DISCUSSION PAPER SERIES

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LEUPHANA University Lüneburg and IZA

ABSTRACT

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This study contributes to the subjective well-being and retirement literature by quantifying life satisfaction before (4) and after retirement (9+) periods asking: Are retirees more satisfied? Fixed-effects and causal instrumental variables (IV) estimates with individual longitudinal data of the Socio-Economic Panel (SOEP, 33 waves) analyze anticipation and adaptation retirement effects of statutory insured and civil service pensioners in Germany.

Main findings: The occupational situation absorbs a positive personal and family influence. There are positive anticipation effects before retirement followed by adaptation instantly when retired both for statutory insured and civil service pensioners. With neutral respectively negative post-retirement adaptation there is no positive retirement effect for both pensioner groups. In short: retirees are not more satisfied, a remarkable result both for statutory insured and civil service pensioners.

Corresponding author:
Joachim Merz
Leuphana University Lüneburg
Department of Economics
Scharnhorststr. 1
21332 Lüneburg
Germany

E-mail: merz@uni.leuphana.de

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1 Introduction

Retirement and a longer individual life as a consequence of 'demographic change' have meant increasing attention in public discussions and economic and social sciences. So, the average life expectancy has risen in Germany for example for men from 65 to 77 years since the 1960s, and for women from 70 to around 82 years[2]. For the individual as well as for society the question as to the quality of life and life satisfaction in the longer period of life after retirement is one of special importance, a question pursued in this study. And, there is a close correlation between life satisfaction and a longer life: "Older people who enjoy life stay in better shape longer" is a summary of the results of a recent British study by Steptoe et al. 2014.[3] Thus, the life satisfaction and retirement topic require particular attention.

This study contributes to the subjective well-being and retirement literature by quantifying the individual life satisfaction situation before and after entry into retirement in Germany. Four pre-retirement periods and a long period after retirement with up to nine and more years this study expands respective settings in the literature. In particular, individual longitudinal data and corresponding microeconometric panel analyses are used to analyze whether individual life satisfaction actually decreases before retirement as a result for instance of fatigue brought about by work. Then, almost as a release, life satisfaction soars in retirement, but after a certain period of time to drop back to the previous level of life satisfaction. This study investigates if there is such a pattern of life satisfaction anticipation and adaptation before and after entry into retirement in Germany, a pattern which is found in other situations of change.

An investigation of changes in the course of life requires a panel analysis which allows the analysis of pre- and post-retirement situations on the individual level. With fixed-effects panel models and robust estimation this study quantifies anticipation and adaptation retirement effects. We investigate the specific influence of socio-economic control variable domains on life satisfaction and check the robustness of results including a causal evaluation by Instrument Variables (IV) estimates. Since statutory insured (GRV, Gesetzliche Rentenversicherung) and civil service (Beamte) pensioners have different work-life conditions and pension arrangements different life satisfaction consequences when retired are expected and thus analyzed separately for each group. The dataset is the individual longitudinal information of the Socio-Economic Panel from 1985 to 2015 with 31 waves (out of the actual 33 waves 1984 till 2016).

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[2] Statistisches Bundesamt 2014, Bundesinstitut für Bevölkerungsforschung 2014.

[3] And, as other numerous longitudinal studies show that happy people have a better chance to live a long and healthy life (Krueger et al. 2009 with review references to Lyubomirsky, King and Diener 2005 and Howell, Kern and Lyubomirsky 2007).

Why is this question of anticipation and adaptation effects, being temporary in nature, important? Because answers will help to qualify the design and the analysis of policy programs and purposes in general. In particular, with respect to retirement it will shed light on the so-called growing third phase of life which will be longer individually and larger by number of silver agers in society. In case and in particular if subjective well-being will even decrease after retiring then the individual living conditions of the elderly should require more political and individual attention than now. In addition to the policy argument: when anticipation is not controlled for in a regression type model then a large life satisfaction (say) gap between the period(s) before and becoming retired (say) may overestimate the event effect. And without controlling for adaptation a shorter adaptation process might be covered by a longer lasting average effect.

The remainder of this study[4] emblazes the background (chapter 2), discusses the empirical strategy (chapter 3) including the large data set of the Socio-economic Panel and the microeconometric model fixed-effect robust specification and estimation, presents the results (chapter 4), checks the robustness of results and its causal interpretation including IV estimates (chapter 5) and discusses and summarizes the findings with a concluding outlook (chapter 6).

2   Background and Motivation

Although subjective well-being/life satisfaction/happiness in welfare measurement is receiving increasing political attention[5] with a growing field of research,[6] there are only few German and international empirical studies on life satisfaction and retirement. Yet international studies include Calasanti 1996, who investigates gender-specific influence on life satisfaction in retirement in America and discusses theoretical approaches such as crisis and continuity theories based on role theory. The crisis theory views the occupational role as the center and major source of cultural and personal validation. Changing the occupational role by retirement will have negatively effects on the self-identity, on life satisfaction, if no other activities than the work role is found. The continuity theory emphasizes personal identity through the development of other roles in retirees' lives. Retirement thereby is seen as an acceptable role in society and hence can provide self-esteem and satisfaction without experience a negative self-identity; work is no longer a central orientation (Calasanti 1996, S18). Nimrod 2007 pronounces four explanations for the relationship between life satisfaction and retirement: "reducers, concentrators, diffusers and expanders" and finds in Israel that the expanders and the concentrators enjoyed a significantly higher life satisfaction. Calvo et al. 2009 analyze gradual retirement (restricted to one year before and after) and its effect on happiness in the USA and find that a chosen or forced rather than a gradual or "cold turkey" transition matters.

A number of studies show an increase in life satisfaction after retirement, some studies report decreasing effects or long-lasting effects. For example, Kesavayuth et al. 2016

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[4]This study expands Merz 2018 among others by a causality analysis with extensive IV estimates of the retirement effects.

[5] See Layard 2006 and his article "Happiness and Public Policy" or Enquete Commission of the German Federal Parliament 2013 "Growth, Wellbeing and Quality of Life".

[6] Diener et al. 1999 with an overview of the last 30 years on subjective welfare, Easterlin 2001 on the relation of income and subjective well-being; see also Clark and Oswald 1995 and Diener and Biswas-Diener 2002, and recently Clark 2018 about a four decades survey of the economics of happiness.

refer to Charles 2004, Johnston and Lee 2009, Latif 2011 who all find that people's well-being may increase after retirement. Gorry et al. 2018, based on the US Health and Retirement Study, find evidence that retirement improves life satisfaction (along with reported and mental health) within the first four years of retirement. Rado and Boissonneault 2020 show for Hungary that voluntary retirees have a higher level of subjective well-being than involuntary retirees not only in the short but also in the long-term. Zhu and He (2015) find an overall positive effect for retirement on women's life satisfaction in Australia which, however, declines with the duration of retirement. Horner 2014 compares the relationship between retirement and subjective well-being for 14 Western European countries, the United Kingdom and the USA. Her causal evaluation, however with cross-sectional data, shows a positive subjective well-being effect that fades over a few years.[7]

With British panel data Kesavayuth et al. 2016 investigate whether individuals anticipate their retirement and adjust to it overtime concerning overall, health, income and leisure satisfaction 4 years before and 5 years (or more) after retirement. The result: there is an increase in overall life satisfaction up to three years before retirement and a higher long-lasting and not temporary satisfaction level once retired.

In Germany Börsch-Supan and Jürges 2009 focus on early retirement and find with data of the German Socio-Economic Panel (SOEP, 1984-2002) that individuals are less happy in the year of early retirement than in the years before and after retirement. After retirement, the pre-retirement satisfaction level is attained after a relatively short while, i.e., the early retirement effect is "negative and short-lived rather than positive and long" (Börsch-Supan and Jürges 2009, 198). Another approach measuring retirement effects apply Dudel et al. 2013 via a standard of living concept. They raise the question how much retirement income is needed in order to maintain one's living standard at old age. With SOEP data they obtain a required net replacement rate of about 87% for the year of entry into retirement with a slightly decline over the retirement period. Bonsang and Klein 2012 also use SOEP data (1985-2008) and find a negligible effect of retirement on life satisfaction when retirement is voluntary but a negative effect when it is involuntary. Henning et al. 2021 find no systematically changed adjustment quality (among others retirement satisfaction) with cross-sectional German Ageing Surveys 1996 to 2014.

Our study focuses on a possible anticipation before and adaptation effect after retirement in a longer perspective (4 years before and 9+ years after retirement), an extent which has not been studied previously. In general, anticipation describes changes in the behaviour in the light of a coming event. Adaptation describes a situation where an event only produces a contemporaneous and not lasting effect progressively dropping back to the pre-event situation.

An *anticipation* effect before an event is well documented in labor market research and is known there as the Ashenfelter dip (Ashenfelter 1978): Neglecting a decline in earnings before a training program on earnings leads to an overestimation of the job training effect. The role of anticipation and adaptation concerning job satisfaction has been demonstrated by Hanglberger 2013 and Hanglberger and Merz 2015, for example. Hanglberger's 2013 results among others show strong anticipation effects for temporary

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[7] Horner (2014, 126-128) also provides further theories and evidence on subjective well-being and retirement. The early study by Schmitt et al. 1979 show demographic, personality and job-related correlates of life satisfaction with a relatively small cross-sectional sample of Michigan civil service pensioners. That retirement also might have impact to others is shown by Bertoni and Brunello 2014, for example, about causal effects of husband's retirement on the mental health of wives in Japan ("Retired Husband Syndrom").

employment effects on job satisfaction. With respect to job satisfaction when changed to self-employment Hanglberger and Merz 2015 find besides the pre-change period no further anticipation effect of becoming self-employed but a weak positive effect of self-employment with adaptation to job satisfaction before.

The literature refers the phenomenon of *adaptation* to a "hedonic treadmill model" (Brickman and Campbell 1971, Diener et al. 1999, Diener et al. 2006), in which after a rise in life satisfaction it sinks to the previous pre-event level as a result of disillusionment in everyday life. In a recent survey Clark 2018 (and Clark 2016) summarized empirical results concerning adaptation and anticipation and found these processes and particular for adaptation with respect to marriage, children, divorce, widowhood and others; see also the job satisfaction adaptation results above. But there are other events like unemployment or disability where adaptation is not visible. Clark's conclusion: "The evidence so far suggests that adaptation is not a universal truth" (Clark 2018, p. 256).

In summary, international and national studies show mixed results about our topic. [8] The question remains still open if and what kind of anticipation and adaptation of life satisfaction in retirement is revealing, in particular in a longer perspective around entry into retirement. With the following detailed analysis this study provides to it an empirically based answer for Germany.

3   Empirical Strategy

Dataset: The Socio-Economic Panel

The data base is the German Socio-Economic Panel (SOEP), a wide-ranging representative longitudinal study of private households, located at the German Institute for Economic Research, DIW Berlin. Every year in Germany around 30,000 respondents in nearly 11,000 households are interviewed now by Kantar Public Germany.

The data provides information on all household members, consisting of Germans living in the old and new German states, foreigners, and recent immigrants to Germany. The Panel was started in 1984 (Goebel et al. 2019). Our panel analysis refers to the years 1984 to 2016 with 33 waves as SOEP-long data (Socio-Economic Panel (SOEP) 1984-2016, version 33, SOEP, 2021, doi:10.5684/soep.v33) and thus includes information on both the new (from 1990) and the old German federal states.

Definition and background of main variables: retirement and life satisfaction

The *German old age security system* is based on three pillars, the public compulsory system, company pension schemes and private provision for old age.[9] The public compulsory pillar is the most important one with the statutory pension insurance (Gesetzliche Rentenversicherung, GRV) with employees as the largest group. The individual GRV pension amount mostly depends on the insured lifelong earned income. Civil service

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[8] Other current studies on life satisfaction in Germany do not focus on retirement but are connected with: Heidl et al. 2012 for example have analyzed general life satisfaction in Western Germany with cross-sectional SOEP data, or Baetschmann 2012, who also used SOEP data to investigate life satisfaction over the human lifecycle. Subjective well-being of the elderly is the focus of institutional studies like the Generali old age study (for example Generali Deutschland AG 2017) in Germany.

[9] See for example Deutscher Bundestag 2014.

employees (Beamte) face a stand-alone social security system which is based on the so-called principle of alimentation (Alimentationsprinzip) which requires an adequate life-long provision of the civil service and his family. The individual pension amount of the civil service pensioners depends on the last official function and the duration of their active period.

The statutory "normal" retirement age for GRV pensioners as well as civil service pensioners in Germany for men and women is age 65. Because of demographic changes with an increase of the elderly a yearly increase of the normal retirement age up to 67 years started in 2012 (Rentenversicherungs-Anpassungsgesetz, effective 1.1.2012). For example, pensions without reduction start with 65 years and ten months in 2021 (year of birth 1956). The aim of 67 years as the normal retirement age will be reached in 2031. Before the 2012 changes flexible retirement was introduced in 1972 with different ages at 60, 63 and 65. The flexible retirement resulted empirically in distinct spikes at these ages (Börsch-Supan and Jürges 2009, p. 179). Early GRV retirement is possible under specific circumstances. Early retirement *without* pension reduction is possible for men and women since 2014 with age 63 if there are at least 45 years of payments into the pension fund. Early retirement however *with* pension deduction (0.3% for each early month) is possible as well. Comparable early retirement (retirement on demand (Ruhestand auf Antrag) or invalidity) with or without deduction apply to civil service pensioners, too.

In general, though civil service pensioners (Beamte) face a different old age security system, however, new GRV regulations regularly are transferred with comparable effects to the civil service pensioners (see Deutscher Bundestag 2014 for details). Taking together, during the last decades changing eligibility rules apply to the individual retirement age (GRV and civil service pension) and show effects to the individual retirement decision (see the empirical causal results later on).

Though many retirement regulations for GRV and civil service pensioners are comparable, nevertheless there are different work-life conditions (for example GRV workers have no tenure, civil service employees have) and pension arrangements. The question therefore arises, and we follow it, if there are also different life satisfaction consequences for these two main groups of retirees, the GRV pensioners and the civil service pensioners.

The SOEP questionnaire information about German retirement/pension payments encompasses current summarized retirement/pension payments as well as detailed payments to different insurance situations (every year). Our focus is on the detailed payments in the SOEP long data set which allows separate analyses of GRV and civil service pensioners. However, detailed SOEP retirement/pension payment information refers to the survey year before. With the intention to correspond the survey years' pension with the respective life satisfaction and socio-economic control information, we thus transformed pension information by one survey period. Now all life satisfaction and control information in period t (2014, say) refers to the lagged pension information of period t+1 (2015, say). Though the survey and socio-economic situation of period t+1 (2015) might be different to period t (2014), because of, for example, attrition, deaths etc. with the effect of losing data, however the subjective well-being information now corresponds to all socio-economics and its pension information that year.

Retirement in our study as to the SOEP data then will be defined by a positive GRV respective civil service payment in a certain period.[10]

The analysis of *individual histories after retirement* with SOEP data shows a relatively large number of individual retirement information discontinuities of one or more years/waves after retirement. To avoid inadequate exits and new entries, unavailable status information at t+1, t+2 etc. is filled with the last retirement data at t till the next again available retirement information of the respondent. The effect: with the 1985 till 2015 data for our full model (4) there remains 6,794 GRV pensioners with filled and 8,694 without filled histories, and 737 civil service pensioners with filled and 1,060 without filled histories (result effects are discussed in the robustness section). Due to a respective work history it is possible that a *civil service pensioner also receives GRV pension*: in our data these are 44.60 % (4,458 observations) of all civil service pensioner observations. The predominant majority observations of them (69.78 %) show a larger civil service pension than GRV pension amount. Not to lose scarce civil service pension information any GRV pension amount is assigned to a GRV, and a civil service pension amount to a civil service pensioner bearing in mind of those overlapping situations which in the GRV case applies only 4.32 % of all GRV pension observations.

