Life-Cycle Responses to Pension Reform: The Role of Subjective Policy Beliefs

Maximilian Blesch[1, 2] and Bruno Veltri[1, 2]

[1]Humboldt Universität Berlin
[2]DIW Berlin

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This study quantifies the impact of *Statutory Retirement Age* (SRA) reforms on individual behavior and welfare in the presence of subjective policy uncertainty and misinformation. We estimate a rich structural life-cycle model with forward-looking agents and dynamic policy belief updating. The model accounts for key determinants of retirement timing, precautionary savings, and old-age labor supply. In the model, agents have probabilistic expectations about the future evolution of the SRA and are misinformed about the penalty for early retirement (ERP). We derive subjective policy beliefs from new survey data from the German Socio-Economic Panel Innovation Sample (SOEP-IS). Our results show that uncertainty and misinformation reduce individual welfare and lead to agents overestimating the welfare cost of future reforms. However, these beliefs can support policy objectives. SRA reforms can lead to forward-looking reductions in savings and labor supply due to expected extensions of the working life. Uncertainty attenuates these anticipatory responses by 20-50 percent while maintaining effectiveness at the retirement margin. Eliminating misinformation would cause individuals to retire 0.8 years earlier and reduce lifetime labor supply by 2 percent, primarily among low-educated men.

JEL Codes D15, D83, I38, J11, J26

Contents

1. Introduction

Ageing populations are straining social security systems across the world, prompting governments to continuously discuss reforms of the pension systems. Since the immediate effects of such reforms only emerge at the end of one's working life, behavioral reactions critically depend on the beliefs about future policy. We study how subjective pension policy beliefs affect behavior and how they moderate the effects of policy reform. We distinguish between *policy misinformation* - systematic misperception about existing policy features - and *policy uncertainty* - individuals' probabilistic expectations about how policy parameters will evolve. While misinformation could be the result of either a lack of salience or of (potentially rational) inattention (Bordalo et al., 2022; Gabaix, 2019), uncertainty is the fundamental unpredictability of the future policy environment (Caplin et al., 2022; Ciani et al., 2023). To quantify subjective policy belief dynamics, we collect survey evidence and analyze how beliefs evolve over the life cycle. We study the interaction of these beliefs with policy reforms in a comprehensive life-cycle framework. In the model, agents make annual savings and labor supply decisions during their working lives and choose when to retire and claim their pensions.

The key mechanism through which policy beliefs affect behavior in our model is the expected timing of retirement. The *direct* effect of reforms that reduce pension system generosity is an increase in savings[1] as well as labor supply, at least for workers who are close to retirement.[2] Since Feldstein (1974), it has been recognized that when pension reforms affect retirement timing, *indirect* effects can be large and typically counteract these direct reform effects. The main reason is that reforms that delay retirement reduce the need to generate resources to finance old-age consumption. As a result, a conflict of policy goals arises, in which reforms aimed at increasing the old-age labor supply may have adverse effects on the behavior of people far from retirement. Thus, a key challenge in predicting responses to policy reform is understanding how subjective beliefs about the future policy environment shape retirement timing expectations.

The policy reforms we study are increases of the *Statutory Retirement Ages* (SRA), which have the express objective of delaying retirement timing to boost old-age labor supply. Modifications of the various types of pension eligibility ages are among the most common types of public pension reforms.[3] The SRA in Germany, which is the reference age for public pensions, is not a strict constraint for the majority of people. Under relatively mild conditions, early retirement is possible at a cost of 3.6 percent of the pension per year of early retirement, the *Early Retirement Penalty* (ERP). In other words, for someone wishing to retire before the SRA, the SRA determines how many years of early retirement they must "purchase," while the ERP sets the price. Together, beliefs about these policies govern the time and conditions under which people can expect to retire and claim their pensions under the standard old-age pension scheme.

We model the perception of the ERP as being subject to *misinformation*, and the percep-

[1] See, for example, Attanasio and Rohwedder (2003); Attanasio and Brugiavini (2003); Alessie et al. (2013); Lachowska and Myck (2018).

[2] See, for example, Manoli and Weber (2016a); Fetter and Lockwood (2018); Gelber et al. (2022). For workers who are further from retirement, quasi-experimental evidence is scarcer, with some recent exceptions (Artmann et al., 2023). This is in part because many reforms that also affect younger workers do not only have income effects but also change work incentives, such as the pension-contribution link (cf. French et al., 2022).

