates of retirement. We further deal with this potential omitted-variable bias using an instrumental variable (IV) approach, employing an additional equation for the retirement decision:

[6] All time-invariant characteristics such as gender and migration status are dropped in the FE estimator. Unreported F test statistics from a Hausman style test confirm that FE models are preferred to OLS models in all cases. Furthermore, two following observations suggest that lack of variation in the retirement variable, instrumental variable and wellbeing outcomes is not an issue in our data for us to apply a FE model. First, within-individual standard deviations reported in Appendix Table A2 show large variations in these variables for the same individual. Second, estimates for standard errors for the retirement variable are equal or greater in pooled OLS regressions (unreported for brevity and will be available upon requests) than in FE regressions (reported in Table 2), indicating that insufficient variation in this endogenous variable is indeed not a problem for our data.

[7] Local variables include regional unemployment rates, an index of relative socio-economic advantage/disadvantage and a metropolitan dummy.

$$R_{i,t} = \pi + X_{i,t}\tau + Z_{i,t}\sigma + \delta_i + \omega_{i,t} \quad (2)$$

In equation (2), $Z_{i,t}$ is an instrumental variable, $\omega_{i,t}$ is an idiosyncratic error term, and π, τ and σ are vectors of parameters to be estimated. Other variables in equation (2) are defined as in equation (1). To be a valid instrumental variable, $Z_{i,t}$ must satisfy three conditions (Wooldridge 2010): (1) it must be adequately correlated with $R_{i,t}$; (2) it must be uncorrelated with $Y_{i,t}$ except through $R_{i,t}$; and (3) it cannot be correlated with unobserved time-variant, individual-specific characteristics $(\mu_{i,t})$.

This study exploits discontinuity in the probability of retiring at state pension eligibility ages (PEA) to derive an instrumental variable to identify the retirement equation (2). In particular, it relies on the fact that individuals at different ages are endowed with distinct exogenously determined eligibility ages for state pension (Lee & Lemieux 2010).[8] We define an instrumental variable which takes a value of one if an individual's age is equal or greater than the state pension eligibility age set at the survey time and zero if otherwise. Our data have information on both birth and interview dates that allow us to measure age (in months) and then precisely identify the discontinuity at the cut-off. This variable is then included in the retirement equation (2) in addition to a second-order polynomial of age and year-quarter fixed effects. Because this instrument varies over time for the same individuals we are able to apply the IV approach to panel data in a FE-IV model, thus effectively accounting for both time-invariant and time-variant unobserved individual heterogeneity at the same time.[9]

[8] Australia's retirement income system includes three pillars: a mean-test age pension, compulsory superannuation and voluntary savings. Eligibility to the state age pension is based on an income test and age and residency requirements. In 2020, the qualifying age for the age pension in Australia is 66 years old for both males and females (Department of Social Services 2020). Although our identification strategy takes into account the changes in the pension eligibility ages for males and females during the study period (see Appendix Table A4 for historical pension eligibility ages in Australia), it primarily exploits the discontinuous changes in the probability of retiring around the pension eligibility ages.

[9] A recent review study by Nishimura *et al.* (2018) suggests that choice of analysis method is one of the key factors in explaining why the estimated results of the effect of retirement on health differ among studies and that a FE-IV model, like the one employed in the current study, provides more

This variable is likely to meet the three requirements described above. Specifically, it may increase the probability of being retired as found in Australian literature (Atalay & Barrett 2014b). This instrument is also theoretically sound: conditional on controlling for a second-order polynomial of age, the exogenously determined eligibility for age pension should directly influence the individual's retirement behaviours, but only indirectly affect their wellbeing via the retirement channel. We will empirically test the strengths of the instrument against the third requirement by controlling for a rich list of time-variant variables which are potentially associated with our instrument in Section 5.4.

A similar approach using state pension eligibility ages as instruments has been successfully employed to draw causal effects of retirement on various outcomes by studies worldwide (Coe & Zamarro 2011; Bonsang *et al*. 2012; Bíró & Elek 2018; Frimmel & Pruckner 2020). Some Australian studies have also used this strategy when exploring the causal effects of retirement on health (Atalay & Barrett 2014a; Zhu 2016; Binh Tran & Zikos 2019), cognitive functioning (Atalay *et al*. 2019) or welfare receipt (Oguzoglu *et al*. 2020). Like other studies employing an IV method, the IV estimates in this study capture a local average treatment effect (LATE) of retirement on wellbeing (Imbens & Angrist 1994). In this study, the LATE is applicable to individuals who retire because they reach the relevant state pension eligibility ages.

For ease of interpretation, we use Ordinary Least Squared (OLS) method to estimate equation (1) and conduct a two-stage least squares (2SLS) regression method for the FE-IV model.[10] Furthermore, due to the panel nature of our data, robust standard errors are clustered at the individual level to account for any serial correlation. To improve the statistical power of our empirical results and for the sake of concentration, in the main analysis, we will estimate these equations using a sample of all individuals observed in our

robust estimates on the health impact of retirement over other alternatives, including an IV model or a FE model.

[10] The FE OLS model is found suitable for modelling SWB (Ferrer-i-Carbonell & Frijters 2004; Riedl & Geishecker 2014).

data. In section 5.3 we will explore heterogeneity in the retirement impact by various characteristics, including gender, occupation and education of respondents.

4. Data and sample

4.1. Data

We use data from the Household Income and Labour Dynamics in Australia (HILDA) survey - an annual nationally representative longitudinal survey of private households in Australia. HILDA contains rich information at the individual and household level, including information on labor-market conditions and individual wellbeing. We employ the first 18 waves of data, which cover a period from 2001 to 2018, for this analysis.

We follow previous Australian studies which use the same dataset (Zhu 2016; Atalay *et al.* 2020) to define an individual as retired if his or her current labour market status is stated as "not in the labour force". We will test the sensitivity of the results using other alternative retirement measures in Section 5.4. Our main measure of subjective wellbeing is an individual's overall satisfaction with his or her life. This outcome is derived from a question asking "All things considered, how satisfied are you with your life?". Respondents are asked to choose one point on a scale from 0 to 10 where a higher scale indicates a higher level of life satisfaction. In addition to this overall life satisfaction indicator, we explore the respondents' satisfaction with other aspects of life available in the data. In particular, respondents are asked about their satisfaction with their financial situation (thereafter called "Financial situation"), the amount of free time that they have ("Free time"), the home in which they live ("Home"), feeling part of their local community ("Community"), the neighbourhood in which they live ("Neighbourhood"), how safe they feel ("Personal safety"), and their health ("Health"). These detailed wellbeing questions allow us to investigate which aspects of life are most likely influenced by retirement.[11]

[11] We do not use another aspect of life satisfaction asking respondents about their "employment opportunities" since it is only relevant to those in the labour force at the time of the survey. Similarly, we do not consider some other aspects of wellbeing such as the respondents' satisfaction about their

4.2. Sample

We focus on individuals aged between 55 and 75 years old at any point during the study period, in line with the usual practice in previous Australian studies (Zhu 2016; Atalay *et al*. 2019, 2020). Since we mainly employ an individual FE-IV model in this analysis, we necessarily restrict the sample to individuals who are observed on at least two occasions and individuals who move in and out of the workforce during the study window.[12] We additionally exclude individuals with missing information on any variable used in our empirical model. These restrictions result in a sample of 64,494 individual-year observations from 7,568 unique individuals obtained over 18 years of data.

[Table 1 around here]

Summary statistics for key variables for retired and non-retired individuals in this sample are reported in Table 1. Table 1 shows that, as compared with non-retired individuals, retired individuals are more likely to be female, older, not in a marital relationship, come from a non-English-speaking-background country, or have lower qualifications. Furthermore, retired individuals tend to live in households with a higher proportion of elderly members or are more likely to live in rental homes. Table 1 also suggests that while there is no statistical difference in the levels of overall life satisfaction and the

relationship with partner or children since responses are only available to relevant sub-population groups (e.g., partnered individuals or individuals with children). Appendix Table A3 reports the correlation structure among key dependent variables. It shows that overall life satisfaction and other satisfaction aspects are positively associated. However, the size of the association varies between 0.15 to 0.50, indicating that each of these satisfaction measures capture a distinct aspect of life satisfaction. Similarly, while mental health (as represented by the mental component measure) and wellbeing measures are positively correlated in our data, the size of the correlations is typically low, between 0.17 and 0.44, depending on the wellbeing measures. These correlations indicate that mental health and wellbeing measures are substantively different (Nikolova & Ayhan 2019).

[12] These restrictions thus exclude a small number of individuals who were never in the workforce from the final sample. We alleviate a concern that sample attrition may affect our results in two ways. First, we apply an individual FE model, which controls for time-invariant factors that affect both the respondents' propensity to remain in the panel as well as their retirement behaviour and wellbeing outcomes. Second, we directly test whether our sample selection criteria led to sample selection issues by running a probit model where the dependent variable is equal to one if the individual is in our sample and zero otherwise. The explanatory variables are basic demographic characteristics, including the retirement variable. One particular concern relating to our research design is that retirement may affect the probability that an individual is included in the final sample. The p value from a t test for statistical significance of the retirement variable included in the regression is 0.12, alleviating concern that our results may be driven by sample selection.

Neighbourhood sub-scale between retired and non-retired individuals, retired individuals report a greater level of satisfaction about Free time, Home and Community but a lower level on Financial situation, Personal safety and Health. However, these simple correlations between retirement and wellbeing measures do not account for individual heterogeneity as well as the possible endogeneity of retirement. Both issues are addressed in the Results section.

5. Results

5.1. Contemporaneous effects of retirement on wellbeing

FE and FE-IV estimates of retirement impact on wellbeing are reported in Table 2. FE results (reported in odd columns of Table 2) show that retirement is negatively associated with Financial satisfaction and Health satisfaction while positively correlated with Free time satisfaction. These associations are statistically significant at the 1% level. However, we do not observe any statistically significant associations between retirement and the overall life satisfaction and other domains of satisfaction, including Home, Community, Neighbourhood and Personal safety. To this end, our findings are largely consistent with that in a German study by Bonsang & Klein (2012) who use a FE model to report that retirement has a positive impact on Free time satisfaction, a negative impact on household income satisfaction and an insignificant effect on Life satisfaction. Our FE finding is also in line with FE results of a negative relationship between retirement and income satisfaction in an European study by Palomäki (2019). As noted in section 3, while the FE model helps remove time-invariant individual characteristics, it cannot deal with problems associated with reversed causality and measurement errors. We next turn to results estimated from a FE-IV model which addresses all three issues simultaneously.

[Table 2 around here]

FE-IV estimates are represented in even columns of Table 2. We note that the first stage F-statistic from FE-IV regressions is greater than 431, which is well above the rule of thumb

value of 10 for a strong instrument (Stock & Yogo 2005).[13] Table 2 shows that applying a FE-IV estimator changes the estimates of retirement remarkably in terms of direction, magnitude and statistical level. In particular, the FE-IV estimator turns the estimates of Life satisfaction from negative and statistically insignificant to positive and highly statistically significant (at the 1% level). The FE-IV results suggest that retirement improves overall life satisfaction and this positive impact of retirement is relatively large in magnitude: retirement increases overall life satisfaction by 1.03 points (on a 0-10 scale as seen in column 2 of Table 2) or by 0.68 standard deviations.[14] Our finding of a positive impact of retirement on overall life satisfaction is in line with IV evidence from an European study by Horner (2014) or a US study by Gorry *et al*. (2018), but different from a null impact in a UK study by Kesavayuth *et al*. (2016). The positive impact of retirement on overall life satisfaction found in this current paper and other studies (Horner 2014; Gorry *et al*. 2018) when viewed with dominant evidence of a large negative effect of unemployment on happiness (Winkelmann 2014) confirm that retirement and unemployment influence wellbeing differently.