Finally, though the SOEP data in general starts with 1984, SOEP retirement/pension information is only available 1986 and later. Together with the delayed pension information from all available 33 SOEP waves (1984-2016) there remains 31 waves (1985-2015) in the further microanalyses.

Concerning *life satisfaction*, SOEP asks about satisfaction in relation to a number of specific topics, such as income, as well as about a general question concerning life satisfaction. Information about general life satisfaction is used here that is collected from all respondents with a scale from 0 (completely dissatisfied) to 10 (completely satisfied).[11] Such a question and its operationalization are also broadly applied in the happiness/satisfaction literature (for example Clark et al. 2008, Frey and Stutzer 2005).

Model specification: illustration of anticipation and adaptation effects

This study investigates whether the hypothesis of a permanently positive/negative retirement effect on life satisfaction would be still supported when anticipation and adaptation effects on subjective well-being are also included. The empirical relevance of two main questions is tested:

☐ is there an anticipation effect that influences the assessment of life satisfaction in retirement, and

☐ is there a long-term retirement effect on general life satisfaction, or does general life satisfaction adapt to the level before retirement?

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[10] SOEP Questionnaire 2013: "Who pays your retirement / pension and what were the monthly payments in 2012? Please state the gross amount, excluding taxes. If you receive more than one pension, please mark each that applies. If you do not know the exact amount, please estimate:", SOEP long variable plc0223, German Pension Insurance (Deutsche Rentenversicherung, formerly LVA, BfA, Knappschaft), own retirement/pension.
SOEP long variable plc0236, civil service pension scheme (Beamtenversorgung). Thus "GRV pension" is used in our study for old age security payment by the German Pension Insurance (GRV), and "civil service pension" for a payment as a civil service pensioner.
[11] SOEP Questionnaire: "In conclusion, we would like to ask you about your satisfaction with your life in general. Please answer on a scale from 0 to 10, where 0 means completely dissatisfied and 10 means completely satisfied."

Illustration of anticipation and adaptation

Figure 1 illustrates retirement effects on life satisfaction without and with anticipation and adaptation. As long as there is no anticipation or adaptation (Figure 1a) ΔS will measure the long-term retirement effect in a regression type model between the before $\overline{S}_0$ and after $\overline{S}_1$ retirement life satisfaction level. Most empirical analyses based on cross sections or using fixed-effects models are interested in this difference between $\overline{S}_0$ and $\overline{S}_2$, the permanent or long-term change in satisfaction caused by a certain incentive.

The situation is different when temporary effects of anticipation and adaptation are considered. Figure 1b shows negative anticipation and a temporary positive effect after retirement.[12] In this scenario a negative *anticipation* effect lowers average satisfaction prior to T (begin of retirement) from $\overline{S}_0$ to $\overline{S}_1$ and the estimated coefficient underestimates the absolute value of the change in satisfaction to $\overline{S}_{min}$. At the same time, neglecting this decline anticipation would lead to an overestimation of the absolute retirement effect. If *adaptation* is observed, analogue the anticipation case the estimation will result in com

Figure 1:   Illustration of retirement estimation effects

1a: Effect without anticipation and adaptation
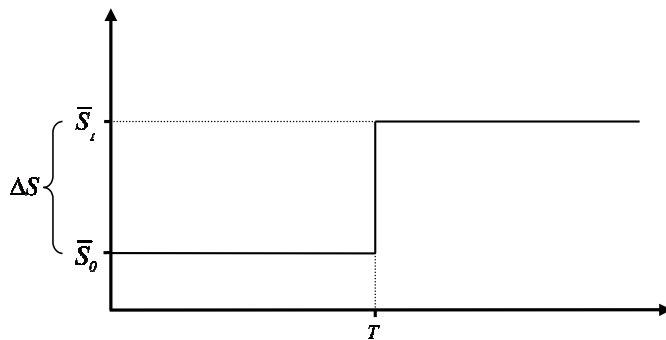
1b: Effect with negative anticipation and full adaptation
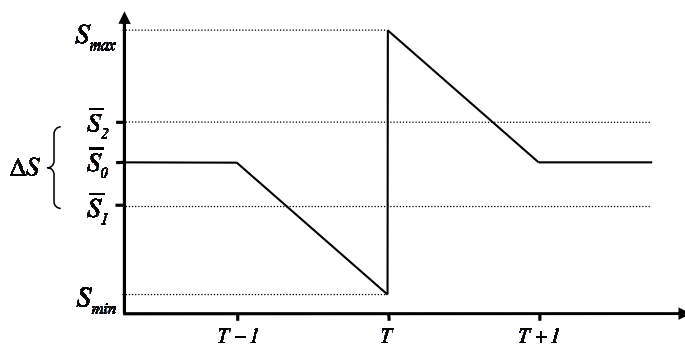
Source: Hanglberger 2013, 140; x-coordinate: time; y-coordinate: life satisfaction S and average life satisfaction $\overline{s}$.

[12] Further graphic illustrations of different anticipation and adaptation paths can be found in Hanglberger 2013, 139 pp.

paring satisfaction levels $\overline{S}_2$ and $\overline{S}_0$ with an underestimation of the absolute value of the change in satisfaction to $\overline{S}_{max}$. $\overline{S}_1$ and $\overline{S}_2$ are mixtures of short-term effects and the long-term baseline satisfaction level $\overline{S}_0$. Then the estimation will yield a positive value for ΔS when retirement does not cause long-term changes in satisfaction. Hence, even panel analyses yield distorted results when anticipation and adaptation effects exist but are not explicitly accounted for.

Life satisfaction scale, interpersonal comparability and causality: Consequences for the econometric model specification

As mentioned, an 11-point *life satisfaction scale* is used as an approach to measuring subjective well-being. This is an ordinal scale that largely fits (generalized) ordered logit or ordered probit models (Greene and Henscher 2010, Long and Freese 2006) but not traditional linear regression models. A further problem is the interpersonal (non) comparability with individual well-being (utility), which could be socially conditioned or of genetic nature (De Neve et al. 2010, Hamermesh 2004). Further problems arise when explanatory factors are not observable or not available (such as genetic factors) and are not part of a regression model but influence both the other factors as well as the dependent variable (omitted variable bias). This also holds for the problem of self-selection and causality, which in our case could be a cohort-specific underlying attitude to work and retirement.

Interpersonal comparability and unobserved effects, such as genetic factors, can be at least partially if not entirely accounted for by means of panel fixed-effects regression models which are based on intra-individual rather than inter-individual differences (like in cross-section models). That is, the same person's history explains the individual development over time.

The fixed-effects approach also controls for all observation specific factors that are constant over time whether they are observable or unobservable. All time-invariant observation-level factors as a source of omitted variable bias (selection bias) are ruled out even though it may not ever be able to observe or measure them.

A plausible solution to the *ordinality problem* in the context of fixed-effect regression models would be an ordered probit fixed-effect model, which however leads to biased results (Greene 2002). A probit-adapted ordinary least squares model (van Praag and Ferrer-i-Carbonell 2008) also requires additional assumptions. Because Ferrer-i-Carbonell and Frijters 2004 have found only minimal differences in measuring well-being cardinally or ordinally, this study uses linear fixed-effects models for the panel estimation (Wooldridge 2002).

Under the *causality/program evaluation perspective* (for example Athey and Imbens 2017, Imbens and Wooldridge 2009, Heckman and Vytlaci 2007), with becoming retired is interpreted as the treatment effect, the fixed-effects regression approach solves the selection/omitted variable bias problem by including time invariant unobserved individual heterogeneity. Each individual serves as its own control group with the identifying assumption that the counterfactual trend in treatment and control group is the same (no time-varying omitted variables). Concerning time variant heterogeneity strict exogeneity (no correlation with the explanatory variables in all periods and the error term) is assumed. Because such components could be related to health shocks and changes in household characteristics (Jürges 2003) in addition health, household and other time variant observable characteristics are controlled for in our fixed-effects regressions.

If the German retirement system would be independent of individual selection, that is the case of a natural experiment, then no selection problem would exist and the fixed-effects estimates would deliver causal treatment effects. However, as described there could be selection on retirement by early retirement (with or without deductions), for instance because of individuals that are generally less happy retire earlier (Bonsang and Klein 2012). In that case self-selection would be faced and a causal interpretation of the fixed-effects model would not be possible. Unfortunate SOEP does not provide direct early retirement information like the necessary years of pension payments to achieve pension without deduction. Given individual age, Bonsang and Klein 2012, however, address this kind of self-selection using eligibility ages and plant closures as instruments for voluntary and involuntary retirement in their early retirement study. Our study partly follows this approach[13] and will take eligibility ages as controls respectively as instruments in our IV estimates.

Altogether, the following arguments for a causal interpretation of our results are offered: First by using fixed-effects estimates which accounts for time invariant heterogeneity and include observable time variant variables (selection-on-observables, for example like eligibility ages, period specific health conditions etc.) as well as by an Instrumental Variable (IV) approach, which ensures the exclusion restriction with its independence of the error term and the treatment variable (see the further discussion and results in our robustness check chapter).

Microeconometric specification and estimation

With the panel-specific fixed-effects approach four models that are based on two basic ones are analyzed: estimation of the effect of retirement on general life satisfaction with and without further socio-economic explanatory factors (control variables). Without control variables the general effect of retirement is measured. With control variables the person-specific effects on life satisfaction are controlled for and quantified with the possibility that these factors might even relativize retirement as the dominant explanation for life satisfaction.

Model I without anticipation and adaptation effects

The basic fixed-effects panel regression model is formulated as

$$S_{it} = d_{it}\gamma + \mathbf{x}_{it}'\boldsymbol{\beta} + b_i + \varepsilon_{it} \tag{1}$$

with S_{it} being subjective satisfaction of individual i at time t. d_{it} is the dummy variable for retirement ($d_{it}=1$) and the phase before ($d_{it}=0$). γ is the estimated regression coefficient that measures the average retirement effect on life satisfaction. $\mathbf{x}_{it}'$ is the vector of socio-economic control variables and $\boldsymbol{\beta}$ the estimated coefficient vector of the strength of respective influence. b_i is the time invariant individual effect (individual heterogeneity) and ε_{it} is the error term.

Model Ia then is the one to have the retirement dummy and measures the general retirement effect. Model Ib includes the control variables as specified in Model I (equation 1).

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[13] Because our focus is not on voluntary vs. involuntary retirement their specific plant closure information is not appropriate here.

Model II with anticipation and adaptation effects

Anticipation and adaptation effects will be specified by lag and lead variables. *Lag variables* indicate if and since when an individual is in retirement; the data even allows for 9 and more years in retirement with 0-1 year, 1-2 years, 2-3 years, 3-4 years, and so on till 9 or more years (dummy variables: $d_{it,T}$, $d_{it,T+1}$, $d_{it,T+2}$, $d_{it,T+3}$, and so on till $d_{it,T+9+}$). *Lead variables* describe if a person will retire with pension benefits ahead in 0-1 year, 1-2 years, 2-3 years or 3-4 years (dummy variables: $d_{it,T-1}$, $d_{it,T-2}$, $d_{it,T-3}$, $d_{it,T-4}$). The dummy variable $d_{it,T-2}$ for example would receive the value 1 (otherwise 0) if the individual will retire in two years. Similarly, $d_{it,T+2}$ stands for the situation two years after retirement. The estimated regression coefficients then quantify each of the two anticipation and adaptation effects,[14] which will allow to capture all possible paths of life satisfaction before and after retirement.

Model II then includes anticipation and adaptation effects and is formulated as

$$
\begin{aligned}
S_{it} = {} & d_{it,T-4}\gamma_{T-4} + d_{it,T-3}\gamma_{T-3} + d_{it,T-2}\gamma_{T-2} + d_{it,T-1}\gamma_{T-1} + d_{it,T}\gamma_T \\
& + d_{it,T+1}\gamma_{T+1} + d_{it,T+2}\gamma_{T+2} + df_{it,T+3}\gamma_{T+3} + d_{it,T+4}\gamma_{T+4} + d_{it,T+5}\gamma_{T+5} \qquad (2) \\
& + d_{it,T+6}\gamma_{T+6} + d_{it,T+7}\gamma_{T+7} + d_{it,T+8}\gamma_{T+8} + d_{it,T+9+}\gamma_{T+9+} + \mathbf{x}_{it}'\boldsymbol{\beta} + b_i + \varepsilon_{it}
\end{aligned}
$$

with $d_{it,T-4}$ to $d_{it,T+9+}$ being dummy variables (0,1), whereby 1 shows how many years until (s)he retires, how long (s)he has been in retirement or that a person is in retirement.

Anticipation is shown by $d_{it,T-1}$, $d_{it,T-2}$, $d_{it,T-3}$ and $d_{it,T-4}$. These dummies indicate that a person will become retired within the next year, 1-2, 2-3, or 3-4 years.

Adaptation is measured by $d_{it,T+1}$, $d_{it,T+2}$, $df_{it,T+3}$, etc. till $d_{it,T+9+}$ indicating that a person is retired since and throughout 1-2, 2-3, etc. and more than 9 years. $d_{it,T}$ is 1 only if a person is not yet retired the year before t and is retired at time of interview in year t. Otherwise $d_{it,T}$ is 0.

The dummies are constructed that only one of the dummies can be 1; all of the others are 0. If a person is neither in retirement nor retiring within the next four years, then all of the dummies are 0. This allows the regression coefficients to be interpreted with reference to those years in which a person is not in retirement or is not planning on retiring in the next four years. The estimated coefficient, for example γ_T, is ceteris paribus the average difference of the life satisfaction of persons who are in the first year of retirement in comparison to the time when they were not retired or planning on retiring in the next four years.

As in Model I, Model IIa is the model without and Model IIb is the model with socio-economic control variables. Table 1 gives an overview of the estimated regression models.

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[14] This model specification is also successfully used in Frijters et al. 2011, Clark et al. 2008 or Hanglberger 2013, Hanglberger and Merz 2015.

Table 1:   **Overview of the estimated regression models**

Model	Retirement	Control
Ia	dummy	–
Ib	dummy	yes
IIa	anticipation and adaptation	–
IIb	anticipation and adaptation	yes

Note: See Appendix A1 for the list of socio-economic control variables.

4   Results

4.1   Descriptive results: Retirement, pension schemes and socio-economic controls

Pensioners under the GRV scheme – compared to civil service pensioners – face different work-life conditions and old age security systems in Germany, already mentioned reasons to analyze retirement effects separately for both groups.

Description - GRV pension and life satisfaction aggregated

We start with the description of the overall average life satisfaction situation and its development with respect to GRV pension.[15] Surprisingly, GRV pensioners on average are significantly *less* satisfied with their life situation altogether from the mid 1980ies to 2015 than non-GRV pensioners (life satisfaction GRV pensioners: 6.906; non-GRV pensioners: 7.041, Table 2).

A closer look to its timely development (Figure 2a) shows for GRV pensioners some u-shaped relationship descending till 2004 and increasing from there on. The general development in its ups and downs is similar for GRV pensioners and non-GRV pensioners over all periods. However, starting from 1997 GRV pensioners are *less* satisfied than non-GRV pensioners. And, the gap to non-GRV pensioners' life satisfaction is significantly growing (gap regression (non-GRV minus GRV life satisfaction) slope: 0.0088, $p<0.001$).