[3] For example, in the 2023 version of the biennial OECD pension report, 9 out of 21 recent pension reforms in OECD countries were changes of the SRA (Scarpetta and di Noia, 2023). See also Börsch-Supan and Coile (2021) for a systematic overview of four decades of pension reforms in selected countries.

tion of the SRA as being subject to *policy uncertainty*. Frequent reforms and ongoing public debate make the SRA a salient feature of the pension system, but this same dynamic creates uncertainty about what the future SRA will be. Hence, subjective probabilistic expectations of the *future* SRA are our measure of policy uncertainty. In contrast to the SRA, the ERP, which has never been changed since its introduction in 1992, is much less salient and largely absent from public discourse, making knowledge of this parameter key to its effect on behavior. [4]

We incorporate misinformation and policy uncertainty in a life-cycle model of savings, labor supply, and endogenous retirement in the tradition of French (2005). In the model, men and women make labor supply and savings decisions while forming expectations about their retirement timing. The model includes key retirement timing incentives studied in the literature (Blundell et al., 2016b; Fisher et al., 2016), including declining health (Blundell et al., 2023), falling wages Fan et al. (2024), joint leisure with retired partners (Carta and De Philippis, 2024), and age-dependent probabilities of losing or finding a job (Rabaté, 2019; Rabaté et al., 2024). We account for relevant institutional features, such as taxes, transfers, as well as the most important alternative paths to retirement based on disability and long working lives. Program substitution via alternative paths to retirement is particularly important in the reform of pension eligibility ages (Atalay and Barrett, 2015; Duggan et al., 2007; Staubli and Zweimüller, 2013).

We elicit beliefs from our own questionnaire in the *Socio-Economic Panel Innovation Sample* (SOEP-IS) and estimate the model using the core sample of the SOEP, linked with admin data from the German pension insurance (Goebel et al., 2019; Lüthen et al., 2022; Richter and Schupp, 2015). The SOEP-IS is a rich and representative panel survey of the German population, in which we included a survey eliciting probabilistic policy beliefs about the SRA and the ERP (cf. Manski, 2004). We estimate the parameters of the model with maximum likelihood (Rust, 1994), explaining the labor supply choices of the respondents in the SOEP-Core, and using the available admin data to refine the observed retirement timing of individuals. The model can replicate well the targeted age profiles of labor supply choices and the untargeted wealth distribution over the life-cycle. The estimated model allows us to simulate counterfactual scenarios with varying assumptions about the realized policies and the agents' policy beliefs, and investigate the interplay of policy beliefs and reforms.

Survey respondents in our SOEP-IS questionnaire on average expect further SRA increases and are uncertain about its future development, which is in line with existing research on pension policy uncertainty (Caplin et al., 2022; Luttmer and Samwick, 2018). Respondents closer to retirement expect smaller increases and report lower forecast uncertainty. This finding is consistent with a model, in which over time expectations and policy converge, while policy uncertainty gradually resolves. We formalize expectation formation using a simple nonstationary, autoregressive process, similar to Hentall-MacCuish (2025).[5] As an example, the estimated model-implied expectation of a 30-year old with a current SRA of 67 is that by the time she retires, the SRA will have risen to around 68.5 years, with a standard deviation of around one

[4]While researchers do not all agree if the ERP is actuarially fair (cf. Börsch-Supan et al., 2016), there is no *public* debate about changing it, which previous research has shown to be critical for the formation of policy reform expectations (Ciani et al., 2023). In Appendix A.1.1, we illustrate this with a frequency analysis of the appearance of the terms "Retirement Age" and "Pension Deduction" (as well as related terms) in major German news outlets.

[5]The process matches the desired features of the data, while remaining computationally tractable through limited history-dependence. We discuss consequences and potential alternatives to this approach in Section 3.1.

year. The model allows us to estimate the long-term effects of expected reforms in a realistic framework, and contrast them with that of unexpected reforms, which the literature typically focuses on.

Our survey evidence further reveals that respondents on average strongly overestimate the ERP. The average respondent overestimates the true ERP by a factor of more than 3, suggesting that many respondents hold early retirement to be almost prohibitively expensive. Based on this finding, we classify respondents into "informed" and "misinformed". In the model, informed agents know the true ERP and misinformed agents hold the belief of an average respondent classified as misinformed in the data. This is similar to the approach of Bairoliya and McKiernan (2025). In line with previous research, our survey evidence also shows that while people on average are misinformed about current pension policy rules (e.g., Bottazzi et al., 2006; Delavande and Rohwedder, 2011), beliefs become more accurate at higher ages (Manski, 2004; Rohwedder and Kleinjans, 2006). We formalize belief updating with a simple exogenous updating process, with education-specific information hazard rates. The process predicts that she share of correctly informed people increases from 18-27 percent at age 25 to 38-55 percent at age 65. The main consequence of misinformation in our model is that agents expect to delay retirement much more as a response to policy reform than would be consistent with a classical model, in which people expect to respond only to financial incentives.