Table 2 also demonstrates that employing a FE-IV model reverses the direction of the estimates of Financial and Health satisfaction aspects from negative to positive while maintaining their level of statistical significance at the 1% level. The FE-IV results clearly show that retirement increases satisfaction with Financial situation and Health. As with the overall life satisfaction, the size of retirement impact on these two satisfaction aspects is quite large as retirement increases Financial satisfaction by 1.09 points (or 0.49 standard

[13] Appendix Table A5 reports results from the first stage regression. The estimate suggests that the retirement probability of individuals age above the pension eligibility ages is on average 9.90 percentage points higher than those just under the PEA cut-off. A jump in the retirement probability around the cut-off is also observed in Appendix Figure A1 which displays the relation between the time to state pension eligibility and the retirement probability. Unreported results (available upon request) for other variables show that the impact of other commonly controlled variables in equation (1) like age and marital status is largely similar to that reported in other studies (Clark 2018; Nguyen & Duncan 2020). For example, age has a U-shape impact on wellbeing measures and individuals display a higher level of wellbeing when being together with their spouse/partner.

[14] 0.68 = 1.03/1.52 where 1.52 is the standard deviation of overall life satisfaction (reported in Appendix Table A2).

deviations) and Health satisfaction by 1.10 points (or 0.53 standard deviations). Our finding of a positive and sizable impact of retirement on financial satisfaction is new to this literature since FE-IV evidence provided by Kesavayuth *et al*. (2016) indicates that retirement has no statistically significant impact on financial satisfaction among UK individuals.[15]

Results from Table 2 additionally show that applying a FE model under-estimates the positive effects of retirement on satisfaction with Free time and Community. In particular, the estimate of retirement on Free time satisfaction is about 2.5 times greater in the FE-IV estimator than in the FE estimator while being statistically significant at the 1% level in both models. Similarly, FE-IV results indicate that retirement has a marginally statistically significant (at the 10% level, as compared with a statistically insignificant FE estimate) and sizable impact (e.g., retirement increases the satisfaction level by 0.56 points or 0.26 standard deviations) on Community satisfaction. Table 2 also shows the notable changes in the direction, magnitude and statistical level in the estimates of retirement on the above wellbeing measures are consistent with results from a Hausman test which suggest retirement is endogenous when modeling these outcomes. The results thus demonstrate that failing to account for the endogeneity of retirement would under-estimate the positive impact of retirement on these wellbeing measures.

FE-IV estimates on other domains of satisfaction such as Home, Neighbourhood and Personal safety continue to show that retirement does not statistically significantly influence these outcomes. The similarity between FE and FE-IV models when confirming the insignificant impact of retirement on Home, Neighbourhood and Personal safety satisfaction domains is

[15] There are two potential factors behind the difference in our findings on the impact of retirement. First, Kesavayuth *et al*. (2016) use UK data where satisfaction with "income" is measured on a 0-7 scale while we use Australian data with satisfaction on "financial situation" recorded on a 0-10 scale. Second, we have a much larger sample size to work with (i.e., we have more than 60,000 observations observed over 18 years while they only have 7,837 observations from two survey waves) which may enhance our capacity to detect a statistically significant impact of retirement.

also consistent with results from a Hausman test which suggest that we can model the retirement decision and each of these wellbeing aspects independently.

5.2. Intertemporal impact of retirement on wellbeing

Section 5.1 represented contemporaneous impact of retirement. It is possible that retirement may have varying effects over time (Bonsang & Klein 2012). To investigate the longer-term impact of retirement, we follow previous studies (Heller-Sahlgren 2017; Le & Nguyen 2018) to separately include leaded values of wellbeing outcomes (i.e., $Y_{i,t+k}$, with $k = 0, 1, 2, \dots 7$) in equation (1) of the FE-IV model. This modified FE-IV model thus allows us to explore the impact of current retirement on wellbeing outcomes which are measured up to 7 years in the future.[16]

[Figure 1 around here]

Figure 1 graphically presents the intertemporal impact of retirement over the course of the first seven years after retirement. One noticeable feature observed from Figure 1 is that the positive impact of retirement on wellbeing outcomes tends to fade rapidly because estimates of retirement typically decrease in size over time or become statistically insignificant after a certain period. In particular, retirement has no statistically significant (at the 5% level) impact on the overall life satisfaction 2 years after retirement. While not directly comparable due to the apparent differences in measures of overall life satisfaction and empirical approach,[17] our finding of the fading impact of retirement on overall life

[16] We also experimented with longer leaded values of wellbeing outcomes but found the estimates are not statistically significant, consistent with evidence of a short-lived impact of retirement as presented in Figure 1. As such, we did not report results from this experiment. To examine a longer-term impact of retirement, some studies compare estimates of two variables capturing different retirement durations in the same regression (e.g., 0-4 years after retirement versus 4+ years (Gorry *et al*. 2018) or currently retired versus 2+ years after retirement (Sohier *et al*. 2020)). This approach bases on an assumption that individuals do not return to work once they retire. Our data do not support this assumption since there are about 4% of individuals in our sample returning to the labour force one year after they had been identified as retired.

[17] In particular, Gorry *et al*. (2018) use responses to the following statements to indicate overall life satisfaction. They are: "In most ways my life is close to ideal", "The conditions of my life are excellent", "I am satisfied with my life", "So far, I have gotten the important things I want in life" and "If I could live my life again, I would change almost nothing". They find the estimate for a variable representing 0-4 years after retirement positive while the estimate for 4+ years after retirement negative. Using a FE model and data from nine European countries, Sohier *et al*. (2020)

satisfaction is consistent with that from a study by Gorry *et al.* (2018) who use a FE-IV model and US data. An important difference is that they found the impact on satisfaction indicators occurs within the first 4 years of retirement while we find the effect only lasts two years after retirement.

We also do not observe any statistically significant impact of retirement on Financial satisfaction beyond year 3 since retirement. Furthermore, the positive impact of retirement on Free time satisfaction is even shorter as the impact turns statistically insignificant from year 2 into retirement. The impact of retirement on Health satisfaction lasts longest as the impact is observed within the first 3 years after retirement. We also notice that the impact of retirement on Health satisfaction increases in years 1 and 2 after retirement, in line with the idea that health is a stock that does not change instantly upon retirement (Heller-Sahlgren 2017; Gorry *et al.* 2018). Likewise, the impact of retirement on Community satisfaction is more pronounced in terms of statistical significance and magnitude during the first two years after retirement, after which the effect becomes statistically insignificant. This pattern is consistent with the view that it may take time for retired individuals to participate in local community activities and hence feel part of their local community after retirement. Finally, Figure 1 shows that retirement does not influence other domains of wellbeing, including Home, Neighbourhood and Personal safety, over the course of the first seven years after retirement.

5.3. Heterogeneity

Above, using a FE-IV model, we found that retirement improves overall life satisfaction and four satisfaction domains, including Financial situation, Free time, Community and Health. It is likely that individuals with different socio-economic background respond differently to retirement. We investigate the heterogeneity of the impact by estimating a FE-IV model for two sub-populations, separated by a set of variables which represent socio-economic

also find the effects of retirement on overall life satisfaction vary over time: a *negative* effect of retirement is only observed two years after retirement.

background of the individuals. These variables include gender (i.e., male versus female), marital status (married versus single), education levels (with or without a post school qualification), occupation groups (blue collar versus white collar)[18] and income groups (top income tercile versus bottom income tercile). For each of the time-variant variables, sub-groups are defined using the value identified at its first appearance in the sample. Furthermore, for the individual's income levels, sub-groups are defined relative to the top/bottom income terciles.

[Figure 2 around here]

Estimates on the impact of retirement by sub-groups for various measures of wellbeing are sucintly presented in Figure 2. Figure 2 suggests that retirement appears to have a greater impact for some sub-groups because their estimates are greater (i.e., more positive) or more statistically significant. For example, a higher positive impact of retirement on overall life satisfaction is observed for individuals who are female, married, have higher qualification, worked in white collar occupations or earned lower income.[19] Similarly, the impact of retirement on Financial satisfaction tends to be more pronouned for females, married individuals, lower educated individuals or lower income individuals. The benefitial retirement effects on Free time satisfaction also appear to be higher for females, white collar workers or low income individuals. Furthermore, the positive impact of retirement on Community satisfaction is greater for individuals who are female, or those who have higher

[18] Managers and professionals are defined as white collar workers while blue collar workers consist of technicians and trades workers, machinery operators and drivers, and labourers. Other workers, including community and personal service workers, clerical and administrative workers, and sales workers, are not included in this analysis. This occupation classification and the availability of information on occupations (i.e., occupations are only available for individuals who were employed at the survey time) reduce the sample size for this heterogenous analysis considerably. These sample restrictions should be taken into account when interpreting the results. We use xtivreg2 command developed by Schaffer (2010) in STATA software to estimate FE-IV regressions. Statistics from a Hausman test for the exogeneity of retirement cannot be calculated for the blue collar sub-population (see Appendix Table A7 - Panel D), probably due to the small sample size for this group.

[19] To this end, our findings are different from that in a study by Gorry *et al*. (2018) who find retirement has a less pronounced impact for individuals who are female or worked in more physically demanding occupations. Differences in wellbeing measures (as noted in footnote 17), empirical approach (e.g., they investigate the differential effects by including an interaction between group membership and retirement status in the regression of wellbeing outcomes) or study contexts (US versus Australia) may explain the disparity in the findings.

qualifications, worked in blue collar occupations or earned higher income. Likewise, the positive retirement effects on Health satisfaction are more visible for single individuals or low income individuals.

Figure 2 also shows that, consistent with the pooled regression results (reported in Table 2 and re-represented in Figure 2), sub-group estimates of retirement on Home, Neighbourhood and Personal safety satisfaction domains are not statistically signficant at any conventional level. However, two exceptions are observed. First, married individuals or high income individuals are more satisfied with their Neighbourhood when they retire since the estimates of retirement are positive and statistically signficant at the 5% level for them. Second, retirement is found to improve Personal safety satisfaction for higher educated individuals, blue collar workers or high income individuals because the retirement estimates are also positive and statistically signficant at the 10% level for them.

However, Figure 2 suggests that, taking the statistical differences of retirement estimates by sub-populations into account, the impact of retirement is not statistically significantly different by the above-mentioned characteristics.[20] One exception is that the estimates of retirement effects on Financial satisfaction are statistically different (at the 5% level) for low income and high income individuals, indicating that only individuals who earned low income feel more satisfied with their financial situation when they retire. Our new finding of a differential impact of retirement on wellbeing, especially on financial satisfaction, by income groups can be explained by two main reasons. It is likely that, for low income individuals, coming from a period of unemployment income support and/or Disability support pension, the relatively stress-free nature of collecting the Age Pension is a welcome relief from reporting requirements of other income support payments (Atalay & Barrett 2014b; Oguzoglu *et al*. 2020). It is also possible that the Age Pension, even if it provides the

[20] Visually, the 95% confidence intervals which do not include zero indicate a statistically significant (at the 5% level) estimate. The statistically significant differences in the estimates by sub-groups are visually indicated by the observation that the 95% confidence intervals do not overlap. Full estimation results are reported in Appendix Table A7.

same level of income as other income supports that these people may have been receiving,[21] comes with other financial advantages, like health care cards (cheaper medical fees and prescription drugs), pensioner discounts on utilities and travel, and other benefits, that are relatively more significant for low income people. As such, retirement improves wellbeing of low-income individuals only.