Description - Civil service pension and life satisfaction aggregated

Whereas the majority of old age pensioners in Germany are insured by the above discussed German statutory pension insurance (GRV) by far less retirees are supported by the civil service pension scheme: as to our SOEP database (1985 till 2015) there are 6,794 GRV pensioners (with 103,278 observations) but 737 civil service pensioners (with 9,995 observations) remaining for estimation (see Table 2).[16]

Surprisingly and in contrast to GRV pensioners: civil service pensioners on average (all periods, 1985 till 2015) are *more* satisfied than non-civil service pensioners (Figure 2b). And, the average life satisfaction of civil service pensioners is even higher than that of GRV pensioners. A simple explanation at hand will be the respective pension amounts which on average is considerable higher for civil service pensioners (1,961.94 €/month)[17] than for GRV pensioners (791.49 €/month).

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[15] All computations were done with Stata.

[16] Total figures for Germany 2018: There are 18.2 Mio. statutory insured (GRV) pensioners and about 1.2 Mio civil service pensioners (Federal Statistical Office Germany 2018).

[17] As the average of all over pension-years.

The question whether entering retirement permanently increases life satisfaction or whether the discussed anticipation and adaptation effects lead to the previous level of life satisfaction is likely to be related to strongly varying personal circumstances, material resources acquired, degree of life change, individual psychological factors such as previous experience with important life transitions, previous work life and leisure time activities, physical and mental health, marital status and many other socio-economic factors (cf. for example Beehr 1986, Kim and Moen 2001, Szinovacz 2003, Wang and Shultz 2009).

Figure 2:   Average life satisfaction GRV and civil service pensioners, retired and non-retired, Germany 1985 to 2015
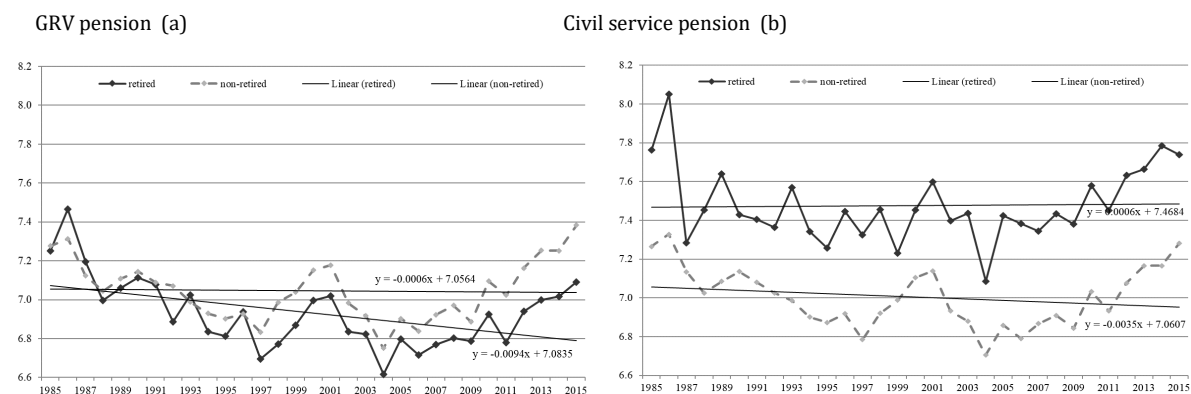
Source: SOEP Socio-Economic Panel 1985-2015; weighted data.

Description - Socio-economic controls

The individual life circumstances in this study will be covered by the following commonly used and available control variable domains: personal, education, occupation, job, social participation, household and region which follow mainly used variables in labor supply and retirement studies. In addition, general personal characteristics are incorporated measured by the so-called Big 5 personality traits as basic drivers behind otherwise revealed behavior, which proved to be important predictors of general satisfaction (Frijters et al. 2004 with reference to Argyle, 1999; Diener and Lucas, 1999). Big 5 items encompass openness, conscientiousness, extraversion, agreeableness, and neuroticism (OCEAN)[18]. Because the SOEP data provide Big 5 information in 3 years only (2005, 2009, 2013) regression based Big 5 estimates are imputed into all waves 1985 till 2015 to allow more item variance.

Apparent the available data restricts the use of further interesting variables like more social participation or previous work conditions. Though the SOEP data offers some information like activities with neighbors and friends, or kind of work life conditions/impairment, however, because available only in some years their incorporation into the model estimation either restricts the usable number of observations and/or are omitted variables. Details about the single definition of socio-economic controls under investigation can be found in the Appendix A1.[19] Table 2 provides descriptive statistics

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[18] Digman 1989 and Lang and Lüdtke 2005 with an overview related to empirical based surveys. See Gerlitz and Schupp 2005 for a detailed description of the Big 5 based personality traits within SOEP.

[19] Correlation results between life satisfaction in general and socio-economic factors like age, sex, health, marital status, education and environment and its mixed results are reported by Clark 2018.

Table 2: Retired and not retired GRV and civil service pension – Descriptive results, Germany 1985 to 2015

GRV	Retired		Not retired		Civil Service	Retired		Not retired	
Variable	Obs.[1]	Mean	Obs.[1]	Mean	Variable	Obs.[1]	Mean	Obs.[1]	Mean
LIFE SATISFACTION					**LIFE SATISFACTION**				
All[2]	560882	6.9814			All[2]	560882	6.9814		
GRV pension	102007	6.9058	385966	7.0408	Civil Servant pension	9878	7.4745	477900	6.9963
GRV PENSION	103278	1	388972	0	**CIVIL SERVICE PENSION**	9995	1	482090	0
GRV PENSIONERS[3]	6794		50135		**CIVIL SERV. PENSIONERS[3]**	737		50083	
PERSONAL DATA					**PERSONAL DATA**				
Age	103278	70.6	388972	41.14	Age	9995	70.57	482090	48.09
Married	103157	0.5637	381950	0.5483	Married	9982	0.5856	474967	0.5515
Widowed	103157	0.2823	381950	0.0329	Widowed	9982	0.1992	474967	0.0938
Health	92496	3.19	313773	2.46	Health	9059	2.95	397035	2.65
Physician visits	94739	4.03	326330	2.27	Physician visits	9307	3.91	411588	2.71
Early retirement 63<65	103278	0.0087	388972	0	Early retirement 63<65	9995	0.0102	482090	0
Early retirement 60<63	103278	0.0185	388972	0	Early retirement 60<63	9995	0.0116	482090	0
Early retirement <60	103278	0.011	388972	0	Early retirement <60	9995	0.0174	482090	0
Education	101655	10.93	372046	11.85	Education	9930	13.22	463610	11.58
Big 5: Openness	103042	4.4576	378130	4.6683	Big 5: Openness	9974	4.3448	471089	4.6210
Big 5: Conscientiousness	103042	5.5333	378130	6.0615	Big 5: Conscientiousness	9974	5.5383	471089	5.9364
Big 5: Extraversion	103042	4.6821	378130	4.9952	Big 5: Extraversion	9974	4.5868	471089	4.9233
Big 5: Agreeableness	103042	5.2249	378130	5.6137	Big 5: Agreeableness	9974	5.1183	471089	5.5241
Big 5: Neuroticism	103042	3.5294	378130	4.1705	Big 5: Neuroticism	9974	3.3825	471089	4.0221
OCCUPATION					**OCCUPATION**				
Liberal profession	103278	0.0034	388972	0.0163	Liberal profession	9995	0.0128	482090	0.0130
Entrepreneur	103278	0.0069	388972	0.0378	Entrepreneur	9995	0.0090	482090	0.0305
Blue collar worker	103278	0.0215	388972	0.2217	Blue collar worker	9995	0.0079	482090	0.1748
White collar worker	103278	0.0206	388972	0.3402	White collar worker	9995	0.0203	482090	0.2650
Civil service pensioner	103278	0.0002	388972	0.0499	Civil service pensioner	9995	0.0245	482090	0.0377
Unemployed (registered)	102764	0.0164	382478	0.0762	Unemployed (registered)	9961	0.0016	475116	0.0624
JOB / PENSION					**JOB / PENSION**				
Working hours	102738	1.33	380058	27.6	Working hours	9940	1.9	472690	21.29
Earned income	103278	58.75	384941	991.67	Earned income	9995	119.91	478059	769.25
GRV amount	103278	791.49	388972	0	Civ. Serv. pension amount	9995	1961.94	482090	0
SOCIAL PARTICIPATION					**SOCIAL PARTICIPATION**				
Hobbies	102371	2.89	379631	1.78	Hobbies	9953	3.00	471878	2.04
Volunteer/Political	103278	0.24	388972	0.32	Volunteer/Political	9995	0.41	482090	0.30
HOUSEHOLD					**HOUSEHOLD**				
Care household	103171	0.0938	384541	0.0239	Care household	9987	0.0609	477560	0.0411
Household size	103278	1.75	388972	2.80	Household size	9995	1.78	482090	2.56
Number of children<19	103278	0.0289	388972	0.6126	Number of children<19	9995	0.0299	482090	0.4750
Residual income	99442	874.92	366615	1369.50	Residual income	9699	683.41	456025	1416.60
REGION					**REGION**				
East	103278	0.1681	388972	0.1426	East	9995	0.0606	482090	0.1510

[1] Number of panel observations (not weighted), [2] Number of observations with valid life satisfaction information, [3] Number of retirements
Source: SOEP Socio-Economic Panel 1985-2015; weighted data (base for estimation).

of our variables used with information for GRV pensioners and civil service pensioners. Some statistics in particular comparing GRV with civil service pensioners attract attention and describe in different ways the different situation of both pensioner groups. For instance, compared to civil service pensioners there are absolutely more GRV pensioners (as mentioned), relatively more GRV pensioners are widowed, their current state of health on average is worse, early retirement between age 60 and 63 is higher, nursing care of those in need within the household is higher, average residual income is higher, and there is by far a higher fraction of GRV than civil service pensioners in East Germany.

On the contrary civil service pensioners work longer, have a larger earned income and in particular a larger pension amount (almost a 2.5 multiple), and, they are more active as a volunteer or political active (0=no, 1=yes) than GRV pensioners. So, many differences are obvious and show a different picture of both pensioner groups. A further discussion of behind the socio-economic variables will follow in the results section.

Altogether: Besides institutional differences, different empirical pattern for GRV and civil service pensioners by content and descriptive results require different estimates as we do.

4.2   Microeconometric results – GRV pension

The individual development before and after retiring is now the focus of the microeconometric panel analysis which, with robust estimated coefficients of the fixed-effects models, investigates life satisfaction of the identical person in retirement in comparison to that person's situation before retirement. We start with the situation of GRV pensioners, the largest pensioner group in Germany.

Our models distinguish between two types: Model I respects retirement by an overall dummy variable to describe a long-lasting general retirement effect on life satisfaction (Models Ia without, Model Ib with control variables). Model II in contrast incorporates single period effects of anticipation and adaptation (IIa without and IIb with control variables, the full model). The results of all models are summarized and illustrated in Figure 3 based on Table 3 with additional estimated scenarios.

The general retirement effect (Model I)

The result: The general retirement effect on life satisfaction is negative (Model Ia) and is highly statistically significant. Thus, GRV pensioners are less satisfied than non-GRV pensioners in the long run, a result which on the individual level corresponds to the aggregate descriptive findings. As to this model specification retirement decreases current life satisfaction regardless of how long a person is in retirement.[20] A coefficient value -.189 of the 11-point scale seems to be small, but with a value of 7 as the median, and that 50 % of all recorded values of life satisfaction are between 6 and 8, then this and other comparable coefficients of that magnitude are not only statistically but also economically significant.

When socio-economic control variables are respected (Model Ib) then the retirement coefficient is no longer significant, retirement has no further general long-lasting effect on life satisfaction. The individual socio-economic circumstances set aside the retirement influence.

Anticipation and adaptation effects of retirement on life satisfaction (Model II)

The above general long-term retirement effect ignores the possibility that the effect of retirement may depend on the duration after and the situation before retirement. Now the hypothesis will be tested whether shorter lasting periods of anticipation of an upcoming retirement and adaptation after retirement play a specific role in explaining life satisfaction (Model II).

The result: *Anticipation and adaptation effects without control variables (Model IIa)* are negative and significant for all lead and lag coefficients. All 14 distinct periods around the individual retirement period at T, four periods before and nine and more periods after retirement, corresponds to the overall less satisfied picture of the GRV pensioners compared to all others. However, now single period effects, of specific importance for our topic, reveal: it appears a clear *anticipation effect* with falling life satisfaction till the retirement start, a rise in life satisfaction in the first retirement year and then an *adapta-*

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[20] For simplicity's sake the term retirement is used synonymously with retirement status and receiving pension.

tion effect with further decreasing life satisfaction shortly eased only in period T+6; a sad picture with respect to a longer retirement perspective.

Figure 3: **The effect of retirement (GRV pension) on life satisfaction with and without accounting for anticipation and adaptation, Fixed-effects regression results, Germany 1985 to 2015**
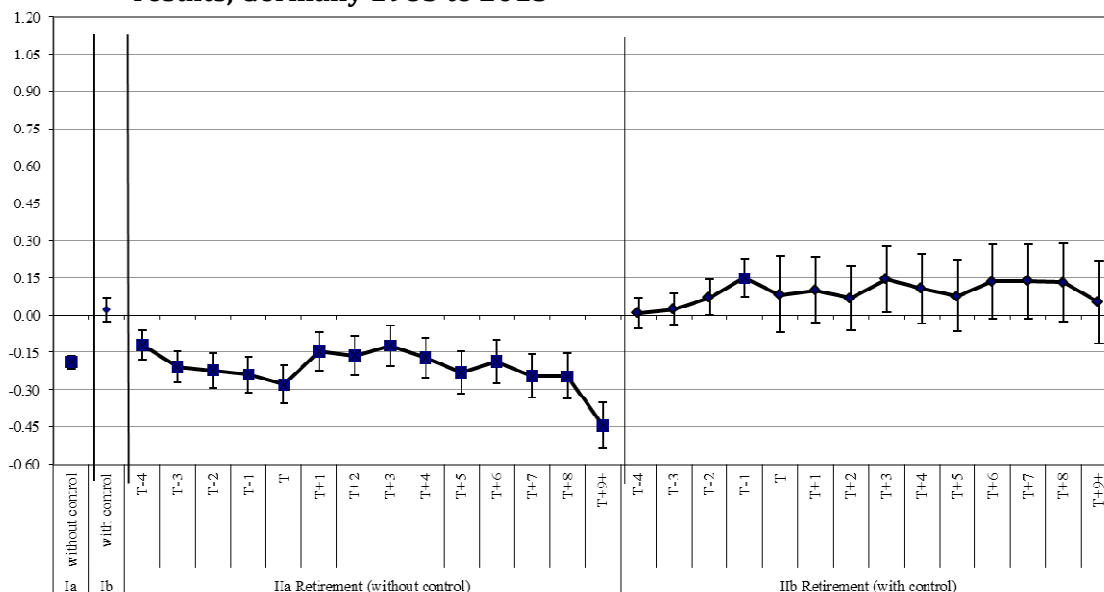
Source: Results of fixed-effects regression Models Ia,b and IIa,b with SOEP Socio-Economic Panel data 1985-2015; 95 % laid above confidence intervals; 95 % estimated confidence intervals are shown with quadratic dots (robust standard errors); detailed regression results can be found in Table 3.