We use the estimated model to simulate the behavioral and welfare effects of policy reform and evaluate the role of beliefs. To this end, we simulate the life-cycles of 30-year old agents with an initial SRA of 67, and vary realized SRAs and beliefs, allowing us to isolate how beliefs shape both margins and welfare. Our benchmark model features both uncertainty about the SRA and misinformation about the ERP with dynamic belief updating. Considered behavioral response margins are annual labor supply and savings, as well as retirement timing.[6] We refer to agent reform responses as forward-looking when they occur before the age of 63, which is the age at which old-age pensions can first be claimed. Welfare is measured as a compensating variation in lifetime consumption (Low et al., 2010).

In our benchmark estimation, a one-year increase in the SRA leads to a delay in retirement timing by around 0.4 years. This result is consistent with the empirical literature on actual retirement timing responses to SRA increases across countries, which typically finds effect sizes of a similar order of magnitude (Dolls and Krolage, 2023; Manoli and Weber, 2016b; Mastrobuoni, 2009; Lalive et al., 2023). We find relatively small but *negative* forward-looking effects of SRA reforms on saving and labor supply during working life. This is consistent with strong indirect reform effects. All else equal, the reforms would reduce pension wealth. However, due to the expected extension of their working lives, younger agents on average face a reduced need to generate additional private and pension wealth for retirement.

Simulations show that without policy uncertainty, reforms would lead to significantly stronger forward-looking effects. Under perfect foresight, which means that agents know the SRA at the end of their working lives, SRA hikes result in more pronounced reductions in saving and labor supply before 63. However, forward-looking reactions to policy reform in our benchmark

[6] Labor choices in the model are discrete, so adjustments mostly happen at the margin of probability of taking a job. For women, we also allow for intensive-margin responses, as they can switch between part-time and full-time work. Labor supply is aggregated by multiplying discrete choices by the average observed number of annual working hours, conditional on sex and education. Consumption-savings choices are continuous and modeled at the household level. Retirement in the model is absorbing and happens simultaneously with pension claiming.

model, which features uncertain agents who have probabilistic reform expectations, are attenuated by 20-50 percent. On the margin of actual retirement timing, however, response sizes are not distinguishable between uncertain agents and those with perfect foresight. As a result, we estimate around 15 percent higher effects of SRA increase on whole lifetime labor supply when accounting for policy uncertainty. The lifetime labor supply change is the sum of the effects of delayed retirement, which is positive, and forward-looking response, which we estimate to be negative.

The two reasons for the attenuation of forward-looking reform effects are baseline differences in expectations and high uncertainty at younger ages. First, uncertain agents in the no-increase baseline still *expect* increases in the SRA even when they do not happen and act accordingly until that belief fades at higher ages. Second, although policy and expectations gradually converge, particularly younger agents in the increasing-SRA counterfactual retain uncertainty over their lives and optimize for a mix of possible outcomes, which further attenuates their response. The conclusion is that when forward-looking reactions are unintended and potentially counterproductive, uncertainty can support policy reform objectives.

Welfare effects of policy reform are significant and driven by misinformation about the ERP. In the benchmark, average individual welfare costs amount to 0.31 percent of lifetime consumption per year of SRA increase. The difference between policy beliefs and actual policy environment allows to compare ex post welfare effects of the reform to expected welfare effects. We compare expected welfare loss to realized welfare loss for the modal 30-year old agent in our sample, a low-educated woman. The reform we simulate is an increase of the SRA that is equal to the one she expects, which is around 1.3 years by the time she turns 63. Expected welfare losses are 0.46 percent when initially misinformed versus 0.17 percent when informed. Ex post, the realized welfare loss due to the reform if she is initially misinformed are 0.40 percent, which is about 15 percent lower than she anticipated. If she is initially informed, it remains at 0.17 percent.

Misinformation makes agents overestimate welfare cost of policy reform due to mechanical reasons and belief updating. Mechanically, when a misinformed agent retires early despite overestimating the ERP, she pays only the actual deduction and thus receives a higher pension than she expected. While this does not happen very often, it makes sense for instance when she has a very low pension claim, which is close to the consumption floor guaranteed by public social assistance, making the penalty size less consequential. Furthermore, belief updating implies that there is a good chance that some time before retirement she learns about the actual ERP and re-optimizes behavior accordingly. The finding that misinformation leads to overestimation of welfare cost of SRA increases has implications both for the political economy of policy reform and for its normative evaluation from a social planner perspective.[7]