Overall, results from these heterogeneous analyses indicate that apart from the differential impact of retirement on Financial satisfaction by pre-retirement income levels, the impact of retirement is not different by all other characteristics and wellbeing measures considered.

5.4. Robustness checks

This section checks the sensitivity of our results to four main threats to our empirical models. First, to test that our results are not driven by the way we define retirement, we re-estimate our results defining retired individuals as those who reported that they retired completely from the workforce at the time of the survey (Panel B1 of Appendix Table A8) or excluding those who were not in the labour force marginally from the previously defined retired individuals (Panel B2). Our results are largely the same as those obtained from the baseline regressions (reproduced in Panel A of Appendix Table A8). Furthermore, we experiment with using weekly working hours in place of the retirement indicator and find a similar pattern: a reduction in weekly working hours increases overall life satisfaction and Financial, Free time, Community and Health satisfaction domains (Panel B3). Second, we try controlling for a cubic (rather than quadratic) polynomial in age and find the same results (Panel C).

[21] As has been done in the above heterogenous analysis, we test this prediction by applying a FE-IV model to examine the impact of retirement on non-wage income and net total income for previously defined low- and high-income groups separately. Unreported results show no statistically significant change in both non-wage income and net total income for low-income individuals. By contrast, net total income for high-income individuals drops by about $50,000 upon retirement. It should be noted that, as will be demonstrated in section 5.4, our findings are not sensitive to the inclusion of non-wage income, including unemployment income support and Age Pension, in the regression.

Third, we address a threat of the omission of time-variant factors which are potentially associated with the instrument and wellbeing outcomes at the same time by additionally controlling for some important time-variant variables (Angrist & Pischke 2008). Particularly, we alleviate concerns that retirement may influence the individual's health by controlling for each of three variables representing the individual's health states. These are the individual's general physical health measure, general mental health measure, and whether he or she has any disability condition. While previous studies found retirement improves health (Atalay & Barrett 2014a; Zhu 2016; Nishimura *et al*. 2018), our results show that controlling for these health variables in the regression does not change our findings in any significant way (see Panels D1, D2 and D3 in Appendix Table A8). Similarly, the results reported in Panel D4 of Appendix Table A8 show little sensitivity in our findings when we also control for non-wage income in the regression.

Finally, the results are robust to using narrower age windows such as 5, 4 and 3 years around the pension eligibility ages (See Panels E1, E2 and E3 of Appendix Table A8).[22] Overall, the results from the above robustness checks further support the idea that our research design captures causal effects of retirement on overall wellbeing.

6. Exploring potential mechanisms

This section investigates possible channels through which retirement may influence some aspects of wellbeing described in our results above. To do this, we apply a FE-IV model similar to the one specified in section 3 to examine the causal impact of retirement on various factors which are usually associated with distinct domains of wellbeing.

Our results in Table 2 showed that retirement improves financial satisfaction. This finding is consistent with another evidence presented in Table 3 that retirement also makes individuals feel more prosperous given their current needs and financial responsibilities

[22] An exception is that the estimate of retirement on Health satisfaction is no longer statistically significant when a 4- or 3-year bandwidth is used, most likely due to the small sample sizes. Similarly, unreported results show no statistically significant retirement impact on all wellbeing outcomes when 1- or 2-year bandwidth is used.

(column 1). It is also in line with another result reported in column 2 of Table 3 that individuals are less likely to report that they experience major worsening in finances upon retirement. It is interesting to observe that individuals do feel more satisfied with their financial situation after retirement even though retirement significantly reduces their net income (by an average of $36,000 per year as seen in column 3 of Table 3).[23] Additional results in Table 3 indicate that retirement does not statistically significantly affect their non-wage household income (column 4) or expenditure (column 5), suggesting that retired individuals may reduce saving or dissave to cope with a reduction in income due to retirement.[24]

[Table 3 around here]

In line with our earlier finding that retirement increases levels of satisfaction about Free time, Table 3 (column 6) shows that individuals feel much less rushed for time when they retire. Table 3 also presents some plausible results explaining why retirement causes individuals to feel more satisfied with their free time. In particular, in line with results in other studies (Stancanelli & Van Soest 2012; Ciani 2016; Atalay *et al*. 2020), our results (columns 7 to 14) suggest that retirement reduces the time that individuals spend on labour market activities, including work related travel, and hence increases the time on home production activities, including household errands, housework, outdoor and physically active tasks. Furthermore, column 16 in Table 3 indicates individuals are much more likely to be an active member of a club when they retire, a finding which possibly explains why individuals display a higher level of feeling part of their local community upon retirement. Columns 20 to 23 in Table 3 show that retirement improves self-reported health, as well as physical and mental health outcomes. This result, while confirming the positive health

[23] To account for temporal price differences, all monetary measures such as income or expenditure are adjusted for Consumer Price Indices, using 2010 as the base year.

[24] Unfortunately, our data do not have information on saving for us to directly investigate this hypothesis. Table 3 also reports statistics from a Hausman test for the null hypothesis that retirement is exogenous in equation (1). Where exogeneity was not rejected, we also experimented with running FE regressions which produced similar results.

impact of retirement as commonly found in the literature (Atalay & Barrett 2014a; Zhu 2016; Nishimura *et al*. 2018), helps explain why individuals in our data are more satisfied with their health upon retirement.

Table 3 also provides some indicative evidence supporting our earlier findings that retirement does not statistically significantly influence the respondents' satisfaction with their Home, Neighbourhood or Personal safety. Particularly, column 15 suggests no statistically significant change in individual preference to continue living in current area upon retirement. Similarly, columns 17 to 19 show retirement does not affect the individuals' probability of being a victim of a property crime or physical violence as well as having serious personal injury.

7. Conclusion

In this study, we used a FE-IV model to explore the causal effects of retirement on various wellbeing domains. We provide robust evidence that retirement improves overall life satisfaction. In turn, the positive impact of retirement on overall life satisfaction is explained by improvements in satisfaction with one's financial situation, free time, health, and participation in local community activities. While the wellbeing impact of retirement is sizable, it is short-lived and the impact fades beyond the first 3 years of retirement. We also present new evidence that retirement improves financial satisfaction for individuals who earned low income before retirement, even though retirement leads to a significant drop in income. Our results reveal that the impact of retirement on wellbeing does not differ by gender, educational, occupational, economic or marital backgrounds. We also explore several possible explanations for our findings.

Our findings on the impact of retirement on overall life satisfaction and various aspects of satisfaction have some potentially important methodological and policy implications. Methodologically, our results indicate that failing to adequately account for the endogeneity of retirement would result in a downward-biased estimate of a positive wellbeing impact of

retirement. From a policy point of view, our finding of the differential retirement impact on financial satisfaction by income groups suggests that policies to increase retirement ages would also delay the retirement induced wellbeing improvements for many older people, especially those from a low socio-economic background. Furthermore, given our finding that the beneficial impact of retirement on wellbeing is short-lived, we recommend governments to consider broader support of organized group activities for seniors, and targeted communications about the availability of such activities, especially for people who have been retired for 3 years or longer, in order to maintain collective wellbeing in the positive range.

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Table 1: Sample means of key covariates and outcomes by retirement status

	Retired (1)	Not retired (2)	Difference = (1)-(2)
Male	0.44	0.57	-0.13***
Age (years)	66.23	60.76	5.47***
Married/De facto	0.73	0.77	-0.05***
Separated/divorced/widowed	0.23	0.18	0.04***
Aboriginal	0.01	0.01	0.00
Non-English-Speaking migrant	0.20	0.16	0.04***
English-Speaking migrant	0.14	0.14	0.01
Year 12	0.09	0.10	-0.01***
Vocational and training qualification	0.33	0.42	-0.09***
Bachelor or higher degree	0.09	0.19	-0.1***
Number of other household members aged 0-4	0.01	0.02	0.00
Number of other household members aged 5-9	0.02	0.02	-0.01***
Number of other household members aged 10-14	0.02	0.04	-0.02***
Number of other household members aged 15-23	0.07	0.23	-0.16***
Number of other household members aged 24-64	0.41	0.76	-0.35***
Number of other household members aged 65 or over	0.50	0.23	0.27***
Homeowner	0.82	0.85	-0.03***
Age >= PEA	0.64	0.19	0.45***
Life satisfaction	8.05	8.04	0.01
Financial situation satisfaction	6.82	6.93	-0.11***
Free time satisfaction	8.08	6.85	1.23***
Home satisfaction	8.40	8.24	0.16***
Community satisfaction	7.08	6.98	0.09***
Neighbourhood satisfaction	8.06	8.07	-0.01
Personal safety satisfaction	8.12	8.22	-0.09***
Health satisfaction	6.53	7.35	-0.82***
Number of observations	34,331	27,163	

Notes: Figures are sample means. Tests are performed on the significance of the difference between the sample mean for retired and not-retired individuals. The symbol *denotes significance at the 10% level, **at the 5% level, and ***at the 1% level.

Table 2: Impact of retirement on wellbeing - results from FE and FE-IV models

	FE	FE-IV	FE	FE-IV	FE	FE-IV	FE	FE-IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Life satisfaction		Financial situation		Free time		Home	
Retired	-0.01	1.02***	-0.21***	1.09***	0.92***	2.43***	-0.02	0.01
	[0.02]	[0.23]	[0.03]	[0.32]	[0.04]	[0.37]	[0.02]	[0.24]
Observations	61,494	61,494	61,494	61,494	61,494	61,494	61,494	61,494
Individuals	7,568	7,568	7,568	7,568	7,568	7,568	7,568	7,568
Mean of dep. variable	8.08	8.08	6.84	6.84	7.57	7.57	8.35	8.35
F-statistic of IV		431.70		431.70		431.70		431.70
Hausman test (p-value)		0.00		0.00		0.00		0.91
	Community		Neighbourhood		Personal safety		Health	
Retired	0.03	0.56*	0.02	0.37	-0.01	0.15	-0.30***	1.10***
	[0.03]	[0.30]	[0.02]	[0.23]	[0.02]	[0.23]	[0.03]	[0.29]
Observations	61,494	61,494	61,494	61,494	61,494	61,494	61,494	61,494
Individuals	7,568	7,568	7,568	7,568	7,568	7,568	7,568	7,568
Mean of dep. variable	7.08	7.08	8.10	8.10	8.22	8.22	6.97	6.97
F-statistic of IV		431.70		431.70		431.70		431.70
Hausman test (p-value)		0.08		0.13		0.47		0.00

Notes: FE results are from the regression (1) while FE-IV results from models (1) and (2). F-statistic of IV denotes the Cragg-Donald Wald F statistic for the excluded instrument in the first stage regression. Hausman test (p-value) reports p-value from a Hausman test of exogeneity of the endogenous variable. Other explanatory variables include the individual characteristics (age and age squared, migration status, Aboriginal status, completed qualifications, marital status), household characteristics (number of household members at various age groups, home ownership status), local socio-economic background variables, state/territory dummies, year dummies, and survey quarters. Robust standard errors clustered at the individual level in parentheses. The symbol *denotes significance at the 10% level, **at the 5% level, and ***at the 1% level.