Anticipation and adaptation effects with control variables (Model IIb), in contrast to the not controlled model (Model IIa), are positive now for all periods before and after retirement, but of different significance. There is a *significant anticipation effect* but now with *growing* life satisfaction till the pre-retirement period (T-1). Life satisfaction then declines in the retirement period T, with some ups and downs. However, all the effects from the retirement period T till T+9+ are not significant anymore and detect "no effect on life satisfaction". What remains for GRV pensioners is only one significant positive effect in the pre-retirement period T-1 on top of growing anticipation. There is a retirement adaptation effect on life satisfaction, since all effects thereafter T-1 show no significant effects to the long-termed pre-retirement situation.

To summarize, the full model (Model IIb) reveals that the socio-economic control factors compensate all not controlled negative significant period effects of retirement on life satisfaction. Only one significant short- term positive effect in the pre-retirement period T-1 remains on top of four period of growing anticipation. The retirement period itself and all further not significant period effects refer to a retirement adaptation effect on life satisfaction.

Socio-economic controls

The results above showed that controlling for/respecting socio-economic variables change the importance and sign of the retirement effects: the general significant effect changed to insignificance (Model I), all the significant negative period specific effects changed to almost all insignificant positive effects (Model II). So, the individual living

conditions described by the socio-economic controls indeed are important to explain retirement life satisfaction.

With focus on the full model (Model IIb) Table 3 (last column) shows that almost all alternative explanatory domains - personal, education, occupation, job, social participation, household and region - with their single controls, will result in the same manner as in Model Ib (Table 3 next to last column) by magnitude, sign and significance with the only insignificance exemption in Model IIb for age, education, three of five Big 5 variables and occupation as being self-employed.

Socio-economic influences in particular: Marital status (if married increasing; if widowed decreasing) and especially the health variables, current health and the number of physician visits, strongly influence and reduce current life satisfaction significantly. Since life satisfaction could also influence health the possibility of reverse causality has to be respected when causality is in the focus (Mazzona and Peracchi 2017, Börsch-Supan and Jürges 2009). We come back to this in our robustness/causality section. Further available SOEP data about subjective health satisfaction (11 points scale 0-10) are not considered because of possible endogeneity problems with common latent variables when subjective variables are explained by subjective variables likewise (Hamermesh 2004). Nevertheless, the rougher subjective current health indicator (very good ... bad, 5 items) is respected because subjective current health might indeed be connected with the individual situation, which is in line with Hamermesh's critique and discussion. In addition, the number of physician visits is included which seems to be a more objective health indicator showing a negative significant effect.

Early retirement (in different age groups) shows no significant effect, a result which is in contrast to Börsch-Supan and Jürges 2009 findings, which however detect the disability status as the driving variable behind the life satisfaction effect.

Education only in Model Ib yields a negative significant coefficient but with diminishing negative influence on life satisfaction with longer education. As to the labor supply literature one might expect that education produces greater earnings and is positively (and not negatively) correlated with life satisfaction. Clark (2018, 249) however offers the explanation that a rise in outcomes relative to that in expectation might not match and hence diminish subjective well-being.

Big 5 factors influence life satisfaction level in the full model (Model IIb) conscientiousness remains a significant and negative Big 5 factor and extraversion (outgoing/energetic vs. solitary/reserved) by a positive and significant influence. Openness to experience (inventive/ curious vs. consistent/cautious) and agreeableness (friendly/compassionate vs. analytical/ detached) attract attention in Model Ib by their high significance and negative signs of the estimated coefficients.

Compared to non-employment all single occupation (self-employment in a liberal profession or as a business owner, blue and white collar worker, civil service) decreases life satisfaction in Model Ib but the self-employed vanish to be significant in the full model (Model IIb). Thus, a strong negative significant influence of the blue and white collar workers' situation has to be recorded. As expected, (former) unemployment significantly decreases current life satisfaction.

Work intensity, as measured by weekly working hours, shows that life satisfaction increases and is diminished with an increase in the number of working hours (Model Ib and IIb). One might expect a decrease because of the working burden. However, it is a hint for an overall importance of a structuring work-life. The significant influence of (former) personal earned income as well as the GRV pension amount and the residual

Table 3: The effect of retirement (GRV pension) on life satisfaction in alternative socio-economic control domains with and without accounting for anticipation and adaptation – Fixed-effects regression results, Germany 1985 to 2015

GRV pension			Personal		Extended personal		Personal and occupation		Extended personal and	
Scenario	(1) … (4)	(1) … (4)	(1)		(2)		(3)		occupation (all) (4)	
	Model I a	Model II a	Model I b	Model II b	Model I b	Model II b	Model I b	Model II b	Model I b	Model II b
RETIREMENT										
Retirement	-0.189***		0.222***		0.250***		0.0363		0.0222	
Retirement T-4		-0.121***		-0.0107		-0.00903		0.00503		0.00749
Retirement T-3		-0.210***		-0.0208		-0.00492		0.00663		0.0239
Retirement T-2		-0.222***		0.00773		0.0211		0.0592		0.0716
Retirement T-1		-0.240***		0.0664		0.0745		0.137**		0.149**
Retirement T		-0.280***		0.177*		0.222**		0.0898		0.0823
Retirement T+1		-0.146**		0.277***		0.330***		0.109		0.101
Retirement T+2		-0.163***		0.249***		0.302***		0.0786		0.0685
Retirement T+3		-0.124*		0.318***		0.372***		0.153+		0.145+
Retirement T+4		-0.172***		0.283***		0.338***		0.113		0.108
Retirement T+5		-0.231***		0.237***		0.307***		0.0687		0.0769
Retirement T+6		-0.186***		0.307***		0.366***		0.138		0.136
Retirement T+7		-0.245***		0.285***		0.368***		0.112		0.136
Retirement T+8		-0.247***		0.304***		0.360***		0.135		0.131
Retirement T+9+		-0.444***		0.202*		0.276***		0.0408		0.0521
PERSONAL DATA										
Age			-0.0598***	-0.145***	-0.0727***	-0.172***	-0.0265***	-0.0344	-0.0438***	-0.0382
Age²			0.0299***	0.0255*	0.0441***	0.0380**	-0.00866+	-0.0175	-0.000206	-0.0135
Married			0.130***	0.113***	0.113***	0.0791*	0.120***	0.113***	0.102***	0.0762*
Widowed			-0.166***	-0.251**	-0.226***	-0.338***	-0.153***	-0.238**	-0.216***	-0.314***
Health			-0.483***	-0.476***	-0.477***	-0.473***	-0.478***	-0.476***	-0.471***	-0.471***
Phsician visits			-0.0103***	-0.0125***	-0.00991***	-0.0125***	-0.0102***	-0.0125***	-0.00979***	-0.0125***
Early retirement 63<65			-0.0680+	0.0479	-0.0716+	0.0484	0.0183	0.06	0.00598	0.0403
Early retirement 60<63			-0.174***	-0.0903	-0.181***	-0.0816	-0.0299	-0.0377	-0.0369	-0.0336
Early retirement <60			-0.501***	-0.379**	-0.501***	-0.401**	-0.360***	-0.303*	-0.362***	-0.323*
Education			-0.929***	-1.249**	-1.097***	-1.365**	-0.470***	-0.624	-0.658***	-0.612
Education²			0.0326***	0.0429**	0.0387***	0.0460**	0.0171***	0.0252	0.0241***	0.0248
Big 5: Openness			-0.415*	-1.115+	-0.323	-1 056	-1.056***	-0.769	-1.085***	-0.672
Big 5: Conscientiousness			0.779*	1.630**	0.880*	2.391***	-0.492+	-1.807*	-0.631+	-1.922*
Big 5: Extraversion			1 066	-1 522	1.503*	-2.376*	0.704+	2.219*	1.065*	2.361*
Big 5: Agreeableness			-2.237***	-3.413***	-2.708***	-3.864***	-0.868**	-1 386	-1.404***	-1 397
Big 5: Neuroticism			-0.21	-2.932***	-0.111	-3.347***	-0.204	-0.529	-0.246	-0.354

Table 3 cont.

GRV pension / Scenario	(1) … (4)	(1) … (4)	Personal (1)		Extended personal (2)		Personal and occupation (3)		Extended personal and occupation (all) (4)	
	Model I a	Model II a	Model I b	Model II b	Model I b	Model II b	Model I b	Model II b	Model I b	Model II b
OCCUPATION										
Liberal profession							-0.119***	-0.153+	-0.106***	-0.128
Entrepreneur							-0.123***	-0.123*	-0.104***	-0.111+
Blue collar worker							-0.0706***	-0.0811+	-0.0626***	-0.0871+
White collar worker							-0.0865***	-0.129**	-0.0727***	-0.132**
Civil service pensioner (Beamter)							-0.229***	-0.272**	-0.188***	-0.249**
Unemployed (registered)							-0.519***	-0.413***	-0.521***	-0.422***
JOB / PENSION										
Working hours (weekly)							0.00606***	0.00789***	0.00615***	0.00814***
Working hours²							-0.00933***	-0.0100**	-0.00934***	-0.0100**
Earned income 10^{-3}							0.102***	0.165**	0.128***	0.239***
Earned income² 10^{-5}							-0.101**	-0.429	-0.128**	-0.751+
GRV amount 10^{-3}							0.151***	0.118	0.226***	0.223*
GRV amount² 10^{-4}							-0.125*	-0.036	-0.171**	-0.163
SOCIAL PARTICIPATION										
Hobbies					-0.00389*	0.00787+			0.00579**	0.0129**
Volunteer/Political					0.0012	0.00271			0.000619	-0.00361
HOUSEHOLD										
Care household					-0.444***	-0.342***			-0.437***	-0.343***
Household size					-0.01	-0.0235+			-0.0305***	-0.0374**
Number of children<19					0.0114	0.0398*			0.0251**	0.0455**
Residual income 10^{-4}					0.421***	0.814***			0.676***	1.09***
Residual income² 10^{-5}					-0.0267***	-0.334***			-0.00398***	-0.0442***
REGION										
East					-0.0526	0.166+			-0.0349	0.157+
Constant	7.098***	6.948***	21.67***	55.77***	22.04***	61.01***	22.54***	26.84*	26.56***	25.60*
R2 within	0.000985	0.00283	0.0708	0.0722	0.0733	0.075	0.0797	0.078	0.083	0.0812
F-Test	146.29***	8.09***	657.73***	98.50***	439.19***	76.22***	431.35***	76.01***	334.37***	63.38***
Max groups	31	18	22	17	22	17	22	17	22	17
Average groups	9 441	8 118	8 448	7 863	8 260	7 741	8 360	7 788	8 186	7 678
Clusters	51179	11038	42067	10691	40 794	10 439	41704	10621	40453	10370
Observations	483175	89611	355389	84067	336967	80809	348647	82717	331161	79617

Note: t statistics based on robust standard errors in parentheses; + $p<0.10$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$

Source: Results of fixed-effects regression Models Ia,b and IIa,b with SOEP Socio-Economic Panel data 1985-2015.

household income (monthly household net income minus individual earned income and pension income) is positive nonlinear and confirms the well-known Easterlin 2001 paradox, according to which a higher income is not proportional to greater life satisfaction (Model Ib and IIb).

Recreational activities with social participation reference like hobbies (temporal intensity) significantly increase life satisfaction. However, participating in voluntary work, in political parties or citizen initiatives has no significant influence on life satisfaction. This is somewhat surprising, since a social engagement is expected to correlate or even to be a stimulus for greater satisfaction (Model Ib and IIb).

People usually do not act on an island but live and act with others. The closest social partners are the household/family members which will play a role in one's life satisfaction. The household/family situation is characterized by household size and its number of children under 19 years old. Both variables are significant but of opposite signs: children rise but increasing household size (for example by other family members) reduces life satisfaction. Person(s) needing care in the household might stress its members which results in a negative significant sign of the estimated influence on life satisfaction (Model Ib and IIb).

Finally, the specific regional situation of East and West Germany is not significant and refers to diminished differences so far.

A comment should be made on the availability and selection of explanatory socio-economic variables. In principle, the variables were chosen that were shown to have an effect in previous studies on life satisfaction and retirement. The Socio-Economic Panel provides other interesting variables for our topic, such as physical and other forms of mental stress at work as well as further variables on the work situation, or personal circumstances including leisure activities. There is also further information about social participation with neighbors and friends, which could possibly influence life satisfaction before and after retirement. Unfortunately, data on these and other variables are collected either at greater intervals or have only been recently collected so that the remaining data, even as an unbalanced panel, are restricted for the final full estimation.

Taken together, respecting socio-economic variables shows that the individual personal, occupation and family/household circumstances are particularly important both substantively and statistically for current life satisfaction and even dominate a general negative retirement effect and strength the particular importance of individual living characteristics.

Model II and alternative socio-economic control scenarios

The above result astonishes. What are the driving factors which lift the without control picture of negative life satisfaction effects and vanishes 13 of 14 periods significant effects around individual retirement? To answer this question Figure 4 summarizes some alternative full model (Model llb) specifications and estimation results (Table 3) with the following embracing domains:

1. **Personal (1)**: close personal (age, married, widowed, health, physician visits), education, Big 5,

2. **Extended Personal (2)**: *personal (1)*, social participation (hobbies, voluntary work, active in political parties or citizen initiatives), care, household size, number of children,

Figure 4: **The effect of retirement (GRV pension and Civil service pension) on life satisfaction in alternative socio-economic control domains when accounting for anticipation and adaptation (Model IIb), Fixed-effects regression results, Germany 1985 to 2015**
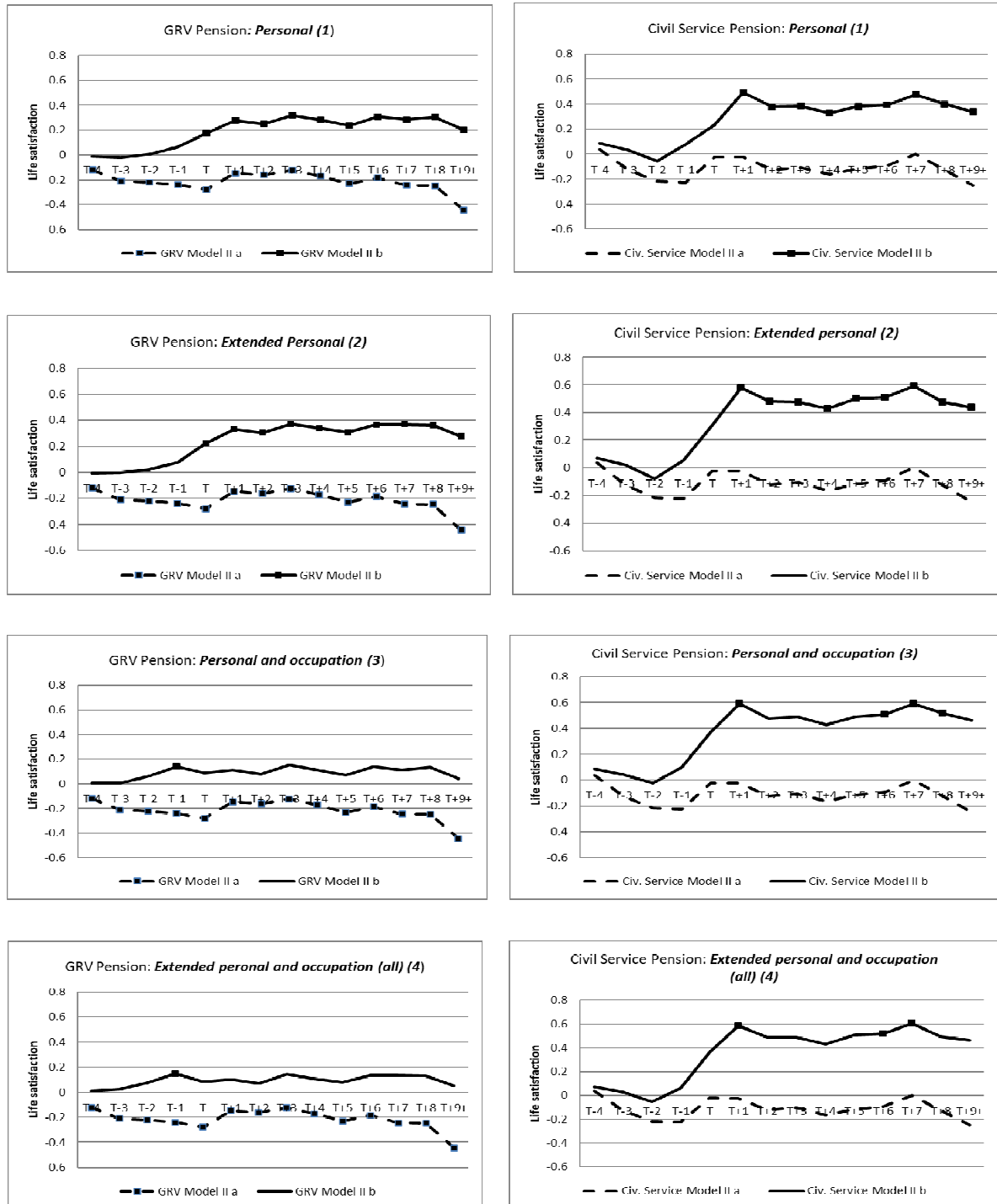
Source: Fixed-effects regression Models IIa (without controls) and Model IIb (with controls), SOEP Socio-Economic Panel data 1985-2015; dots mark estimated significant influence (with robust standard errors) with at least 5 % significance; detailed regression results in Table 3 and Appendix Table A1.

3. ***Personal and occupation (3)****: Personal (1),* occupational status, job (weekly working hours),

4. ***Extended Personal and occupation (all, full model) (4):*** *Extended Personal (2)**,* occupational status, job (weekly working hours).

In addition to the above domains all scenario estimates include income variables as personal work and pension income respectively, residual income (household net income minus work and pension income respectively) and the regional dummy for East Germany.

Personal (1) and ***Extended Personal (2)*** both in particular lift the negative single period effects of Model IIa (without controls) into even positive and significant ten significant retirement effects on life satisfaction. There is anticipation up to the first post-retirement period T+1, then some fluctuations around that significant level.

Remarkably, when ***occupation*** (occupational status and job variable) is added, then occupation strongly diminishes the personal lift effect (***Personal (1) and Extended Personal (2))*** and only one significant period remains overall (***Personal and occupation (3))***. The positive shape of the development remains. Yet, the strong absorbing occupation effect could not be hindered by the extended personal factors in the full model (Model IIb, ***Extended Personal and occupation (all) (4)***). The retirement effects after T-1 effect are positive but no more significant (95 % significance level).

The occupational domain, which drives the absorbing effect and encompasses the occupational status (to describe the general job status situation) as well as working hours (to describe work intensity), is a mix of coefficient signs (occupational status negative; working hours positive but diminishing, see Table 3). The working hours interact with the negative occupational status to draw a combined occupational picture where the estimated occupational status dominates the working hours intensity measure. The estimated respective coefficients encompass the pre- and post-retirement situation and this is what they should measure: showing the overall pre- and post-influence. The remarkable absorbing result is considered again in the discussion section below.

All the above estimation results are based on fixed-effects regression model specifications which explicitly account for individual unobserved heterogeneity. An alternative formulation and estimation by a random-effects model (not shown), which can only generally account for heterogeneity through its variance, confirms the results found and indicates robustness of our results so far.

4.3   Microeconometric results – Civil service pension

The results for civil service pensioners and the question if civil service pensioners – compared to GRV pensioners – with their different background of work-life conditions and old age security systems in Germany differ in life satisfaction when retired is discussed now.

The analysis for civil service pensioners is based on the same model specification without and with socio-economic controls as for the above pensioners (GRV) and again are estimated by fixed-effects robust regression. The single results are provided in the Appendix Table A2. Figure 5 summarizes the results.

Surprisingly, and in contrast to GRV pension results, all single *without control* pre-retirement and post-retirement period effects though negative are no more significant (Model IIa without control).

With regard to the full model (IIb) it becomes aware an anticipation effect with rising life satisfaction till one period after retirement (T+1) and only significant positive effects later in periods T+6 and T+7 with a further insignificant diminishing development.

Compared to GRV pension the post-retirement effects are higher in absolute terms and show even in some years after retirement (T+6 and T+7) still significant positive effects.

Figure 5: **The effect of retirement (civil service pension) on life satisfaction with and without accounting for anticipation and adaptation, Fixed-effects regression results, Germany 1985 to 2015**
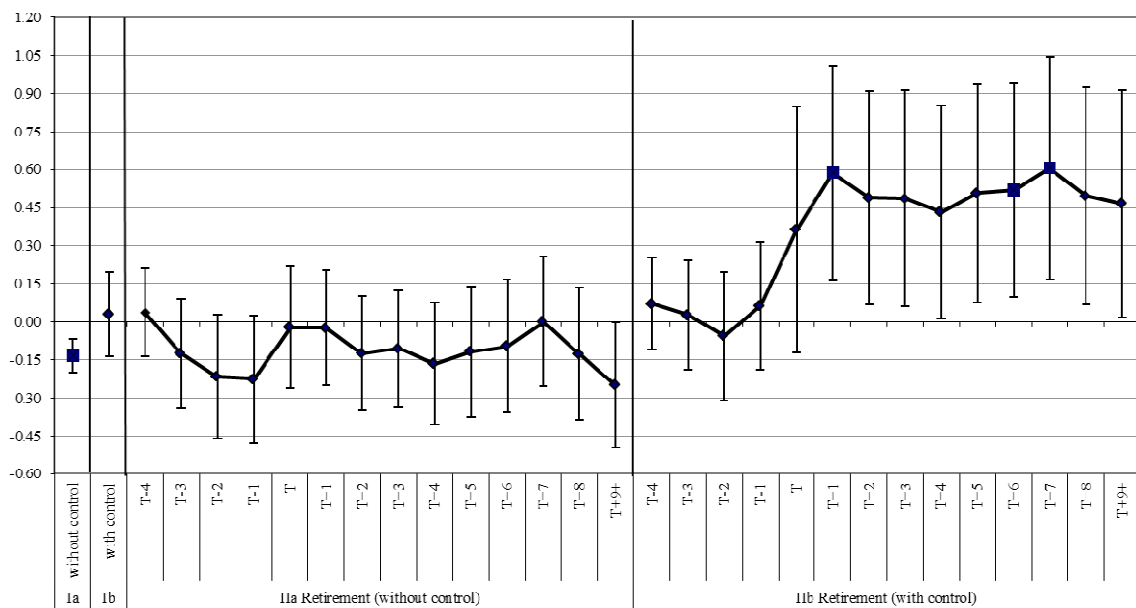
Source: Results of fixed-effects regression Models Ia,b and IIa,b with SOEP Socio-Economic Panel data 1985-2015; 95 % laid above confidence intervals; 95 % estimated confidence intervals are shown with quadratic dots (robust standard errors); detailed regression results can be found in Appendix Table A2.

The influence of the socio-economic control factors in the estimation of life satisfaction is shown in Appendix Table A2. As to the sign as well as to the significance of the estimated coefficients the picture is similar to that of explaining GRV pension. There is one difference to be mentioned. Whereas in the GRV pension estimates the GRV pension amount was significant in (non-linear) rising life satisfaction (Model IIb), civil service pension amount is not significant. The general higher pension amount of civil service pensioners might be an explanation.

Civil service pension Modell II and alternative socio-economic control

The question arises how single control domains are responsible for the changing effects in a similar manner as to the GRV pension situation.

Personal (1) and ***Extended Personal (2)*** control variables both lift the non-significant single period effects without controls into even positive and significant nine retirement effects on life satisfaction (Figure 4 and Appendix Table A2). There is anticipation up to the first post-retirement period T+1, then some fluctuations around that significant level and there is adaptation from period T+7 with falling life satisfaction.

Again remarkably, when occupation is added, then occupation diminishes the personal lift effect (***Personal (1) and Extended Personal (2)***) and only three significant ex-post period effects remain overall (***Personal and occupation (3)***. The general positive shape of the development remains. Yet, the absorbing occupation effect could not be hindered by the extended personal factors (full model IIb, ***Extended Personal and occupation (all) (4)***. The absorbing effect, however, is not as strong as with GRV pensioners and shows positive effects diminishing from T+7.

Thus, the inclusion of different socio-economic control domains act in a similar manner for both pension systems, GRV pension and civil service pension: the individual *occupational* background absorbs (almost) all positive further significant individual socio-economic effects of retirement on life satisfaction. The absorbing effect, however, for civil service pensioners is not as strong as with GRV pensioners. A plausible result, when a secure working life concerning unemployment hazards for civil service pensioners is in mind.

5 Robustness: Causality, retirement definition impact

The robustness check discusses the impact of the retirement definition itself and the question of causality.

Retirement definition: With regard to the *definition of retirement* we mentioned, that gaps in the individual pension history (due to missing pension information) are replaced in our study by the last available individual pension information. The effect: the *GRV pension* picture after filling missing data is virtually identical to the unfilled one with respect to single estimates and the effect of alternative scenarios. The *civil service picture* is virtually identical, too, for most single estimates and the effect of alternative scenarios, however, with a less absorbing influence of occupational factors with filled periods.

Causality: The microeconometric regression results above focus rather on the correlation than on causality of retirement effects. With regard to *causality* the following arguments for a causal interpretation of our results is offered: To begin with, by using fixed-effects estimates which solve the selection/omitted variable bias problem by including *time invariant* unobserved individual heterogeneity. In addition, *time variant* unobserved individual heterogeneity is addressed by including observable time variant variables (selection-on-observables, for example like eligibility ages, period specific health conditions etc.). The following Instrumental Variable (IV) approach copes with the endogeneity problem between retirement and life satisfaction and claims to eliminate any violation of the exclusion restriction with its independence of the error term and the treatment variable.

Under the causality perspective the period specific retirement treatment effects are endogenous in the regression approach, that is the error term in the outcome (life satisfaction) equation is no more independent from the other variables. To cope with the endogeneity problem the IV approach treats an independent variable (retirement effect) as endogeneous which is to be instrumented by replacing the endogeneous regression

right hand side variables with fitted values in the second stage of a two-stage least squares (2SLS) procedure. Such a two-stage least squares (2SLS) estimation, using a linear probability model to explain the treatment in the first stage, deliver consistent (life satisfaction) results.[21]

Correcting for the endogeneity of retirement and life satisfaction we therefore estimated two-stage-least-squares regressions where the likelihood of a period specific treatment is estimated first followed by the impact estimation of all respective period effects in the second stage.

Formalizing the IV analysis, life satisfaction S_{it} for the full model (Model IIb, equation 2) is

$$S_{it} = \sum_{j=T-4}^{j=T+9+} d_{it,j}\gamma_j + \mathbf{x}_{1it}'\boldsymbol{\beta}_1 + b_i + \varepsilon_{it} = \boldsymbol{d}_{it}'\gamma + \mathbf{x}_{1it}'\boldsymbol{\beta} + b_i + \varepsilon_{it} , \tag{3}$$

with the 14 period specific retirement dummies $\boldsymbol{d}_{it}$, the $k_1 \times 1$ vector of observations on k_1 exogenous variables $\mathbf{x}_{1it}$, the unobserved individual effects b_i and the error term ε_{it}. The endogenous treatment variables $\boldsymbol{d}_{it}$, the vector of all pre- and post-retirement effects, in the first stage is estimated as a linear probability model by exogenous variables $\mathbf{x}_{1it}$ and the $k_2 \times 1$ vector of instruments $\mathbf{x}_{2it}$, which are not correlated with ε_{it} and any further exogenous variables $\mathbf{x}_{i1t}$ (exclusion restriction) as

$$d_{it,j} = \mathbf{x}_{1it}'\boldsymbol{\beta}_{1j} + \mathbf{x}_{2it}'\boldsymbol{\beta}_{2j} + b_{ij} + \nu_{it,j} \qquad j = T-4,...,T+9+ , \tag{4}$$

where b_{ij} measures unobserved heterogeneity and ν_{ijt} is the error term for a series of (14) separately fixed-effects panel regressions j ($j = T-4,...,T+9+$).

The estimated effects $\hat{\boldsymbol{d}}_{it}$ of equation (4) then are used in the second stage

$$S_{it} = \widehat{\boldsymbol{d}_{it}'}\gamma + \mathbf{x}_{1it}'\boldsymbol{\beta} + a_i + \eta_{it} . \tag{5}$$

with unobserved individual effects a_i and η_{it} as the error term.

Our instrumental-variables regression is based on first-differenced data with the reduced form

$$S_{it} = \boldsymbol{d}_{it}'\gamma + \mathbf{x}_{1it}'\boldsymbol{\beta}_1 + \mathbf{x}_{2it}'\boldsymbol{\beta}_2 + g_i + \varepsilon_{it} = \mathbf{z}_{it}'\boldsymbol{\delta} + g_i + \varepsilon_{it}$$

and

$$S_{it} - S_{i,t-1} = (\mathbf{z}_{it} - \mathbf{z}_{i,t-1})\boldsymbol{\delta} + \varepsilon_i - \varepsilon_{i,t-1} , \tag{6}$$

where $\mathbf{z}_{it} = \begin{bmatrix} \boldsymbol{d}_{it} & \mathbf{x}_{1it} & \mathbf{x}_{2it} \end{bmatrix}$ with the endogenous treatment variables $\boldsymbol{d}_{it}$, the exogenous variables which are not instrumented $\mathbf{x}_{1it}$, the exogenous variables which are the instruments $\mathbf{x}_{2it}$, and the fixed-effects g_i removed by differencing. The estimation method is first-differenced two-stage least squares (FD2SLS). While the fixed-effects estimator assumes that the explanatory variables in all periods are not related to the error terms

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[21] See the IV and causality discussion for example by Imbens 2014, Angrist, Imbens and Rubin 1996 and Angrist and Pischke 2009 chapt. 4.

in all periods (strict exogeneity), the assumptions for estimates on first-differenced data are weaker by assuming that explanatory variables and error terms are uncorrelated in the same and the surrounding periods (Bonsang and Klein 2011, 16).

The empirical challenge is to find appropriate instruments $\mathbf{x}_{2it}$. The general requirement: correlation with the respective retirement treatment but no correlation with other variables in the life satisfaction equation.

Which variables are usable as such instruments? First, individual age is named a candidate and used as an instrument in other comparable studies (Leimer 2017, 12; Horner 2014, 131; Bonsang and Klein 2012). As they point out, because all individuals pass the formal early and normal retirement ages, being eligible for early and normal retirement is exogeneous. This approach is followed and instruments used for being older than 60, 63 and 65 years (and other years) as identifying strategies which are motivated by German institutional rules (see Bonsang and Klein 2012, 16 and the discussion above and below).