Table 3: Exploring potential mechanisms

	Self-assessed prosperity (1-6 scale, higher is more prosperous)	Major worsening in finances last year (Dummy = 1 if yes, = 0 if no)	Net total income ($100,000, financial year, 2010 price)	Normalized non-wage household income ($100,000, 2010 price)	Annual household expenditure per person ($1000, 2010 price)	Often feel rushed for time (1-5 scale, higher is less often)	Time caring for disabled spouse/relative (hours per week)	Time playing with your children (hours per week)
Estimate	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Retired	0.18*	-0.06*	-0.36***	0.07	-1.61	0.58***	-4.42**	0.87
	[0.10]	[0.03]	[0.11]	[0.09]	[3.75]	[0.13]	[2.16]	[0.61]
Observations	57,574	54,642	61,494	61,494	36,785	57,678	52,419	52,487
Individuals	7,279	7,006	7,568	7,568	5,570	7,283	7,005	7,020
Mean of dep. variable	3.86	0.03	0.46	0.26	25.78	3.10	2.59	0.92
F-statistic of IV	412.34	383.53	431.70	431.70	297.08	412.51	363.71	370.43
Hausman test (p-value)	0.02	0.02	0.04	0.94	0.55	0.02	0.01	0.21

Notes: Results for each column are from a separate FE-IV regression. Other notes: see Table 2. Description of dependent variables:

(1) "Self-assessed prosperity" is constructed from responses to a question "Given your current needs and financial responsibilities, would you say that you and your family are: [1] Prosperous, [2] Very comfortable, [3] Reasonably comfortable, [4] Just getting along, [5] Poor, [6] Very poor". The coding of this variable is reversed in this study.

(2) "Major worsening in finances" is constructed from responses to a question asking the respondents about major events (Major worsening in finances in this case) that have happened in their life over the past 12 months. This question is asked from Wave 2 and in Self-Completed Questionnaire (SCQ) (about 90% of all surveyed individuals returned their SCQ).

(3) "Net total income" is net financial year gross total income (at an individual level), including regular private income, irregular private income, Australian public transfers, foreign pensions, and other regular public transfers.

(4) "Normalized non-wage household income" is non-wage household income adjusted for household size.

(5) "Annual household expenditure per person" is calculated from the annual household expenditure on Groceries; Clothing and footwear; Cigarettes and tobacco; Alcohol; Meals eaten out; Private health insurance; Medicines, prescriptions, pharmaceuticals, alternative medicines; Fees paid to health practitioners; Education fees; Other insurance (home/contents/motor vehicle); Home repairs/renovations/maintenance; Motor vehicle fuel; Motor vehicle repairs/maintenance; Public transport and taxis; Telephone rent, calls and internet charges; and Electricity bills, gas bills and other heating fuel. Information on expenditure is only available from Wave 6.

(6) "Often feel rushed for time" is derived from responses to a question "How often do you feel rushed or pressed for time? [1] Almost always, [2] Often, [3] Sometimes, [4] Rarely, [5] Never".

(7) and (8) are constructed from responses to a question in SCQ "How much time would you spend on each of the following activities in a typical week?". "Time caring for disabled spouse/relative" refers to "Caring for a disabled spouse or disabled adult relative, or caring for elderly parents or parents-in-law" and "Time playing with your children" relates to "Playing with your children, helping them with personal care, teaching, coaching or actively supervising them, or getting them to child care, school and other activities".

Table 3: Exploring potential mechanisms (continued)

	Time travelling to and from a place of paid employment (hours per week)	Time on household errands (hours per week)	Time on housework (hours per week)	Time on volunteer/charity work (hours per week)	Time on outdoor tasks (hours per week)	Often participate in physical activity (1-6 scale, higher is more often)	Preference to continue living in area (1-5 scale, higher is weaker)	Current active member of a club (Dummy = 1 if yes, = 0 if no)
Estimate	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Retired	-3.96***	3.19***	6.04***	0.41	5.43***	0.65***	0.13	0.30***
	[0.47]	[0.82]	[1.63]	[0.91]	[1.20]	[0.24]	[0.21]	[0.08]
Observations	54,405	55,570	56,168	53,031	55,857	57,684	31,702	57,384
Individuals	7,126	7,160	7,181	7,027	7,162	7,285	6,479	7,270
Mean of dep. variable	1.59	5.19	13.02	1.70	6.19	3.58	1.64	0.43
F-statistic of IV	397.65	394.77	407.66	366.21	405.73	407.42	183.26	398.24
Hausman test (p-value)	0.00	0.01	0.05	0.57	0.01	0.02	0.36	0.00

Notes: Results for each column are from a separate FE-IV regression. Other notes: see Table 2. Description of dependent variables:

(9) to (13) are constructed from responses to a question in SCQ "How much time would you spend on each of the following activities in a typical week?".

(9) refers to "Travelling to and from a place of paid employment".

(10) refers to "Household errands, such as shopping, banking, paying bills, and keeping financial records (but do not include driving children to school and to other activities)".

(11) refers to "Housework, such as preparing meals, washing dishes, cleaning house, washing clothes, ironing and sewing".

(12) refers to "Volunteer or charity work (for example, canteen work at the local school, unpaid work for a community club or organisation)".

(13) refers to "Outdoor tasks, including home maintenance (repairs, improvements, painting etc.), car maintenance or repairs and gardening".

(14) "Often participate in physical activity" is constructed from responses to a question "In general, how often do you participate in moderate or intensive physical activity for at least 30 minutes?: [1] Not at all, [2] Less than once a week, [3] 1 to 2 times a week, [4] 3 times a week, [5] More than 3 times a week, [6] Every day".

(15) "Preference to continue living in area" is constructed from responses to a question "Now think about the local area in which you live. How strong is your preference to continue living in this area?: [1] Strong preference to stay, [2] Moderate preference to stay, [3] Unsure / No strong preference to stay or leave, [4] Moderate preference to leave, [5] Strong preference to leave". This information is only available in waves 1, 2, 3, 4, 6, 8, 10, 12, 14, 16, and 18.

(16) "Current active member of a club" is constructed from responses to a question in SCQ "Are you currently an active member of a sporting, hobby or community-based club or association?"

Table 3: Exploring potential mechanisms (continued)

	Victim of a property crime last year (Dummy = 1 if yes, = 0 if no)	Victim of physical violence last year (Dummy = 1 if yes, = 0 if no)	Serious personal injury/illness last year (Dummy = 1 if yes, = 0 if no)	Self-assessed health (1-5 scale, higher is less healthy)	Physical Component Summary (Mean 50 and SD 10, higher is healthier)	Mental Component Summary (Mean 50 and SD 10, higher is healthier)	Long term health condition (Dummy = 1 if yes, = 0 if no)
Estimate	(17)	(18)	(19)	(20)	(21)	(22)	(23)
Retired	-0.03	-0.00	-0.02	-0.32***	6.27***	4.19***	-0.30***
	[0.03]	[0.01]	[0.06]	[0.12]	[1.77]	[1.61]	[0.08]
Observations	54,657	54,508	54,551	57,220	47,047	47,047	61,412
Individuals	7,001	6,999	7,007	7,260	6,529	6,529	7,563
Mean of dep. variable	0.03	0.01	0.12	2.88	45.77	52.09	0.38
F-statistic of IV	384.13	383.33	387.55	405.22	300.83	300.83	435.17
Hausman test (p-value)	0.27	0.72	0.32	0.00	0.00	0.00	0.00

Notes: Results for each column are from a separate FE-IV regression. Other notes: see Table 2. Description of dependent variables:

(17) to (19) are constructed from responses to a question asking the respondents about major events that have happened in their life over the past 12 months. This question is asked from Wave 2 and in SCQ.

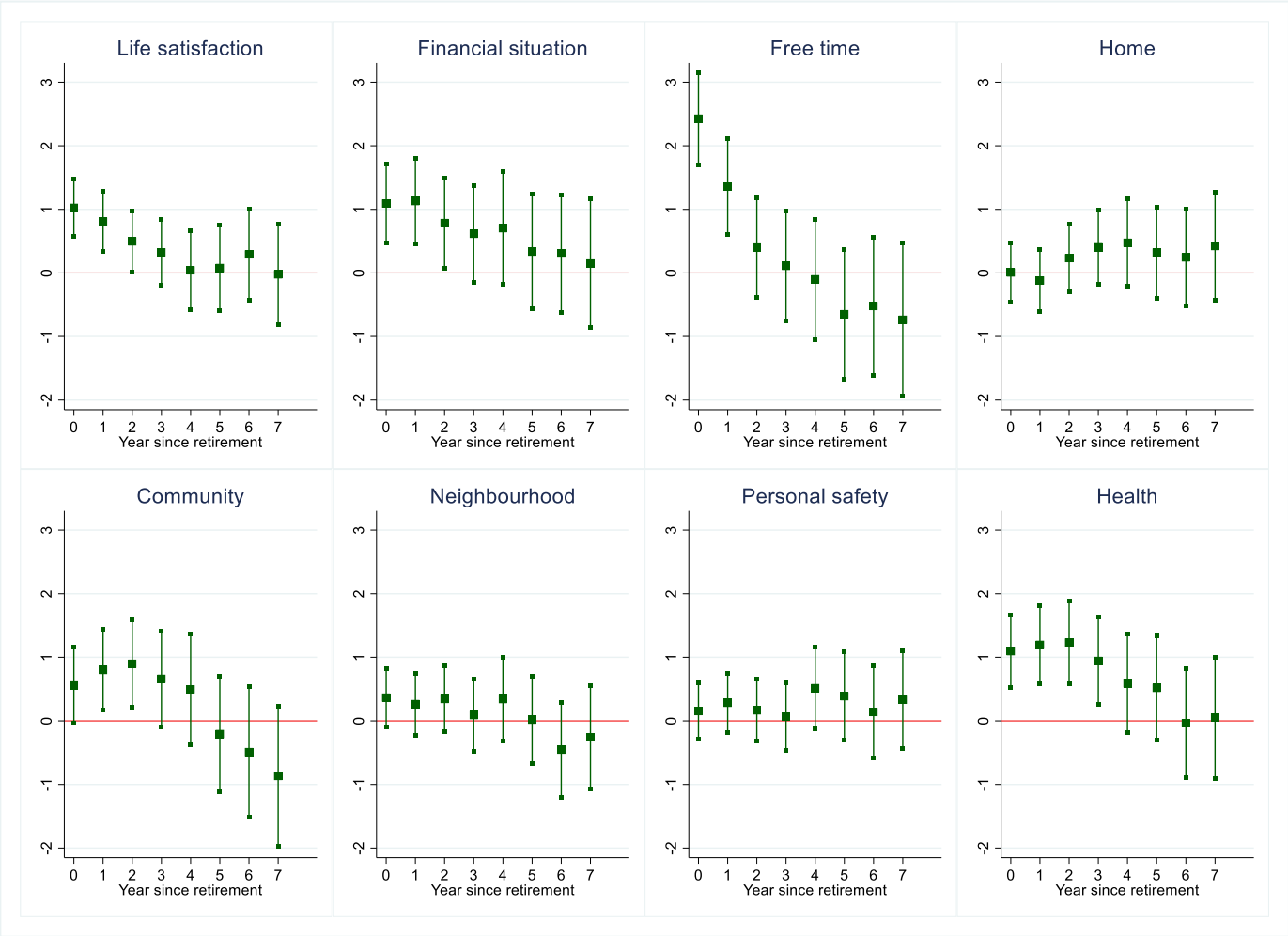
(20) "Self-assessed health" is constructed from responses to a question "In general, would you say your health is: [1] Excellent, [2] Very good, [3] Good, [4] Fair, [5] Poor".