In Germany there are various regulations concerning early old age retirement with and without deduction. Our data show a majority of GRV pensioners with early retirement (61.3% of all retired being younger than the official retirement age of 65 years): 14% with retirement between 63 and <=65, 29.7% with retirement between 60 and <=63 and about 17.7 % below 60 years (weighted data). Early retirement is considered by respective early retirement age-classes membership as instruments. Though both instruments, age and early retirement classes, beyond their link to institutional regulations, are linked by age, they nevertheless cover a different spectrum: the age classes comprise general living and life time cohort experiences and behaviour, the early retirement classes include explicitly the official age of entering retirement. Though belonging to an age-class and early retirement situation is the same for everyone therein, there is variation across age-cohorts with regard to the actual start of retirement, eligibility rules and other institutional regulations (see Deutsche Rentenversicherung (DRV) 2020).

Since the mid-eighties, the begin of our analysis, there were various changes of the GRV and civil service retirement laws in Germany. It is assumed that, in particular, changing eligibility rules and changes with respect to the official time of retiring, pension amount and other institutional regulations have influences on the individual retirement decision, our treatment variable to be explained. Again, those institutional arrangements are valid instruments, because all individuals pass the institutional arrangements, these instruments are exogeneous and not correlated with the life satisfaction outcome variable.

Institutional re-arrangements of this kind are selected and specified by the respective effective years as instrument dummies[22] (see Appendix A1 for single definitions). They encompass increases and restrictions in the pension age limit and pension level (inc_age_limit_1997, pension_res_1999, pension_lev_red_2001), old age part-time changes (inc_age_limit_2006), and gradual changes of pension by downstream taxation since 2005 (taxes_2005).[23] In addition, the finance crisis 2008/2009 (finance_cri-

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[22] Aware that the time (year) link is only a rough approximation with probably additional effects but its use is due to the available data. Nevertheless, time linked dummies are used in the literature (see for example the year-of-birth and quarter-of-birth dummies as instruments in the Angrist and Krueger 1991 schooling attendance analysis).

[23] One major change of pension laws in the last decade in Germany is about the stepwise increase of the normal retirement age-limit (Regelaltersgrenze, RV-Altersgrenzenanpassungsge-

sis_2009) is included - obvious being exogeneous - because the uncertain global economic situation and perspective could had influences on the individual retirement decision (for example by postponing deducted early retirement),

How might these instruments affect the old age retirement decision? The individual decision to retire D_i $(d_i = 0,1)$ could be described under an economic perspective as an individual optimization process of expected (potential) life satisfaction S_i^d with respect to costs of entering retirement $c(d, \mathbf{x}_{2it} \mathbf{z})$ as

$$D_i = \arg\max_{d \in (0,1)} u = f(S_i^d, c(d, \mathbf{x}_{2it})). \tag{7}$$

Costs (like for example deductions of early retirement) enter in the choice problem but the potential outcome (life satisfaction) is not affected by. If a certain non-observable utility level u in such a latent variable discrete choice setting is exceeded then the individual retires. Again, a valid instrument $\mathbf{x}_{2it}$ are the mentioned regulatory features, eligibility and general institutional rules, which typically will change the costs (and via utility trading the decision to retire) without affecting life satisfaction (potential outcome) directly.

Table 4 and Figure 6 show the IV estimation results for GRV and civil service pensioners. For comparison reasons the tables again show the fixed-effects results of the full Model IIb (Extended personal and occupation (all) (4)) of our correlation fixed-effects analysis form the first part of the paper. They include early retirement variables. As discussed above, there are good reasons to respect early retirement as an instrument which will be the case in the following. Tables 4 and 6 thus also offer comparable Model IIb fixed-effects estimates without early retirement.[24]

The IV estimation requires at least as many instruments as there are treatment effects in the outcome equation. With 14 treatment effects in our case thus at least 14 instruments have to be specified for 14 single estimates if all effects are analysed together. For the sake of brevity all single 14 estimates of the first stage behind are not shown here but available from the author by request.

One final note with regard to our model specification: there are arguments to incorporate a time variable in the estimation. Because the instruments discussed above are linked to time no further unspecific time variables are specified.

IV results GRV pension

The fixed-effects correlation analysis (Model IIb) for GRV pensioners of the first part of our study yields the pre-retirement period (T-1) as the only significant retirement effect on life satisfaction. This significant effect is positive. With no significant effects before

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setz 2007) from 65 to 67 years effective 2012 till 2029. Till 2023 the lifelong working years is increased every year by one month; after 2023 the increase is two month per year. Because our data ends 2015, maximal four additional months had to be considered in addition to the normal pension age-limit of 65 under the new law. Because this number of months vanishes in the available yearly data this law is not considered further on.

[24] Model IIb (fixed-effects) with and without early retirement result in the same significant (< 5%) treatment periods and similar socio-economic influence for both pensioner groups. Period T+6 of civil service pensioners only misses the 5% limit with 5.3% significance.

and after T-1, this positive effect indicates some anticipation followed by adaptation to the long run pre-retirement situation.

IV GRV results with full set of IVs

The full model (Model IIb) IV FD2SLS second stage estimation – with more than 14 above discussed instruments (IV 1) – also shows a positive significant effect at T-1, supporting the fixed-effects result being a causal effect of improving life satisfaction in the first period before retirement. The pre-retirement u-shaped development (T-4 positive significant, T-3 not significant, T-1 positive significant) refer to a pleasant anticipation of retirement comparable to a mentioned Ashenfelter dip. The falling life satisfaction thereafter even to a significant negative effect at T+2 and the later not significant effect at all strengths the anticipation and adaptation development around T-1 (Table 4, column 3).

IV GRV pension results with partitioned sets of IVs

Retirement is a far-reaching break in the way of life. Hence, to answer the question if the pre-retirement and post-retirement estimates therefore differ, our IV analysis is partitioned into two estimation parts (four pre-retirement and the ten retirement and post-retirement periods). The result: Still with the full IV set like above (IV 1) there is a more pronounced and significant pre-retirement u-shape of life satisfaction (Table 4, column 4) followed by significant less satisfied post-retired GRV pensioners (Table 4, column 5). Life satisfaction after retirement is dipping steeply till T+2, then improves slightly but will remain significant less satisfied respectively not different compared to the long run pre-retirement life satisfaction level. Thus, both the fixed-effects correlation and the partitioned causal IV analyses show no significant positive post-retirement effects. Whereas the correlation results detect no significant different post-retirement effects compared to the long run pre-retirement, the partitioned causal IV analysis even yields in 7 of 9 periods significant negative retirement effects on life satisfaction.

This result is supported by a further scarce modelling specification. The IV set is reduced (to IV 2) within the partitioned estimates and concentrated the instruments to particular expected effects of a change in the retirement age limit (age_limit_inc_1997) and the reduction of the pension level (pension_level_red_2001). The result (Table 4, columns 6 and 7): the pre-retirement development again is u-shape, all post-retirement effects are not significant as in the correlation analysis.

Causality results GRV pension altogether: GRV pensioners anticipate retirement with increase life satisfaction till T-1 (fixed-effects correlation and causal IV results) and show adaptation to the long-term pre-retirement situation (fixed-effects correlation and FD2SLS with IV 2) and even diminished life satisfaction (two parts IV 1) after retirement.

In other words, by both, the fixed-effects correlation and the IV analyses, with no positive retirement effects the answer to the question if GRV pensioners are more satisfied is no, a remarkable result.

IV results civil service pension

The fixed-effect correlation analysis of civil service pensioners (full Model IIb) yields three positive significant post-retirement effects for T+1, T+6 and T+7[25], all other treatment coefficients are not significant. Some pleasant anticipation in the development of

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[25] Two positive effects at T+1 and T+7 with fixed-effects estimates *without early retirement* (Appendix Table A2, column 2).

Table 4: **The effect of retirement (GRV pension) on life satisfaction in alternative IV specifications (Model IIb), Fixed-effects (FE) and IV FD2SLS regression results, Germany 1985 to 2015**

GRV pension	FE		IV Model II b	IV Model II b	IV FD2SLS IV Model II b	IV Model II b	IV Model II b
		Model II b	all	pre-ret.	T, post-ret.	pre-ret.	T, post-ret.
	Model II b	without Early ret.	IV 1	IV 1	IV 1	IV 2	IV 2
	1	2	3	4	5	6	7
RETIREMENT							
Retired T-4	0.00749	0.00795	9.462**	1.728*		2.459**	
Retired T-3	0.0239	0.0248	-1.243	-2.316***		-2.388***	
Retired T-2	0.0716	0.0729+	-0.837	-2.165***		-2.246***	
Retired T-1	0.149**	0.151**	5.167*	0.362***		0.371***	
Retired T	0.0823	0.0242	3.186		-3.028*		-6.818
Retired T+1	0.101	0.102	3.058		-3.773*		-8.156
Retired T+2	0.0685	0.07	-14.43**		-13.28***		27.37
Retired T+3	0.145+	0.146+	-6.335+		-9.263***		16.22
Retired T+4	0.108	0.11	-1.933		-8.823***		-168.8
Retired T+5	0.0769	0.0786	0.13		-5.740***		-107.3
Retired T+6	0.136	0.137	0.779		5.182		87.73
Retired T+7	0.136	0.138	-1.89		-1.8		209.9
Retired T+8	0.131	0.133	0.0158		-5.033		223.5
Retired T+9+	0.0521	0.0543	-0.609		-7.998**		49.29
PERSONAL DATA							
Age	-0.0382	-0.0381					
Age²	-0.0135	-0.0136	-0.00599	-0.014	0.256+	-0.0138	-1.718
Married	0.0762*	0.0759*	0.0372	0.0926***	0.0791	0.0924***	-0.539
Widowed	-0.314***	-0.315***	-0.664**	-0.538***	-0.643***	-0.523***	3.478
Health	-0.471***	-0.472***	-0.363***	-0.349***	-0.397***	-0.348***	-0.362
Phsician visits	-0.0125***	-0.0126***	-0.0175***	-0.0102***	-0.0126***	-0.0103***	0.0117
Early retirement 63<65	0.0403						
Early retirement 60<63	-0.0336						
Early retirement <60	-0.323*						
Education	-0.612	-0.611	-3.023	-0.924***	-1.111	-0.922***	-2.456
Education²	0.0248	0.0247	0.111	0.0342***	0.0433	0.0342***	0.122
Big 5: Openness	-0.672	-0.673	-0.61	-1.174*	0.14	-1.128+	32.09
Big 5: Conscientiousness	-1.922*	-1.923*	-0.0616	-1.162**	-1.866	-1.164*	-16.59
Big 5: Extraversion	2.361*	2.360*	3.041	1.438*	3.367+	1.412*	22.86
Big 5: Agreeableness	-1.397	-1.394	-8.257	-2.381**	-2.888	-2.410**	-28.52
Big 5: Neuroticism	-0.354	-0.356	-2.903	-0.644	0.0668	-0.683	11.58
OCCUPATION							
Liberal profession	-0.128	-0.128	0.14	0.0216	-0.0134	0.0286	-1.234
Entrepreneur	-0.111+	-0.110+	-0.104	0.00581	-0.138	0.00895	-2.145
Blue collar worker	-0.0871+	-0.0867+	0.0467	-0.00931	-0.0784	-0.0091	-1.196
White collar worker	-0.132**	-0.132**	-0.0445	-0.0339	-0.0996	-0.0368	-1.366
Civil service pensioner (Beamter)	-0.249**	-0.248**	-0.1	-0.129*	-0.193	-0.125*	-1.765
Unemployed (registered)	-0.422***	-0.425***	-0.375*	-0.333***	-0.440***	-0.331***	-0.53
JOB / PENSION							
Working hours (weekly)	0.00814***	0.00808***	0.0112	0.00846***	0.0108**	0.00839***	0.0834
Working hours² 10⁻²	-0.0100**	-0.00998**	-0.0123	-0.00853***	-0.0143**	-0.00842***	-0.0956
Earned income 10⁻³	0.239***	0.239***	-0.117	0.107***	0.0983	0.105***	0.552
Earned income² 10⁻⁵	-0.751+	-0.755+	1.275	-0.109*	-0.209	-0.105+	-6.571
GRV amount 10⁻³	0.223*	0.223*	2.965	0.310***	3.401*	0.315***	9.192
GRV amount² 10⁻⁵	-1.633	-1.563	-85.28	-2.254***	-88.08**	-2.290***	-292.8
SOCIAL PARTICIPATION							
Hobbies	0.0129**	0.0129**	-0.00069	0.000303	0.00126	-0.000158	-0.0273
Volunteer/Political	-0.00361	-0.00342	-0.00143	-0.000283	-0.00596	0.0000776	0.00407
HOUSEHOLD							
Care household	-0.343***	-0.343***	-0.189+	-0.171***	-0.185**	-0.171***	-0.224
Household size	-0.0374**	-0.0376**	0.0363	0.00712	0.0445+	0.00691	0.0767
Number of children<19	0.0455**	0.0456**	0.115	0.0415*	0.0769*	0.0431*	-0.149
Residual income 10⁻³	0.109***	0.109***	0.136***	0.0570***	0.0664***	0.0573***	0.0983
Residual income² 10⁻⁵	-0.442***	-0.443***	-0.542+	-0.113***	-0.0334***	-0.114***	-0.0505

Table 4 cont.

GRV pension	FE			IV Model II b	IV Model II b	IV FD2SLS IV Model II b	IV Model II b	IV Model II b
		Model II b		all	pre-ret.	T, post-ret.	pre-ret.	T, post-ret.
	Model II b	without Early ret	IV 1	IV 1	IV 1	IV 1	IV 2	IV 2
	1	2	3	4	5	6	7	
REGION								
East	0.157+	0.157+	-0.09	0.0227	-0.26	0.0264	-3.306
Constant	25.60*	25.61*	-0.188	-0.0749***	-0.217	-0.0766***	0.931
INSTRUMENTS								
			IV 1	IV 1	IV 1	IV 2	IV 2	
R2 within	0.0812	0.081	0.0000904	0.0126	0.0005	0.0102	0.0000572
F-Test (fe) resp. Wald-Test (fd)	63.38***	67.17***	549.56***	5835.51***	1903.94***	5486.26***	6.41
Max groups	17	17	16	17	20	17	20
Average groups	7.7	7.7	7.3	8.4	8.4	8.4	8.4
Clusters	10370	10370	9271	19369	14471	19369	14471
Observations	79617	79617	66278	150497	118338	150497	118338

IV 1: age_ge50, age_ge55, age_ge60, age_ge63, age_ge65, early_63_lt65, early_60_lt63, early_lt60, age_limit_inc_1997, pension_res_1999, pension_lev_red_2001, age_limit_inc_2006, taxes_2005, taxes_2005_2, taxes_2005_3, finance_crisis_2009

IV 2: age_ge50, age_ge55, age_ge60, age_ge63, age_ge65, early_63_lt65, early_60_lt63, early_lt60, age_limit_inc_1997, pension_lev_red_2001

Note: t statistics (Fixed-effects: on robust standard errors) significance: + $p<0.10$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$

Source: Results of fixed-effects (FE) and IV FD2SLS regression Model IIb (with controls), SOEP Socio-Economic Panel data 1985-2015.

effects till T+1 and then adaptation with no significant effects is visible (exemption a positive effect at T+7). Is there a similar picture under the causality perspective?

IV civil service results with full set of IVs

The full model (Model IIb) IV FD2SLS second stage estimation – with the same specification as for GRV pensioners and the above full set of more than 14 instruments (IV 1) – for civil service pensioners show no significant coefficients for all 14 before and after retirement treatment effects and for all control variables as well (Appendix Table A2, column 3). Moreover, the coefficients are relatively large and not convincing from an economic point of view. Hence the GRV specification to explain civil service pension life satisfaction is not successful under the causality perspective.

So, how to proceed? Various specifications with combinations of the above discussed single policy measures result in no significant coefficients either. An extension of retirement policy measures by individual circumstances like job pressure (as exposition to hazardous conditions, job is high stress, job involves hard manual labor) or official disability in favour of early retirement, show large single coefficients and do not yield significant results as well. Because the 16 German states (Länder) have some different retirement ages for civil service pensioners an appropriate Länder IV approach was also estimated. However, there are no significant results, too. Thus, all the different IV approaches within the full 14 periods approach (IV 1) are not successful to detect significant influences.

IV civil service pension results with partitioned sets of IVs

Will partitioned estimates better explain the situation? The result (Appendix Table A2, columns 4, 5): no significant retirement and post-retirement effects are shown (T, T+1, … T+9+). However, there are significant influences at T-4 and T-3 which diminish

life satisfaction in those years relatively long before the actual retirement period followed by no effects later on. A three partitioned estimation (not shown here) delivers

Figure 6: **The effect of retirement (GRV pension and Civil service pension) on life satisfaction in alternative IV specifications (Model IIb), Fixed-effects (FE) and IV FD2SLS regression results, Germany 1985 to 2015**
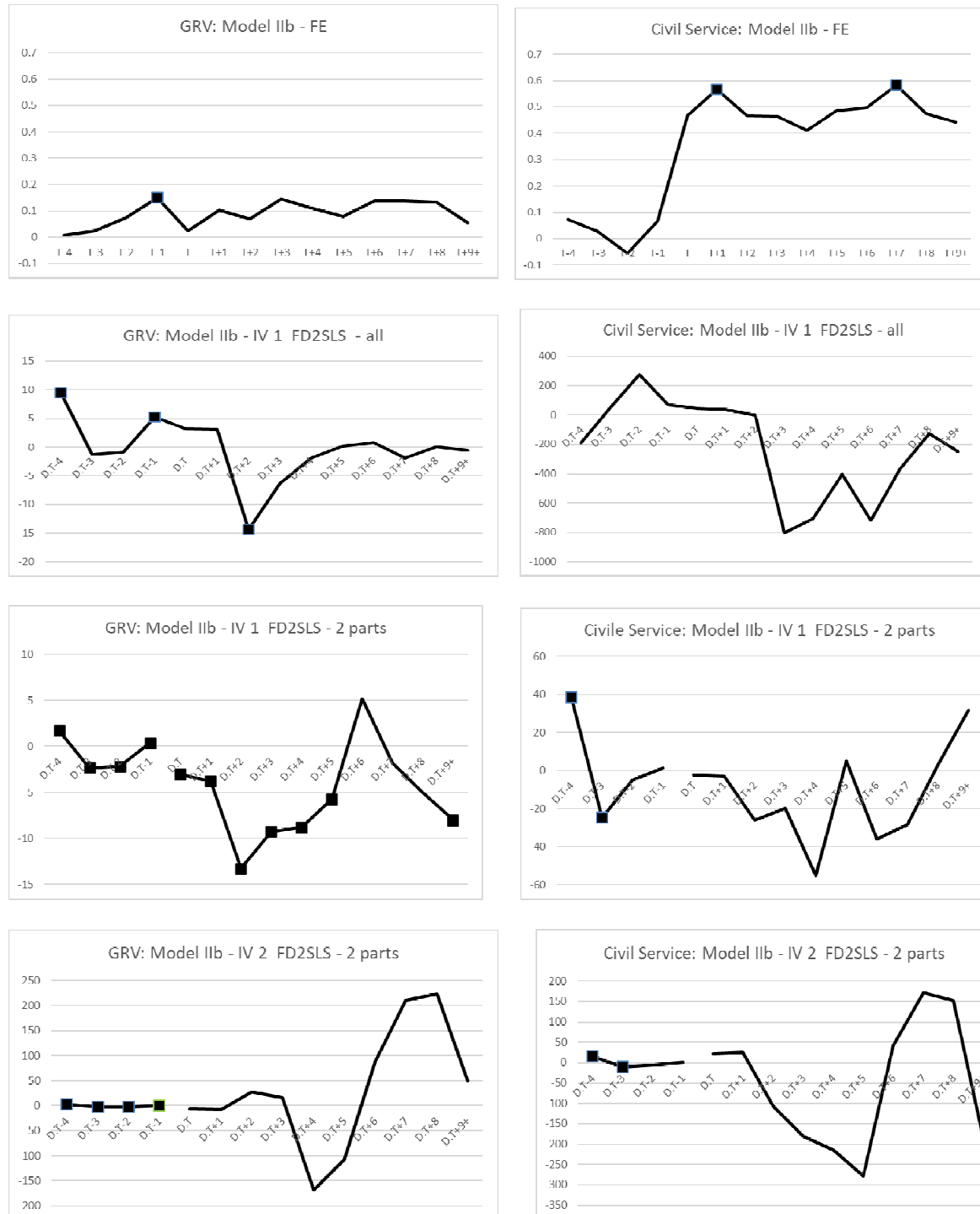
Source: Fixed-effects (FE) and IV FD2SLS regression Model IIb (with controls), SOEP Socio-Economic Panel data 1985-2015; dots mark estimated significant influence with at least 5 % significance; detailed regression results in Table 4 and Appendix Table A2.

the same result. The u-shaped pre-retirement development is somewhat comparable to the GRV pre-retirement IV estimation.

As to the GRV sparce IV specification then the IV set is reduced (to IV 2) within the partitioned estimates and concentrates the instruments again to particular expected effects of a change in the retirement age limit (age_limit_inc_1997) and the reduction of the pension level (pension_level_red_2001). The result: again, the early periods T-4 and T-3 are significant; later all the effects are not significant (Appendix Table A2, column 7). Thus, the partitioned IV 1 and IV 2 approaches for civil service pensioners both show a u-shaped pre-retirement anticipation and then adaptation to permanent neutral effects.

Though the IV picture of different partitioned models are stable, however some caveats have to be made to the civil service findings. The different result compared to the fixed-effects correlation analysis (there with significant positive coefficients in T+1 and T+7), insignificant not partitioned estimates and various not successful IV specifications ask for a careful final conclusion. In addition, even with 31 panel waves there are only relatively few observations available (remember the data provide 737 civil service pensioners but 6,794 GRV pensioners). One conclusion, the specific civil service situation with a protected working life and a better off old age pension situation asks for additional data and explanatory pattern than captured so far by the available controls.

Causality results civil service altogether: Civil service pensioners show a u-shaped pre-retirement anticipation and then adaptation to permanent neutral effects (partitioned IV 1 and IV 2 causal approaches). Remember, the fixed-effects correlation result – anticipation to T+1 and, then adaptation with neutral effects till one further significant positive effect at T+7 – is not supported by the permanent neutral post-retirement IV effects. Nevertheless, the different IV specifications show civil service pensioners who are not more satisfied when compared to the long run pre-retirement satisfaction level.

To conclude so far: Beyond differences between the GRV and civil service results there are two striking findings with our causal analysis: for both there are anticipation effects followed by adaptation. And, the answer to our paper's question, if retires are more satisfied, is no, both for GRV and civil service pensioners.

6   Discussion, summary and outlook

The present study examines the influence of an individual's retirement on general life satisfaction. A potentially comprehensive reorientation of an individual's life after the end of a phase of gainful employment might lead to changes in his or her subjectively perceived current life satisfaction. An investigation of changes in the course of life requires a panel analysis which allows the analysis on the individual level. Our panel study examines in particular the importance of anticipation and adaptation effects on life satisfaction in the years before (four years) and after retirement (nine years and longer) and offers new results for Germany.

Descriptive results

From the aggregate descriptive analysis over 31 years two main conclusions can be drawn: First, GRV pensioners are *less* satisfied than non-GRV pensioners and, in contrast, civil service pensioners are *more* satisfied than non-civil service pensioners. And second,

the global average life satisfaction of civil service pensioners is *higher* than that of GRV pensioners.

Fixed-effects results

Surprisingly, uncontrolled negative retirement life satisfaction effects are vanished in all pre- and post-retirement periods when socio-economic controls are incorporated in the fixed-effects panel model estimates. This holds both for GRV pensioners as well as for civil service pensioners.

Alternative model specifications bundled in four domains: *Personal (1), Extended Personal (2), Personal and occupation (3),* and *Extended Personal and occupation (all) (4)* detect a remarkable result: the significance of Personal and Extended personal characteristic effects disappears when the (former) occupational situation enter the socio-economic controls (Personal and occupation as well as Extended Personal and occupation).

The inclusion of different socio-economic control domains acts in the same manner for both pension groups, GRV pension and civil service pension: the individual *occupational background* absorbs (almost) all positive significant individual socio-economic effects of retirement on life satisfaction. Hence, the occupational structuring of life prevents the positive personal retirement influence on life satisfaction. The fixed-effects estimates (full model (4)) refute the thesis that retirement increases life satisfaction of retirees, both for GRV and civil service pensioners.

Causality, anticipation and adaptation

The causal estimates with various Instrumental Variables (IV) both for GRV and civil service pensioners yields two striking findings: for both pension groups there are u-shaped *anticipation effects* with increase in life satisfaction before retirement followed by *adaptation* instantly when retired. With neutral respectively negative post-retirement adaptation there is no positive retirement effect on life satisfaction after retirement, a remarkable result which confirms the fixed-effects correlation results. And, our partitioned IV results, beyond neutral effects, show post-retirement life satisfaction which is even worse than the long-term pre-retirement situation.

Thus, are retirees more satisfied? The striking answer to our paper's question, both for GRV and civil service pensioners, is: no. Hence, the believe in a positive effect of retirement on life satisfaction can result in an erroneous conclusion and is misleading if not short, medium and longer term pre- and post-retirement circumstances are considered.

Because our study explicitly respects shorter, medium termed and longer effects than global termed retirement effects and is based on a large set of individual panel data with 31 years of individual reported information and 14 periods effects, our results can hardly be compared to other empirical studies with other or more restricted data bases or different approaches. Nevertheless, our results are comparable to a certain degree with an anticipation effect shown in the British study by Kesavayuth et al. 2016. As to Atchley 1976, a positive, pleasant anticipation is like a honeymoon effect expecting the paradise without working anymore; a situation addressed in the introducing scenario. However, the Kesavayuth et al. 2016 and the British Study by Gorry et al. 2018 are in contrast to our results there and by other cited studies with increased and higher long-lasting life satisfaction level after retirement. Yet, the result by Horner 2014, with relatively neutral effects over the long term, and the German result by Bonsang and Klein 2012, with a negligible effect on voluntary but negative effect on involuntary retirement, are in some accordance to our results.

Altogether

In all, our panel results offer the following narrative: it is the individual's personal and family life situation, social participation with its personality traits behind, its experience and expectations which overcomes a pure retirement effect. Though many personal circumstances even increase life satisfaction for some periods, yet the (former) work life conditions and experience in particular seems to be the constitutive dimension, so that all in all the positive effect vanishes. It seems that work life for many is the central orientation and center of life which is structuring the living conditions. Retirement then will tear the anchor and sense of life so far and prevent an increased life satisfaction thereafter. So, our result is comparable with the role theory predication which "points to job occupation as a fundamental determinant of retirement satisfaction, reflecting whether individuals feel that they have lost meaning in their lives, or on the contrary feel relieved to have abandoned their jobs" (Clark and Fawaz 2009, 6), and its corresponding crisis theory Calasanti (1999). So, a lesson from our study might be: the more your life could be independent from the (former) job circumstances the more satisfied you will be when retired. And concerning the paper's allover question again: Are retirees more satisfied? Our striking answer for Germany - in contrast to many findings in the literature - is no, both for GRV and civil service pensioners.

Appendix A1: Variables and Definitions

Variable	Definition
DEPENDENT VARIABLE	
Current life satisfaction	11-point scale: 0=completely dissatisfied, 10=completely satisfied
RETIREMENT	
Retirement	Dummy (0=Not retired, 1=Retired; Retirement=Receipt of pension benefits)
Retirement T-4	Dummy; Upcoming retirement in 4-5 years
Retirement T-3	Dummy; Upcoming retirement in 3-4 years
Retirement T-2	Dummy; Upcoming retirement in 2-3 years
Retirement T-1	Dummy; Upcoming retirement in 1-2 years
Retirement T	Dummy; Retirement began during the last year
Retirement T+1	Dummy; Retirement began 1-2 years ago and still retired
Retirement T+2	Dummy; Retirement began 2-3 years ago and still retired
Retirement T+3	Dummy; Retirement began 3-4 years ago and still retired
Retirement T+4	Dummy; Retirement began 4-5 years ago and still retired
Retirement T+5	Dummy; Retirement began 5-6 years ago and still retired
Retirement T+6	Dummy; Retirement began 6-7 years ago and still retired
Retirement T+7	Dummy; Retirement began 7-8 years ago and still retired
Retirement T+8	Dummy; Retirement began 8-9 years ago and still retired
Retirement T+9+	Dummy; Retirement began over 9 years ago and still retired
PERSONAL DATA	
Age	Age in years
Age^2	Age in years^2
Married	Dummy (0=no, 1=yes)
Widowed	Dummy (0=no, 1=yes)
Health	Current state of health 1=very good, 5=poor
Physician visits	Number of visits of all physicians within the last three months
Early Retirement 63-65	Early Retirement: Age >= 63 & age < 65 & Retirement
Early Retirement 60-63	Early Retirement: Age >= 60 & age < 63 & Retirement
Early Retirement 60	Early Retirement: Age < 60 & Retirement
Education	Years of school
Big 5: Openness	Openness (three variables mean) 1=does not apply, 7=applies fully
Big 5: Conscientiousness	Conscientiousness (three variables mean) 1=does not apply, 7=applies
Big 5: Extraversion	fully
Big 5: Agreeableness	Extraversion (three variables mean) 1=does not apply, 7=applies fully
Big 5: Neuroticism	Agreeableness (three variables mean) 1=does not apply, 7=applies fully
OCCUPATION	Neuroticism (three variables mean) 1=does not apply, 7=applies fully
Freelancer (Liberal profession)	Dummy (0=no, 1=yes)
Entrepreneur	Dummy (0=no, 1=yes)
Blue collar worker	Dummy (0=no, 1=yes)
White collar worker	Dummy (0=no, 1=yes)
Civil service (*Beamter*)	Dummy (0=no, 1=yes)
Unemployed (registered)	Dummy (0=no, 1=yes)
JOB	
Working hours	Actual weekly working hours
Working time^2	Working hours^2
Earned income	Personal net earned income, monthly
Earned income^2	Earned income^2
Secondary paid income	Days/month and hours/day
SOCIAL PARTICIPATION	
Hobbies	Hours a normal workday
Volunteer/political active	Active as a volunteer or political active (0=no, 1=each week, each month or more seldom)
HOUSEHOLD	
Care	Nursing care of those in need within the household (0=no, 1=yes)
Household size	Household size

No. of children	Total number of children (<19 years old)
Residual income	Household net income – personal earned income – pension income
Residual income²	Residual income²
REGION	
East	Germany (0=old federal states (west), 1=new federal states (east))

Source: Own compilation from the variables in the Socio-Economic Panel (long version) 1984-2016.