(21) "Physical Component Summary" is constructed from SF-36 physical functioning.

(22) "Mental Component Summary" is constructed from SF-36 mental functioning.

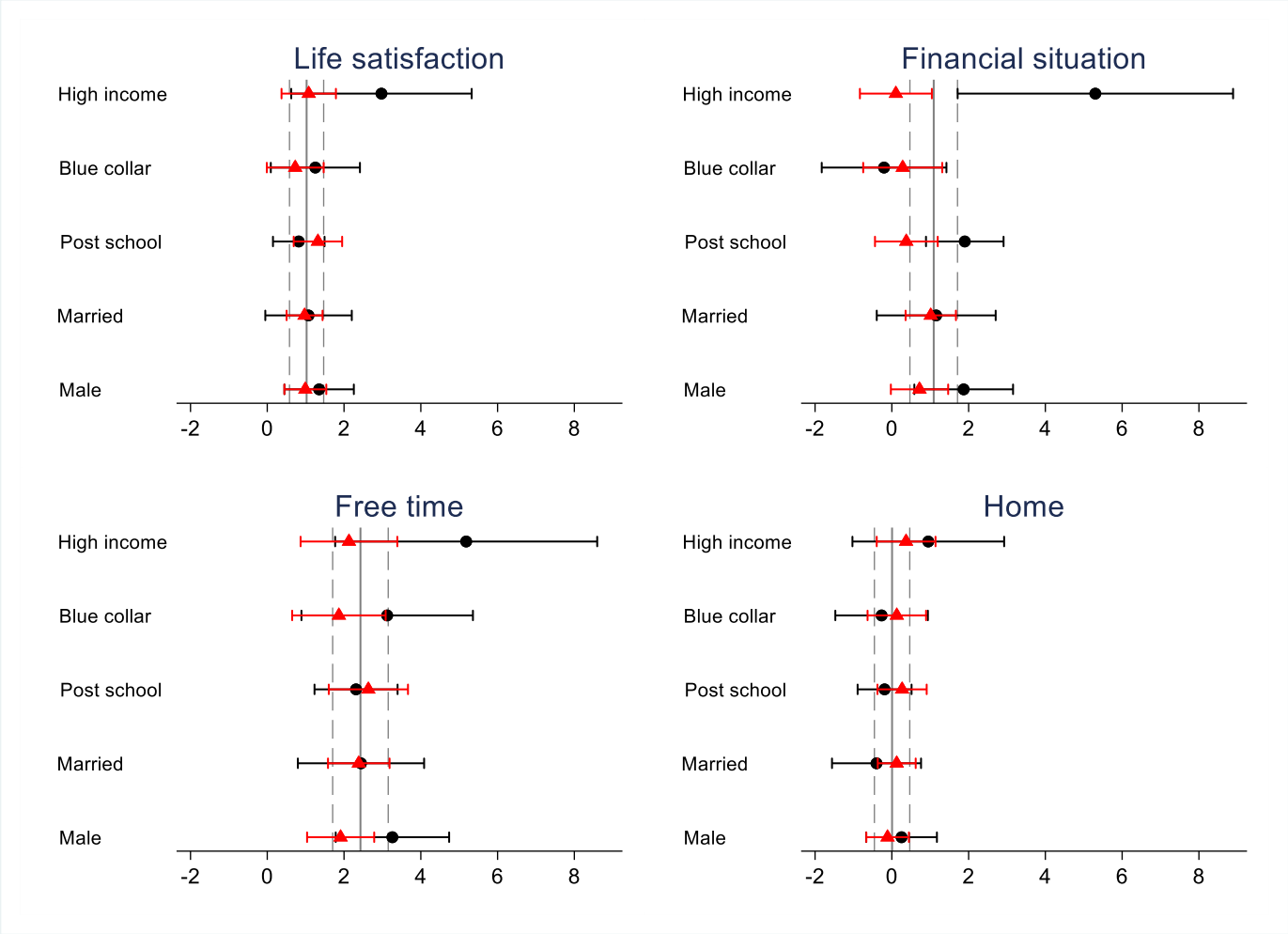
(23) "Long term health condition" refers to the individual's long-term health condition, disability or impairment, constructed from Household Form, answered by one person in household.

Figure 1: Intertemporal impact of retirement on wellbeing



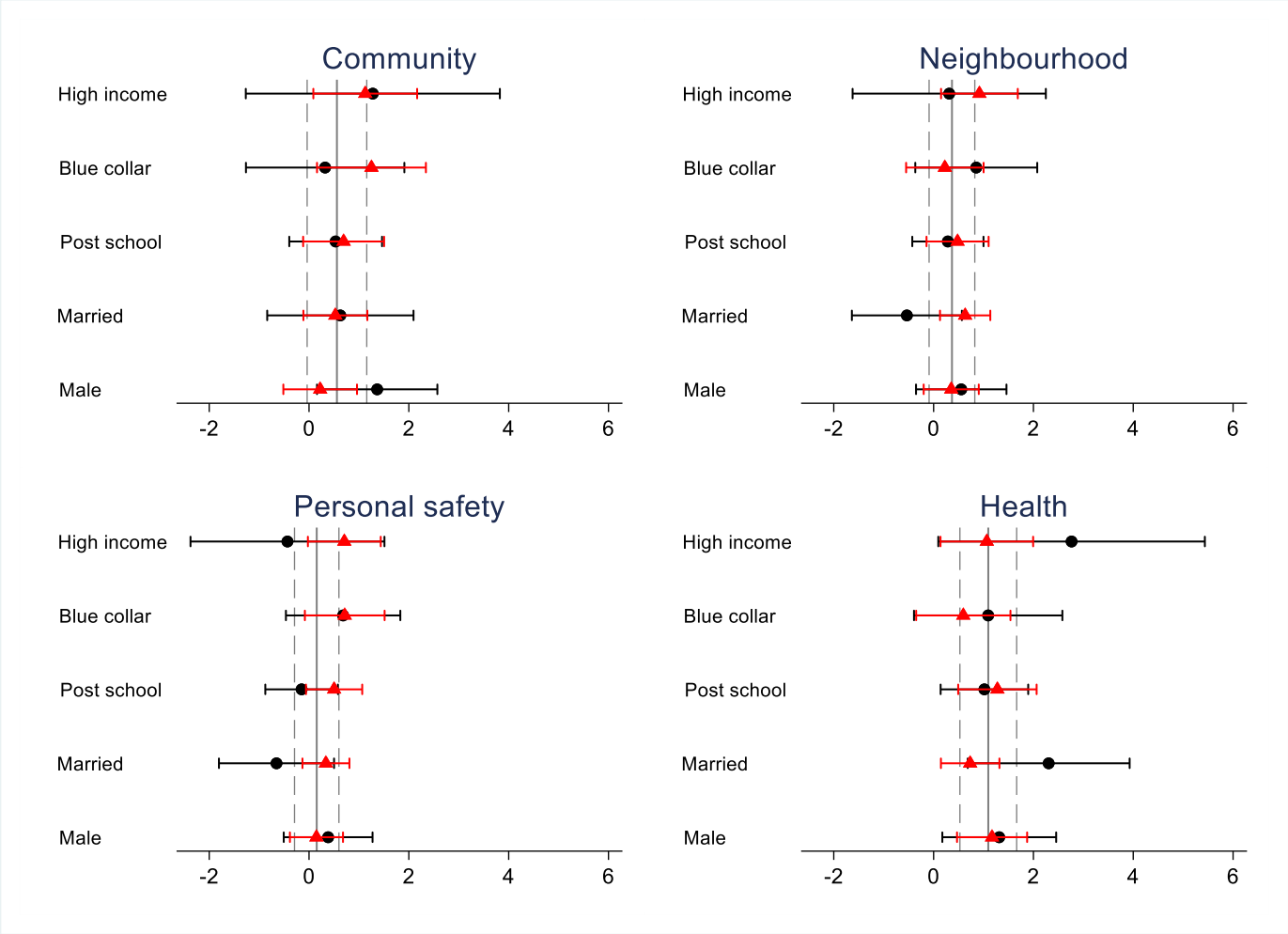
Notes: Results (coefficients and 95% confidence intervals) for each year and each outcome are from separate FE-IV regressions. Detailed regression results are reported in Appendix Table A6.

Figure 2: Heterogenous impact of retirement on wellbeing



Notes: Results for different sub-populations are obtained from separate FE-IV regressions. The (red) triangles indicate the retirement coefficient estimate (and its 95% confidence interval) in the regression for the sub-population mentioned on the y axis while the (black) circles represent the estimate for the other sub-population. The solid (dash) vertical line shows the retirement coefficient (95% confidence interval) estimates for the whole population. Detailed regression results are reported in Appendix Table A7.

Figure 2: Heterogenous impact of retirement on wellbeing (continued)



Appendices for online publication

Appendix Table A1: Review of previous studies on the impact of retirement on wellbeing

Study (chronologically ordered)	Data	Country	Sample	Wellbeing measures	Method	Impact of retirement	Heterogeneity	Long-term impact
Bonsang & Klein (2012)	GSOEP	Germany	Males, aged 50-70	Life satisfaction Satisfaction domains: Income, Free time, and Health	FE	Life: 0 (voluntary), - (involuntary) Income: - Free time: + Health: + (voluntary), - (involuntary)	No	No
Abolhassani & Alessie (2013)	GSOEP	Germany	Males and females, aged 50-70	Life satisfaction	FE	0 (voluntary), - (involuntary)	No	No
Horner (2014)	SHARE ELSA HRS	16 countries in Western Europe and the US	Males, aged 50-70	Life satisfaction	IV RA	+	Country	No
Kesavayuth *et al.* (2016)	BHPS	UK	Males and females, aged 50-75	Life satisfaction Satisfaction domains: Income and Free time	FE-IV RA	Life: 0 Income: 0 Free time: +	Gender, Personality	No
Gorry *et al.* (2018)	HRS	USA	Males and females, aged 50-93	Life satisfaction	FE-IV RA	+ (0-4 years after retirement), - (4+ years after retirement)	Gender, Education, Occupation,	Yes

							Ethnicity, Marital status	
Palomäki (2019)	EU-SILC	29 European countries	Males and females, aged 50 or over	Income satisfaction	FE	-	No	No
Sohier *et al.* (2020)	SHARE	9 European countries	Males and females, aged 50-74	Life satisfaction	FE	0 (concurrent), - (2 years after retirement)	Occupation, Marital status	Yes

Notes: Data: GSOEP - German Socio-Economic Panel; SHARE - Survey of Health, Ageing and Retirement in Europe; ELSA - English Longitudinal Study of Ageing; BHPS - British Household Panel Survey; HRS - Health and Retirement Study; EU-SILC - The European Union Statistics on Income and Living Conditions.
Method: FE – Fixed Effect; IV RA– Instrumental Variable method using Retirement Age eligibility as instrument; FE-IV RA – Fixed Effect Instrumental Variable method using Retirement Age eligibility as instrument.
Impact of retirement: "0" indicates a statistically insignificant impact (i.e., P value of the estimate >0.05); "-" ("+") indicates a negative (positive) and statistically significant impact.