Instruments GRV and civil service pension

age	By age classes; 0,1 dummies
early	Early retirement by age classes; 0,1 dummies
inc_age_limit_1997	Increase of age limit for women and longtime insured person (Gesetz zur Förderung eines gleitenden Übergangs in den Ruhestand, WFG); inc_age_limit_1997=1 if year>=1997, =0 else
pension_res_1999	GRV pension for unemployed, old age part-time, GRV pension for women restricted for born before 1952 (Rentenreformgesetz, RRG '99); pension_res_1999=1 if year>=2000 and born < 1952, =0 else
pension_lev_red_2001	Reduction of pension level Altersvermögenergänzungsgesetz, AVmEG); pension_lev_red_2001=1 if year>=2001, =0 else
taxes_2005	Gradual change of pension by downstream taxation 2005 till 2040 (Alterseinkünftegesetz, AltEinkG 2004, effective 2005); taxes_2005=year-2004 if year>=2005 else taxes_2005=0; taxes_2005_2= taxes_2005²; taxes_2005_3= taxes_2005³
inc_age_limit_2006	Increase of age limit to 63 for the earliest pension demand of unemployed or old age part-time (RV-Nachhaltigkeitsgesetz 2004, effective 2006); inc_age_limit_2006=1 if year>=2006, =0 else
finance_crisis_2009	Finance crisis 2008/2009; =1 if year>=2009, =0 else

Source: Rentenversicherung Bund (DRV) 2020, Gesetzeschronik, Berlin.

Appendix Table A1: The effect of retirement (civil service pension) on life satisfaction in alternative socio-economic control domains with and without accounting for anticipation and adaptation – Fixed-effects regression results, Germany 1985 to 2015

Civil service pension			Personal		Extended personal		Personal and occupation		Extended personal and occupation (all) (4)	
Scenario	(1) … (4)	(1) … (4)	(1)		(2)		(3)			
	Model I a	Model II a	Model I b	Model II b	Model I b	Model II b	Model I b	Model II b	Model I b	Model II b
RETIREMENT										
Retirement	-0.133***		0.228***		0.269***		0.0809		0.0308	
Retirement T-4		0.0366		0.0862		0.0718		0.0874		0.0724
Retirement T-3		-0.125		0.0319		0.0173		0.0433		0.0272
Retirement T-2		-0.217		-0.0541		-0.0788		-0.025		-0.0542
Retirement T-1		-0.226		0.0784		0.0522		0.101		0.0645
Retirement T		-0.0221		0.237		0.309		0.372		0.365
Retirement T+1		-0.0234		0.492***		0.577***		0.592*		0.588*
Retirement T+2		-0.124		0.376**		0.480***		0.478+		0.489+
Retirement T+3		-0.105		0.383**		0.474***		0.490+		0.487+
Retirement T+4		-0.164		0.328*		0.428**		0.429+		0.433+
Retirement T+5		-0.117		0.382*		0.499**		0.490+		0.508+
Retirement T+6		-0.0944		0.393*		0.508**		0.505*		0.520*
Retirement T+7		0.00031		0.475**		0.589***		0.592*		0.606*
Retirement T+8		-0.126		0.401*		0.477**		0.518*		0.496+
Retirement T+9+		-0.249+		0.337*		0.438**		0.465+		0.466+
PERSONAL										
Age			-0.0600***	-0.137***	-0.0735***	-0.171***	-0.0254***	-0.0234	-0.0418***	-0.0268
Age²			0.0341***	0.0250*	0.0488***	0.0415***	-0.0057	-0.0185	0.00211	-0.0135
Married			0.131***	0.113***	0.113***	0.0784*	0.117***	0.110***	0.1000***	0.0763*
Widowed			-0.164***	-0.244**	-0.228***	-0.339***	-0.158***	-0.239**	-0.220***	-0.321***
Health			-0.484***	-0.479***	-0.478***	-0.475***	-0.479***	-0.478***	-0.472***	-0.472***
Phsician visits			-0.0105***	-0.0128***	-0.0101***	-0.0129***	-0.0104***	-0.0127***	-0.0100***	-0.0127***
Early retirement 63<65			-0.0387	0.323	-0.0393	0.303	-0.0726	0.378	-0.0945	0.352
Early retirement 60<63			-0.126	0.3	-0.129	0.329	-0.125	0.331	-0.144	0.356
Early retirement <60			-0.194	0.0355	-0.222+	0.0254	-0.186	0.0843	-0.220+	0.0749
Education			-0.860***	-1.184**	-1.043***	-1.381**	-0.395***	-0.426	-0.564***	-0.393
Education²			0.0302***	0.0412**	0.0369***	0.0471**	0.0144***	0.0179	0.0207***	0.0167
Big 5: Openness			-0.426*	-1.031+	-0.304	-0.958	-1.031***	-0.656	-1.051***	-0.567
Big 5: Conscientiousness			0.673*	1.184*	0.801*	2.056***	-0.478+	-1.653*	-0.603+	-1.755*
Big 5: Extraversion			0.974	-1 175	1.427*	-2.053+	0.572	1.819+	0.876*	1.933+
Big 5: Agreeableness			-2.055***	-3.231***	-2.579***	-3.924***	-0.680*	-0.878	-1.166***	-0.821
Big 5: Neuroticism			-0.199	-2.743***	-0.0856	-3.229***	-0.21	-0.477	-0.263	-0.29

Appendix Table A1 cont.

Civil service pension	(1) … (4)	(1) … (4)	Personal (1)		Extended personal (2)		Personal and occupation (3)		Extended personal and occupation (all) (4)	
Scenario	Model I a	Model II a	Model I b	Model II b	Model I b	Model II b	Model I b	Model II b	Model I b	Model II b
OCCUPATION										
Liberal profession							-0.116***	-0.147+	-0.103**	-0.126
Entrepreneur							-0.123***	-0.118+	-0.103***	-0.109+
Blue collar worker							-0.0783***	-0.0823+	-0.0691***	-0.0936*
White collar worker							-0.0941***	-0.134**	-0.0796***	-0.142***
Civil service pensioner (Beamter)							-0.106**	-0.119	-0.0891*	-0.145
Unemployed (registered)							-0.565***	-0.468***	-0.567***	-0.476***
JOB / PENSION										
Working hours (weekly)							0.00481***	0.00581*	0.00500***	0.00630**
Working hours²							-0.00824***	-0.00833**	-0.00832***	-0.00849**
Earned income 10^{-3}							0.0980***	0.156**	0.123***	0.234***
Earned income² 10^{-5}							-0.976**	-0.416	-0.121	-0.761+
GRV amount 10^{-3}							0.053	-0.137	0.139*	-0.0882
GRV amount² 10^{-4}							0.039	0.211	-0.0611	0.184
SOCIAL PARTICIPATION										
Hobbies					-0.00288	0.00907*			0.00632**	0.0135***
Volunteer/Political					0.00194	0.00356			0.00118	-0.00243
HOUSEHOLD										
Care household					-0.445***	-0.343***			-0.435***	-0.342***
Household size					-0.0170**	-0.0345*			-0.0331***	-0.0423**
Number of children<19					0.0193*	0.0497**			0.0280***	0.0485**
Residual income 10^{-4}					0.477***	0.972***			0.680***	1.11***
Residual income² 10^{-5}					-0.03***	-0.424***			-0.0401***	-0.465***
REGION										
East					-0.051	0.162+			-0.0342	0.158+
Constant	7.061***	6.856***	21.23***	53.77***	21.59***	60.83***	21.41***	22.68+	25.21***	20.96+
R2 within	0.000051	0.000166	0.0697	0.0706	0.0722	0.0738	0.079	0.0771	0.0823	0.0805
F-Test	11.25***	0.85	647.79***	96.56***	432.90***	74.99***	428.18***	74.80***	331.49***	62.41***
Max groups	31	18	22	17	22	17	22	17	22	17
Average groups	9 458	8 116	8 465	7 861	8 274	7 738	8 377	7 790	8 199	7 677
Clusters	51053	11048	41953	10699	40684	10439	41591	10623	40345	10366
Observations	482841	89669	355147	84106	336607	80778	348408	82750	330805	79582

Note: t statistics based on robust standard errors in parentheses; + p < 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001
Source: SOEP Socio-Economic Panel data 1985-2015, own calculation.

Appendix Table A2: The effect of retirement (civil service pension) on life satisfaction in alternative IV specifications (Model IIb), Fixed-effects (FE) and IV FD2SLS regression results, Germany 1985 to 2015

Civil service pension	FE				IV FD2SLS		
			IV Model II b	IV Model II b	IV Model II b	IV Model II b	IV Model II b
		Model II b	all	pre-ret.	T, post-ret.	pre-ret.	T, post-ret.
	Model II b	without early ret.	IV 1	IV 1	IV 1	IV 2	IV 2
	1	2	3	4	5	6	7
RETIREMENT							
Retired T-4	0.0724	0.0727	-188.1	38.46***		15.09*	
Retired T-3	0.0272	0.0273	50.79	-24.57**		-10.16*	
Retired T-2	-0.0542	-0.0547	275	-4.996		-5.511	
Retired T-1	0.0645	0.0651	71.52	1.307		1.308	
Retired T	0.365	0.467+	45.36		-2.176		22.44
Retired T+1	0.588*	0.566*	35.35		-2.919		25.75
Retired T+2	0.489+	0.468+	-3.263		-26.09		-107.6
Retired T+3	0.487+	0.464+	-801.5		-19.62		-179.8
Retired T+4	0.433+	0.411	-706		-55		-214.7
Retired T+5	0.508+	0.485+	-404.6		5.169		-277.8
Retired T+6	0.520*	0.497+	-719.5		-36.06		42.16
Retired T+7	0.606*	0.583*	-365.3		-28.21		171.3
Retired T+8	0.496+	0.473+	-128.8		3.126		153
Retired T+9+	0.466+	0.443	-249		31.91		-190.7
PERSONAL DATA							
Age	-0.0268	-0.0271					
Age²	-0.0135	-0.0135	0.677	0.023	-0.185	0.0117	0.299
Married	0.0763*	0.0762*	-1.082	0.0479	0.0224	0.0838*	-0.028
Widowed	-0.321***	-0.322***	1.183	-0.565***	-0.645**	-0.612***	0.407
Health	-0.472***	-0.472***	-0.368	-0.333***	-0.377***	-0.345***	-0.336
Phsician visits	-0.0127***	-0.0127***	-0.0525	-0.00911***	-0.0126***	-0.00888***	-0.00949
Early retirement 63<65	0.352						
Early retirement 60<63	0.356						
Early retirement <60	0.0749						
Education	-0.393	-0.397	3.252	-1.073+	-1.183	-1.011**	14.68
Education²	0.0167	0.0168	-0.137	0.0387+	0.0478	0.0369**	-0.526
Big 5: Openness	-0.567	-0.570	-24.5	-1.729	5.445	-1.469*	-14.22
Big 5: Conscientiousness	-1.755*	-1.757*	13.42	-1.204	-1.547	-1.199*	-19.31
Big 5: Extraversion	1.933+	1.939+	-18.43	1.845	4.222	1.673*	-2.317
Big 5: Agreeableness	-0.821	-0.830	16.97	-2.765	-5.197	-2.550*	47.73
Big 5: Neuroticism	-0.290	-0.293	-15.9	-0.467	3.365	-0.512	-1.766
OCCUPATION							
Liberal profession	-0.126	-0.126	-1.292	-0.00994	0.0738	-0.0211	-0.0529
Entrepreneur	-0.109+	-0.109+	0.0833	-0.0175	-0.0737	-0.0178	-0.731
Blue collar worker	-0.0936*	-0.0936*	-0.362	-0.0306	-0.105	-0.0258	0.0349
White collar worker	-0.142***	-0.142**	0.0708	-0.0614	-0.15	-0.0458	-0.0798
Civil service pensioner (Beamter)	-0.145	-0.142	-4.611	0.0319	-0.497	0.00142	0.326
Unemployed (registered)	-0.476***	-0.476***	-0.674	-0.325***	-0.345***	-0.330***	-0.134
JOB / PENSION							
Working hours (weekly)	0.00630**	0.00629**	-0.00626	0.00889**	0.00930+	0.00848***	0.0231
Working hours² 10⁻²	-0.00849**	-0.00849**	0.00535	-0.0100*	-0.0125**	-0.00904***	-0.024
Earned income 10⁻³	0.234***	0.234***	-0.57	0.106*	0.226	0.109***	2.192
Earned income² 10⁻⁵	-0.761+	-0.761+	5.924	-0.0999	-1.641	-0.11	-12.05
GRV amount 10⁻³	-0.0882	-0.0666	9.746	0.874	1.562	0.872	-15.42
GRV amount² 10⁻⁵	0.184	0.147	-33.41	-10.64	-31.49	-10.61	262
SOCIAL PARTICIPATION							
Hobbies	0.0135***	0.0135***	-0.179	-0.000637	0.0211	0.00142	0.0619
Volunteer/Political	-0.00243	-0.00246	0.564	-0.00457	0.0568	-0.000283	-0.247
HOUSEHOLD							
Care household	-0.342***	-0.342***	1.583	-0.0809	-0.227*	-0.147**	0.281
Household size	-0.0423**	-0.0424**	0.402	0.0177	0.101*	0.013	-0.0721
Number of children<19	0.0485**	0.0486**	-0.0831	0.0378	0.0183	0.0381+	0.298
Residual income 10⁻³	0.111***	0.111***	0.414	0.0531***	0.0347	0.0541***	0.243
Residual income² 10⁻⁵	-0.465***	-0.465***	-5.526	-0.0890*	-0.0174	-0.101***	-0.121

Appendix Table A2 cont.

Civil service pension	FE		IV FD2SLS				
			IV Model II b	IV Model II b	IV Model II b	IV Model II b	IV Model II b
			all	pre-ret.	T, post-ret.	pre-ret.	T, post-ret.
		Model II b					
	Model II b	without Early ret.	IV 1	IV 1	IV 1	IV 2	IV 2
	1	2	3	4	5	6	7
REGION							
East	0.158+	0.158+	5.352	0.0458	-0.0386	0.0126	-0.445
Constant	20.96+	21.05+	-0.521	-0.105*	0.186	-0.0940***	0.211
INSTRUMENTS							
			IV 1	IV 1	IV 1	IV 2	IV 2
R2 within	0.0805	0.0804	0.00000126	0.000446	0.000781	0.00283	0.000037
F-Test (fe) resp. Wald-Test (fd)	62.41***	66.24***	3.94	1051.32***	766.14***	3620.03***	30.02
Max groups	17	17	16	17	20	17	20
Average groups	7.7	7.7	7.4	8.4	8.4	8.4	8.4
Clusters	10366	10366	9218	19289	14446	19289	14446
Observations	79582	79582	66200	150356	118258	150356	118258

IV 1: age_ge50, age_ge55, age_ge60, age_ge63, age_ge65, early_63_lt65, early_60_lt63, early_lt60, age_limit_inc_1997, pension_res_1999, pension_lev_red_2001, age_limit_inc_2006, taxes_2005, taxes_2005_2, taxes_2005_3, finance_crisis_2009

IV 2: age_ge50, age_ge55, age_ge60, age_ge63, age_ge65, early_63_lt65, early_60_lt63, early_lt60, age_limit_inc_1997, pension_lev_red_2001

Note: t statistics (Fixed-effects: on robust standard errors) significance: + $p<0.10$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$

Source: Results of fixed-effects (FE) and IV FD2SLS regression Model IIb (with controls), SOEP Socio-Economic Panel data 1985-2015.

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