Appendix Table A2: Variable description and summary statistics

Variable	Description	Mean	Min	Max	Standard deviations		
					Overall	Between	Within
Retired	Dummy variable: = 1 if not in the labour force at the survey time and zero otherwise	0.56	0.00	1.00	0.50	0.43	0.28
Life satisfaction	Responses to a question "All things considered, how satisfied are you with your life?"	8.08	0.00	10.00	1.52	1.27	0.96
Financial situation satisfaction	Responses to a question asking the respondents about their satisfaction with their financial situation	6.84	0.00	10.00	2.20	1.86	1.31
Free time satisfaction	Responses to a question asking the respondents about their satisfaction with the amount of free time that they have	7.57	0.00	10.00	2.27	1.75	1.57
Home satisfaction	Responses to a question asking the respondents about their satisfaction with the home in which they live	8.35	0.00	10.00	1.61	1.32	1.07
Community satisfaction	Responses to a question asking the respondents about their satisfaction with feeling part of their local community	7.08	0.00	10.00	2.12	1.71	1.37
Neighbourhood satisfaction	Responses to a question asking the respondents about their satisfaction with the neighbourhood in which they live	8.10	0.00	10.00	1.60	1.29	1.05
Personal safety satisfaction	Responses to a question asking the respondents about their satisfaction with how safe they feel	8.22	0.00	10.00	1.60	1.28	1.05
Health satisfaction	Responses to a question asking the respondents about their satisfaction with their health	6.97	0.00	10.00	2.09	1.80	1.16
Age >= PEA	Dummy variable: = 1 if the respondent's age is equal or greater than the Pension Eligible Age at the survey time and zero otherwise	0.45	0.00	1.00	0.50	0.42	0.33
Male	Dummy variable: = 1 if is a male and zero otherwise	0.48	0.00	1.00	0.50	0.50	0.00
Age (years)	Age at the survey time (years)	63.87	55.00	75.00	5.64	5.47	3.47
Married/De facto	Dummy variable: = 1 if is married or in De factor relationship at the survey time and zero otherwise	0.72	0.00	1.00	0.45	0.43	0.14
Separated/divorced/widowed	Dummy variable: = 1 if is separated/divorced/widowed at the survey time and zero otherwise	0.23	0.00	1.00	0.42	0.40	0.14
Aboriginal	Dummy variable: = 1 if has an Aboriginal and Torres Strait Islanders origin and zero otherwise	0.01	0.00	1.00	0.11	0.12	0.00
Non-English-Speaking migrant	Dummy: = 1 if immigrant from a Non-English-Speaking Background (NESB) country and zero otherwise	0.15	0.00	1.00	0.35	0.36	0.00
English-Speaking migrant	Dummy: = 1 if immigrant from an English-Speaking Background (NESB) country and zero otherwise	0.14	0.00	1.00	0.35	0.35	0.00
Year 12	Dummy: = 1 if complete Year 12 and zero otherwise	0.08	0.00	1.00	0.27	0.27	0.03
Vocational or Training qualification	Dummy: = 1 if has a vocational or training qualification and zero otherwise	0.38	0.00	1.00	0.48	0.48	0.06
Bachelor or higher degree	Dummy: = 1 if has a bachelor degree or higher and zero otherwise	0.14	0.00	1.00	0.35	0.35	0.03
Number of other HH members aged 0-4	Number of other household members aged 0-4	0.02	0.00	4.00	0.17	0.13	0.12
Number of other HH members aged 5-9	Number of other household members aged 5-9	0.02	0.00	4.00	0.18	0.15	0.13
Number of other HH members aged 10-14	Number of other household members aged 10-14	0.04	0.00	4.00	0.22	0.20	0.15
Number of other HH members aged 15-23	Number of other household members aged 15-23	0.15	0.00	6.00	0.47	0.46	0.27
Number of other HH members aged 24-64	Number of other household members aged 24-64	0.54	0.00	6.00	0.69	0.62	0.41
Number of other HH members aged 65 or over	Number of other household members aged 65 or over	0.37	0.00	3.00	0.49	0.41	0.30
Homeowner	Dummy: = 1 if lives in an owned home and zero otherwise	0.83	0.00	1.00	0.37	0.35	0.17

Notes: Longitudinal sampling weights are used.

Appendix Table A3: Correlation structure among key dependent variables

	Life satisfaction	Financial satisfaction	Free time satisfaction	Home satisfaction	Community satisfaction	Neighbourhood satisfaction	Personal safety satisfaction	Health satisfaction	Mental Component Summary
Life satisfaction	1.00								
Financial satisfaction	0.45	1.00							
Free time satisfaction	0.37	0.24	1.00						
Home satisfaction	0.45	0.32	0.24	1.00					
Community satisfaction	0.40	0.29	0.22	0.31	1.00				
Neighbourhood satisfaction	0.43	0.29	0.26	0.45	0.53	1.00			
Personal safety satisfaction	0.44	0.38	0.24	0.35	0.41	0.48	1.00		
Health satisfaction	0.50	0.38	0.15	0.23	0.30	0.34	0.32	1.00	
Mental Component Summary	0.44	0.28	0.17	0.20	0.23	0.22	0.25	0.42	1.00

Notes: All correlations are statistically significant at the 1% level. “Mental Component Summary” is constructed from SF-36 mental functioning.

Appendix Table A4: Historical eligibility ages for Australian age pension

Date pension age changes	Pension age	
	Females	Males
1/07/1995	60.0	65.0
1/07/1997	60.5	65.0
1/07/1999	61.0	65.0
1/07/2001	61.5	65.0
1/07/2003	62.0	65.0
1/07/2005	62.5	65.0
1/07/2007	63.0	65.0
1/07/2009	63.5	65.0
1/07/2011	64.0	65.0
1/07/2013	64.5	65.0
1/07/2015	65.0	65.0
1/07/2017	65.5	65.5
1/07/2019	66.0	66.0
1/07/2021	66.5	66.5
1/07/2023	67.0	67.0

Notes: Source: Australian Government Department of Social Services (2020)

Appendix Table A5: First-stage regression results

Variable	Estimate (S.E)
Age >= PEA	9.90***
	[0.80]
Age	5.15***
	[1.03]
Age squared	-0.02***
	[0.01]
Married/De facto (a)	5.60
	[4.68]
Separated/divorced/widowed (a)	4.65
	[4.86]
Year 12 (b)	7.79
	[7.95]
Vocational and Training qualification (b)	7.42
	[5.42]
Bachelor or higher degree (b)	-1.92
	[8.79]
Number of other household members aged 0-4	1.83
	[1.28]
Number of other household members aged 5-9	3.73***
	[1.34]
Number of other household members aged 10-14	2.17*
	[1.11]
Number of other household members aged 15-23	0.27
	[0.66]
Number of other household members aged 24-64	-1.23**
	[0.60]
Number of other household members aged 65 or over	3.90***
	[0.92]
Homeowner	1.47
	[1.07]
Observations	61,494
Individuals	7,568
R-squared	0.195

Notes: Results are from the first stage of FE-IV regression. (a) and (b) denotes being single and having year 11 or below qualification as the base group, respectively. Other included variables: local socio-economic background variables, state/territory dummies, year dummies, and survey quarters. Robust standard errors clustered at the individual level in parentheses. Coefficient estimates and standard errors are multiplied by 100 for aesthetic purposes. The symbol *denotes significance at the 10% level, **at the 5% level, and ***at the 1% level.

Appendix Table A6: Long-term impact of retirement on wellbeing

	Year since retirement							
Wellbeing outcome	0	1	2	3	4	5	6	7
Life satisfaction								
Retired	1.02***	0.81***	0.50**	0.32	0.04	0.08	0.29	-0.02
	[0.23]	[0.24]	[0.25]	[0.26]	[0.32]	[0.35]	[0.37]	[0.40]
Observations	61,494	54,376	48,573	43,355	38,534	33,864	29,488	24,746
Individuals	7,568	6,844	6,246	5,767	5,371	4,940	4,548	3,565
Mean of dep. variable	8.07	8.10	8.11	8.13	8.14	8.15	8.17	8.18
F-statistic of IV	431.70	373.64	317.45	257.14	189.85	166.58	147.01	122.38
Hausman test (p-value)	0.00	0.00	0.04	0.25	0.93	0.84	0.40	0.96
Financial situation								
Retired	1.09***	1.13***	0.79**	0.62	0.70	0.33	0.30	0.15
	[0.32]	[0.34]	[0.36]	[0.39]	[0.45]	[0.46]	[0.47]	[0.52]
Observations	61,494	54,385	48,582	43,366	38,535	33,861	29,478	24,728
Individuals	7,568	6,844	6,245	5,770	5,371	4,940	4,548	3,562
Mean of dep. variable	6.84	6.91	6.96	7.01	7.04	7.08	7.10	7.12
F-statistic of IV	431.70	370.39	316.30	256.37	190.07	168.00	147.25	122.92
Hausman test (p-value)	0.00	0.00	0.02	0.08	0.10	0.42	0.50	0.75

Notes: Results for each column and each wellbeing outcome are from a separate FE-IV regression. F-statistic of IV denotes the Cragg-Donald Wald F statistic for the excluded instrument in the first stage regression. Hausman test (p-value) reports p-value from a Hausman test of exogeneity of the endogenous variable. Other explanatory variables include the individual characteristics (age and age squared, migration status, Aboriginal status, completed qualifications, marital status), household characteristics (number of household members at various age groups, home ownership status), local socio-economic background variables, state/territory dummies, year dummies, and survey quarters. Robust standard errors clustered at the individual level in parentheses. The symbol *denotes significance at the 10% level, **at the 5% level, and ***at the 1% level.

Appendix Table A6: Long-term impact of retirement on wellbeing (continued)

	Year since retirement							
Wellbeing outcome	0	1	2	3	4	5	6	7
Free time								
Retired	2.43***	1.36***	0.40	0.11	-0.10	-0.65	-0.52	-0.74
	[0.37]	[0.38]	[0.40]	[0.44]	[0.48]	[0.52]	[0.56]	[0.62]
Observations	61,494	54,326	48,528	43,311	38,483	33,811	29,427	24,686
Individuals	7,568	6,844	6,247	5,768	5,370	4,940	4,545	3,561
Mean of dep. variable	7.56	7.64	7.71	7.78	7.85	7.90	7.96	8.02
F-statistic of IV	431.70	371.67	317.84	255.27	191.81	166.84	148.10	122.39
Hausman test (p-value)	0.00	0.03	0.81	1.00	0.94	0.28	0.50	0.34
Home								
Retired	0.01	-0.12	0.23	0.40	0.48	0.32	0.24	0.42
	[0.24]	[0.25]	[0.27]	[0.30]	[0.35]	[0.36]	[0.39]	[0.43]
Observations	61,494	54,371	48,575	43,354	38,522	33,854	29,475	24,734
Individuals	7,568	6,844	6,247	5,769	5,371	4,940	4,546	3,564
Mean of dep. variable	8.35	8.37	8.39	8.40	8.41	8.43	8.44	8.46
F-statistic of IV	431.70	373.19	317.94	256.87	192.45	166.70	147.36	123.96
Hausman test (p-value)	0.91	0.70	0.36	0.17	0.19	0.44	0.47	0.34

Appendix Table A6: Long-term impact of retirement on wellbeing (continued)

	Year since retirement							
Wellbeing outcome	0	1	2	3	4	5	6	7
Community								
Retired	0.56*	0.80**	0.90**	0.66*	0.50	-0.21	-0.49	-0.87
	[0.30]	[0.32]	[0.35]	[0.38]	[0.44]	[0.46]	[0.52]	[0.56]
Observations	61,494	54,297	48,507	43,293	38,466	33,790	29,413	24,664
Individuals	7,568	6,839	6,242	5,766	5,369	4,938	4,544	3,557
Mean of dep. variable	7.08	7.10	7.12	7.14	7.15	7.17	7.19	7.21
F-statistic of IV	431.70	373.78	317.07	256.87	190.58	167.92	146.92	124.11
Hausman test (p-value)	0.08	0.03	0.04	0.17	0.37	0.53	0.33	0.12
Neighbourhood								
Retired	0.37	0.27	0.34	0.09	0.34	0.02	-0.45	-0.26
	[0.23]	[0.25]	[0.26]	[0.29]	[0.34]	[0.35]	[0.38]	[0.41]
Observations	61,494	54,337	48,541	43,321	38,493	33,821	29,447	24,697
Individuals	7,568	6,843	6,247	5,769	5,371	4,941	4,548	3,561
Mean of dep. variable	8.10	8.10	8.11	8.11	8.12	8.12	8.13	8.13
F-statistic of IV	431.70	373.93	318.81	257.48	193.47	168.44	149.12	124.05
Hausman test (p-value)	0.13	0.39	0.28	0.91	0.31	0.96	0.29	0.61

Appendix Table A6: Long-term impact of retirement on wellbeing (continued)

	Year since retirement							
Wellbeing outcome	0	1	2	3	4	5	6	7
Personal safety								
Retired	0.15	0.28	0.17	0.07	0.52	0.39	0.14	0.33
	[0.23]	[0.24]	[0.25]	[0.27]	[0.33]	[0.35]	[0.37]	[0.39]
Observations	61,494	54,373	48,572	43,353	38,529	33,858	29,477	24,734
Individuals	61,494	54,373	48,572	43,353	38,529	33,858	29,477	24,734
Mean of dep. variable	7,568	6,844	6,246	5,769	5,371	4,940	4,547	3,563
F-statistic of IV	431.70	373.17	318.30	257.51	191.92	167.82	146.97	123.54
Hausman test (p-value)	431.70	373.17	318.30	257.51	191.92	167.82	146.97	123.54
Health								
Retired	1.10***	1.20***	1.23***	0.94***	0.59	0.52	-0.03	0.05
	[0.29]	[0.31]	[0.33]	[0.35]	[0.39]	[0.42]	[0.44]	[0.49]
Observations	61,494	54,395	48,592	43,373	38,548	33,877	29,499	24,750
Individuals	7,568	6,845	6,246	5,769	5,372	4,941	4,551	3,564
Mean of dep. variable	6.96	6.96	6.95	6.93	6.91	6.89	6.88	6.87
F-statistic of IV	431.70	372.85	317.76	257.30	191.98	166.96	146.45	123.32
Hausman test (p-value)	0.00	0.00	0.00	0.00	0.11	0.17	0.97	0.89

Appendix Table A7: Heterogeneity

	Life satisfaction		Financial situation		Free time		Home		Community		Neighbourhood		Personal safety		Health	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Separate regression by	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
A. Gender (Male = Yes, Female = No)																
Retired	1.35***	0.99***	1.87***	0.72*	3.26***	1.91***	0.25	-0.11	1.37**	0.22	0.55	0.35	0.38	0.15	1.32**	1.17***
	[0.46]	[0.28]	[0.66]	[0.38]	[0.75]	[0.45]	[0.47]	[0.28]	[0.62]	[0.38]	[0.46]	[0.28]	[0.45]	[0.27]	[0.58]	[0.36]
Observations	32,280	29,214	32,280	29,214	32,280	29,214	32,280	29,214	32,280	29,214	32,280	29,214	32,280	29,214	32,280	29,214
Individuals	3,953	3,615	3,953	3,615	3,953	3,615	3,953	3,615	3,953	3,615	3,953	3,615	3,953	3,615	3,953	3,615
Mean of dep. variable	8.10	8.05	6.86	6.83	7.56	7.57	8.35	8.35	7.11	7.04	8.13	8.06	8.19	8.25	6.99	6.94
F-statistic of IV	130.16	237.09	130.16	237.09	130.16	237.09	130.16	237.09	130.16	237.09	130.16	237.09	130.16	237.09	130.16	237.09
Hausman test (p-value)	0.00	0.00	0.00	0.01	0.00	0.02	0.56	0.73	0.03	0.46	0.25	0.22	0.37	0.61	0.00	0.00
B. Marital status (Married/De facto = Yes, Single or Separated/divorced/widowed = No)																
Retired	1.08*	0.97***	1.16	1.01***	2.44***	2.38***	-0.40	0.13	0.63	0.53	-0.54	0.63**	-0.65	0.34	2.31***	0.73**
	[0.57]	[0.24]	[0.79]	[0.33]	[0.84]	[0.41]	[0.59]	[0.25]	[0.75]	[0.33]	[0.56]	[0.26]	[0.59]	[0.24]	[0.83]	[0.30]
Observations	15,417	46,077	15,417	46,077	15,417	46,077	15,417	46,077	15,417	46,077	15,417	46,077	15,417	46,077	15,417	46,077
Individuals	1,983	5,585	1,983	5,585	1,983	5,585	1,983	5,585	1,983	5,585	1,983	5,585	1,983	5,585	1,983	5,585
Mean of dep. variable	7.72	8.20	6.18	7.07	7.55	7.57	8.11	8.43	6.74	7.19	7.84	8.19	7.97	8.30	6.57	7.10
F-statistic of IV	93.20	336.46	93.20	336.46	93.20	336.46	93.20	336.46	93.20	336.46	93.20	336.46	93.20	336.46	93.20	336.46
Hausman test (p-value)	0.04	0.00	0.05	0.00	0.05	0.00	0.61	0.63	0.41	0.12	0.40	0.02	0.31	0.16	0.00	0.00

Notes: Results for different sub-populations are obtained from a separate FE-IV regression. Other notes: see Table 2.

Appendix Table A7: Heterogeneity (continued)

	Life satisfaction		Financial situation		Free time		Home		Community		Neighbourhood		Personal safety		Health	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Separate regression by	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
C. Education (Post school or higher qualification = Yes, Year 12 or below = No)																
Retired	0.82**	1.32***	1.90***	0.38	2.31***	2.63***	-0.19	0.27	0.53	0.69*	0.29	0.48	-0.15	0.50*	1.02**	1.28***
	[0.34]	[0.32]	[0.52]	[0.42]	[0.55]	[0.53]	[0.36]	[0.33]	[0.47]	[0.41]	[0.36]	[0.32]	[0.37]	[0.29]	[0.45]	[0.40]
Observations	29,987	31,445	29,987	31,445	29,987	31,445	29,987	31,445	29,987	31,445	29,987	31,445	29,987	31,445	29,987	31,445
Individuals	3,617	3,944	3,617	3,944	3,617	3,944	3,617	3,944	3,617	3,944	3,617	3,944	3,617	3,944	3,617	3,944
Mean of dep. variable	8.09	8.07	6.67	7.01	7.70	7.44	8.40	8.31	7.05	7.10	8.09	8.11	8.14	8.29	6.81	7.12
F-statistic of IV	213.27	197.17	213.27	197.17	213.27	197.17	213.27	197.17	213.27	197.17	213.27	197.17	213.27	197.17	213.27	197.17
Hausman test (p-value)	0.01	0.00	0.00	0.18	0.01	0.00	0.68	0.40	0.28	0.10	0.45	0.14	0.76	0.08	0.00	0.00
D. Occupation (Blue collar = Yes, White collar = No)																
Retired	1.25**	0.73*	-0.20	0.28	3.12***	1.87***	-0.27	0.13	0.32	1.25**	0.85	0.23	0.68	0.72*	1.09	0.60
	[0.59]	[0.38]	[0.83]	[0.53]	[1.14]	[0.62]	[0.61]	[0.39]	[0.81]	[0.56]	[0.62]	[0.40]	[0.58]	[0.41]	[0.76]	[0.48]
Observations	15,268	9,491	15,268	9,491	15,268	9,491	15,268	9,491	15,268	9,491	15,268	9,491	15,268	9,491	15,268	9,491
Individuals	1,788	1,118	1,788	1,118	1,788	1,118	1,788	1,118	1,788	1,118	1,788	1,118	1,788	1,118	1,788	1,118
Mean of dep. variable	8.14	8.11	7.26	6.79	7.15	7.37	8.33	8.33	7.26	7.07	8.23	8.07	8.46	8.18	7.44	7.20
F-statistic of IV	42.49	113.72	42.49	113.72	42.49	113.72	42.49	113.72	42.49	113.72	42.49	113.72	42.49	113.72	42.49	113.72
Hausman test (p-value)	0.01		0.93		0.04		0.67		0.67		0.14		0.21		0.06	

Appendix Table A7: Heterogeneity (continued)

	Life satisfaction		Financial situation		Free time		Home		Community		Neighbourhood		Personal safety		Health	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Separate regression by	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
E. Income (Top income tercile = Yes, Bottom income tercile = No)																
Retired	2.98**	1.08***	5.30***	0.11	5.18***	2.13***	0.95	0.37	1.28	1.13**	0.31	0.92**	-0.43	0.71*	2.76**	1.07**
	[1.20]	[0.36]	[1.83]	[0.48]	[1.74]	[0.64]	[1.01]	[0.39]	[1.30]	[0.53]	[0.99]	[0.39]	[0.99]	[0.37]	[1.36]	[0.47]
Observations	20,195	20,729	20,195	20,729	20,195	20,729	20,195	20,729	20,195	20,729	20,195	20,729	20,195	20,729	20,195	20,729
Individuals	2,523	2,522	2,523	2,522	2,523	2,522	2,523	2,522	2,523	2,522	2,523	2,522	2,523	2,522	2,523	2,522
Mean of dep. variable	7.98	8.16	6.37	7.35	7.84	7.29	8.36	8.35	6.98	7.14	8.03	8.19	8.05	8.39	6.47	7.39
F-statistic of IV	40.53	112.52	40.53	112.52	40.53	112.52	40.53	112.52	40.53	112.52	40.53	112.52	40.53	112.52	40.53	112.52
Hausman test (p-value)	0.00	0.00	0.00	0.61	0.00	0.13	0.34	0.38	0.31	0.03	0.79	0.01	0.67	0.04	0.01	0.00

Appendix Table A8: Robustness checks

	Life satisfaction	Financial situation	Free time	Home	Community	Neighbourhood	Personal safety	Health
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. Baseline								
Retired	1.02***	1.09***	2.43***	0.01	0.56*	0.37	0.15	1.10***
	[0.23]	[0.32]	[0.37]	[0.24]	[0.30]	[0.23]	[0.23]	[0.29]
Observations	61,494	61,494	61,494	61,494	61,494	61,494	61,494	61,494
Individuals	7,568	7,568	7,568	7,568	7,568	7,568	7,568	7,568
F-statistic of IV	431.70	431.70	431.70	431.70	431.70	431.70	431.70	431.70
Hausman test (p-value)	0.00	0.00	0.00	0.91	0.08	0.13	0.47	0.00
B1. Using different retirement definition: Retired completely from the labour force								
Retired completely from the LF	0.80***	0.88***	2.10***	-0.10	0.55**	0.30	0.15	0.85***
	[0.19]	[0.27]	[0.32]	[0.20]	[0.26]	[0.20]	[0.20]	[0.24]
Observations	57,343	57,343	57,343	57,343	57,343	57,343	57,343	57,343
Individuals	7,448	7,448	7,448	7,448	7,448	7,448	7,448	7,448
F-statistic of IV	539.96	539.96	539.96	539.96	539.96	539.96	539.96	539.96
Hausman test (p-value)	0.00	0.00	0.00	0.67	0.05	0.20	0.49	0.00
B2. Using different retirement definition: Excluding "not in the labour force marginally" from retirement								
Not in the LF not marginally	1.11***	1.18***	2.62***	0.01	0.60*	0.40	0.17	1.18***
	[0.25]	[0.34]	[0.41]	[0.25]	[0.33]	[0.25]	[0.24]	[0.32]
Observations	61,494	61,494	61,494	61,494	61,494	61,494	61,494	61,494
Individuals	7,568	7,568	7,568	7,568	7,568	7,568	7,568	7,568
F-statistic of IV	328.82	328.82	328.82	328.82	328.82	328.82	328.82	328.82
Hausman test (p-value)	0.00	0.00	0.00	0.97	0.10	0.14	0.51	0.00

Notes: Results for each column in each panel are from a separate FE-IV regression. Other notes: see Table 2.

Appendix Table A8: Robustness checks (continued)

	Life satisfaction	Financial situation	Free time	Home	Community	Neighbourhood	Personal safety	Health
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
B3. Using different retirement definition: Weekly working hours								
Hours of work per week in all jobs	-0.03***	-0.03***	-0.07***	-0.00	-0.01*	-0.01	-0.00	-0.03***
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
Observations	61,391	61,391	61,391	61,391	61,391	61,391	61,391	61,391
Individuals	7,567	7,567	7,567	7,567	7,567	7,567	7,567	7,567
F-statistic of IV	401.97	401.97	401.97	401.97	401.97	401.97	401.97	401.97
Hausman test (p-value)	0.00	0.00	0.01	0.98	0.08	0.14	0.46	0.00
C. Including age cubed								
Retired	1.18***	1.68***	2.87***	0.12	0.18	0.37	0.04	1.27**
	[0.42]	[0.59]	[0.68]	[0.45]	[0.56]	[0.44]	[0.42]	[0.53]
Observations	61,494	61,494	61,494	61,494	61,494	61,494	61,494	61,494
Individuals	7,568	7,568	7,568	7,568	7,568	7,568	7,568	7,568
F-statistic of IV	112.26	112.26	112.26	112.26	112.26	112.26	112.26	112.26
Hausman test (p-value)	0.00	0.00	0.00	0.75	0.78	0.41	0.91	0.00
D1. Including additional variables: General physical health								
Retired	1.02***	1.22***	2.52***	0.00	0.51	0.41	0.08	0.72**
	[0.25]	[0.37]	[0.43]	[0.26]	[0.35]	[0.27]	[0.26]	[0.29]
Observations	47,047	47,047	47,047	47,047	47,047	47,047	47,047	47,047
Individuals	6,529	6,529	6,529	6,529	6,529	6,529	6,529	6,529
F-statistic of IV	313.78	313.78	313.78	313.78	313.78	313.78	313.78	313.78
Hausman test (p-value)	0.00	0.00	0.00	0.97	0.16	0.15	0.74	0.00

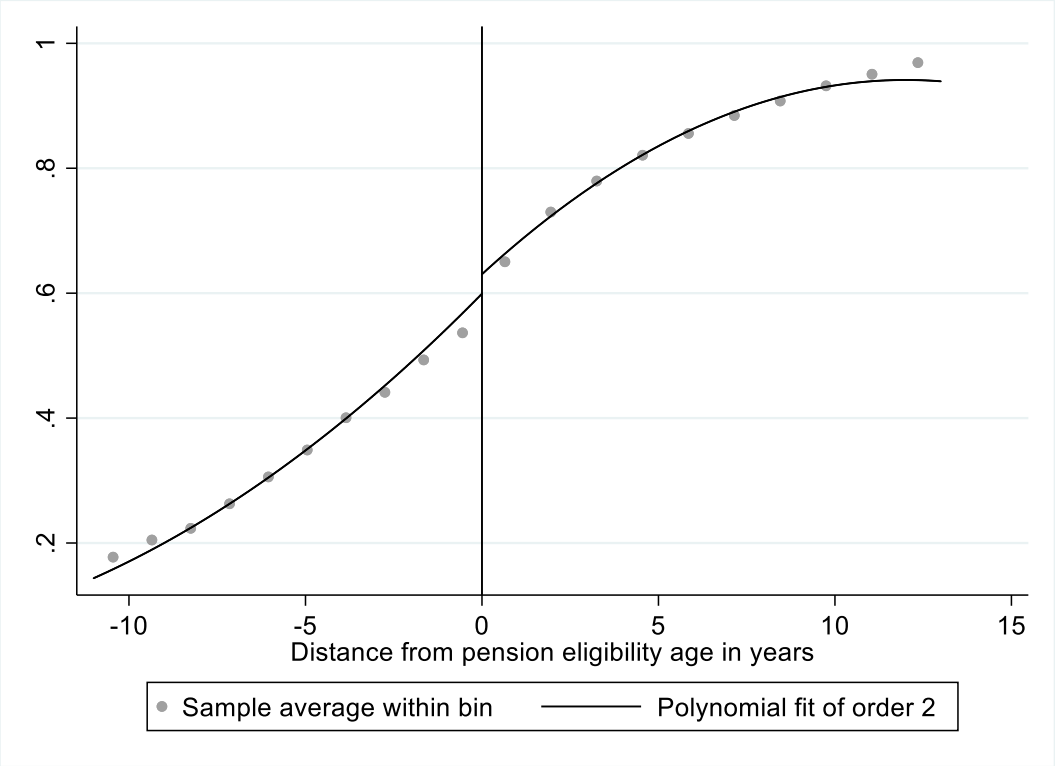
Appendix Table A8: Robustness checks (continued)

	Life satisfaction	Financial situation	Free time	Home	Community	Neighbourhood	Personal safety	Health
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
D2. Including additional variables: General mental health								
Retired	0.97***	1.20***	2.47***	-0.03	0.48	0.41	0.06	0.98***
	[0.25]	[0.37]	[0.43]	[0.27]	[0.35]	[0.27]	[0.26]	[0.32]
Observations	47,047	47,047	47,047	47,047	47,047	47,047	47,047	47,047
Individuals	6,529	6,529	6,529	6,529	6,529	6,529	6,529	6,529
F-statistic of IV	303.97	303.97	303.97	303.97	303.97	303.97	303.97	303.97
Hausman test (p-value)	0.00	0.00	0.00	0.93	0.20	0.16	0.81	0.00
D3. Including additional variables: Disabled condition								
Retired	0.97***	1.03***	2.41***	-0.01	0.54*	0.36	0.13	0.91***
	[0.22]	[0.31]	[0.36]	[0.23]	[0.30]	[0.23]	[0.22]	[0.27]
Observations	61,412	61,412	61,412	61,412	61,412	61,412	61,412	61,412
Individuals	7,563	7,563	7,563	7,563	7,563	7,563	7,563	7,563
F-statistic of IV	447.36	447.36	447.36	447.36	447.36	447.36	447.36	447.36
Hausman test (p-value)	0.00	0.00	0.00	0.97	0.08	0.14	0.55	0.00
D4. Including additional variables: Non-wage income								
Retired	1.03***	1.09***	2.43***	0.01	0.56*	0.37	0.15	1.10***
	[0.23]	[0.32]	[0.37]	[0.24]	[0.31]	[0.23]	[0.23]	[0.29]
Observations	61,494	61,494	61,494	61,494	61,494	61,494	61,494	61,494
Individuals	7,568	7,568	7,568	7,568	7,568	7,568	7,568	7,568
F-statistic of IV	431.03	431.03	431.03	431.03	431.03	431.03	431.03	431.03
Hausman test (p-value)	0.00	0.00	0.00	0.91	0.08	0.13	0.47	0.00

Appendix Table A8: Robustness checks (continued)

	Life satisfaction	Financial situation	Free time	Home	Community	Neighbourhood	Personal safety	Health
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
E1. Using different age bandwidth: 5 years around the PEA								
Retired	1.17***	1.35**	2.69***	0.03	-0.41	0.12	-0.00	1.30**
	[0.46]	[0.61]	[0.72]	[0.47]	[0.60]	[0.46]	[0.45]	[0.55]
Observations	31,517	31,517	31,517	31,517	31,517	31,517	31,517	31,517
Individuals	4,647	4,647	4,647	4,647	4,647	4,647	4,647	4,647
F-statistic of IV	75.92	75.92	75.92	75.92	75.92	75.92	75.92	75.92
Hausman test (p-value)	0.01	0.01	0.01	0.87	0.47	0.79	0.94	0.00
E2. Using different age bandwidth: 4 years around the PEA								
Retired	1.69***	1.96**	2.75***	0.45	-0.50	0.37	0.54	0.90
	[0.60]	[0.79]	[0.89]	[0.59]	[0.75]	[0.57]	[0.57]	[0.65]
Observations	25,191	25,191	25,191	25,191	25,191	25,191	25,191	25,191
Individuals	4,130	4,130	4,130	4,130	4,130	4,130	4,130	4,130
F-statistic of IV	46.42	46.42	46.42	46.42	46.42	46.42	46.42	46.42
Hausman test (p-value)	0.00	0.00	0.02	0.39	0.50	0.52	0.32	0.07
E3. Using different age bandwidth: 3 years around the PEA								
Retired	1.61**	2.56**	2.99**	0.79	-1.19	0.08	0.24	1.17
	[0.80]	[1.14]	[1.26]	[0.83]	[1.07]	[0.79]	[0.80]	[0.90]
Observations	18,748	18,748	18,748	18,748	18,748	18,748	18,748	18,748
Individuals	3,597	3,597	3,597	3,597	3,597	3,597	3,597	3,597
F-statistic of IV	23.20	23.20	23.20	23.20	23.20	23.20	23.20	23.20
Hausman test (p-value)	0.03	0.01	0.07	0.29	0.26	0.96	0.74	0.11

Appendix Figure A1: Share of retired individuals by distance to/from pension eligibility age



Notes: This figure is obtained by regression functions with uniform kernel weights on a 2nd order polynomial function, fitted separately above and below the cut-off.