We evaluate the potential gains from eliminating misinformation and find that it would improve individual welfare but have strong adverse effects on policy reform goals. For this exercise, we assume that SRA is increased gradually by two years from 67 to 69. We compare the baseline with misinformation and random updating to a counterfactual scenario in which everyone is informed about the ERP from the start. Agents in the counterfactual retire around 1.3 years earlier on average with the same incentives, reducing lifetime labor supply by over 2.4 percent. The effect is driven by men, particularly low-educated men, for whom pension wealth

[7]Which welfare criterion is the appropriate one to evaluate policies which are perceived as risky by agents ex ante is subject to debate, as discussed for example in Fleurbaey (2010).

is the most important source of old-age household income and who, when misinformed, would not have considered early retirement. The individual welfare effect of debiasing is positive and sizable, at 0.89 percent of lifetime consumption. However, as with the other welfare effects that we quantify, our model is one of partial equilibrium, but general equilibrium effects for such a strong adjustment in behavior can be assumed to be pronounced and counteractive.

Misinformation about the ERP can produce the well-known spike of retirement decisions at the SRA, which empirical literature across different countries has documented extensively and which cannot be explained by pure financial incentives.[8] In the baseline with misinformation, we show that retirement behavior bunches around the SRA.[9] This is because even close to retirement, around half of the agents are still misinformed, implying they hold early retirement to be very expensive, which incentivizes them to wait until they reach the SRA to retire. In contrast, when we compare the baseline to the counterfactual scenario in which everyone is informed, retirement behavior of the debiased agents is a much smoother function of their age.

The literature has recently explained this behavior either by interpreting the SRA as a normative signal for the appropriate time to retire (e.g. Cribb et al., 2016; Gruber et al., 2022) or with reference-dependent preferences and loss aversion (Behaghel and Blau, 2012; Lalive et al., 2023; Seibold, 2021). We show that when early retirement is possible, overestimation of the ERP is observationally similar.[10] With this finding, we join Hentall-MacCuish (2025) in offering a biased policy-belief-based complementary explanation for the bunching of retirement decisions around the SRA. More generally, all these explanations lead to agents expecting stronger reactions of retirement timing to SRA reform than would be predicted by a standard model. As we show that retirement timing expectations drive indirect reform effects, having a behavioral feature like this in a model of responses to SRA reform has significant effects on forward-looking reform responses.

Shedding light on the role of probabilistic reform expectations is another way in which we contribute to the large literature that evaluates responses to pension reform through the lens of forward-looking life-cycle models (e.g., Daminato and Padula, 2024; French, 2005; French and Jones, 2011; Gustman and Steinmeier, 2005; Haan and Prowse, 2014; Iskhakov and Keane, 2021; van der Klaauw and Wolpin, 2008). While the importance of reform expectations in the evaluations of reform responses has long been recognized (Burtless, 1986; Moffitt, 1987), models typically assume that reforms are unexpected because reform expectations are difficult to quantify. Notable exceptions are van der Klaauw and Wolpin (2008), who identify reform expectations from choice data, and Gustman and Steinmeier (2015), who assumes different sets of potential beliefs for policy evolution. In contrast, by using subjective expectations, we avoid making strong assumptions about the way those expectations are formed and we recover estimates about the uncertainty around them, which would otherwise be difficult to identify. We show that the lower perceived likelihood and decreasing uncertainty at higher ages imply that probabilistic reform expectations particularly affect responses among younger people, who are still far from retirement.

[8]See Lumsdaine et al. (1996); Rust (1997) for an early discussion of the phenomenon in the US.

[9]More precisely, it bunches around the SRA (69) and age 67, at which agents can retire if the conditions for early pension due to long working life are met.

[10]For instance, Lalive et al. (2023) finds that Swiss women, when asked in surveys to state the reason for the time at which they decide to claim, answer that they view claiming at the SRA as "normal" and that they wanted to avoid penalties. Since the authors find timing decisions to be financially suboptimal, they view this as support for reference-dependence. If respondents overestimate penalty sizes, however, this would be another way to rationalize these findings.

Our results also help reconcile the typical finding of the quasi-experimental literature, which typically finds no measurable forward-looking effects of SRA increases on labor supply for people.(Geyer and Welteke, 2021; Mastrobuoni, 2009; Staubli and Zweimüller, 2013)[11], which is discussed in detail by Rabaté et al. (2024). Likewise, there is no strong evidence for a positive impact of SRA reform on savings, while some studies even find negative effects.(cf. Etgeton et al., 2023, and the discussion therein). We offer two explanations for the lack of such responses, which, as we discussed at the beginning, are observed for other types of reforms that reduce pension generosity. One explanation is that people expect to postpone retirement significantly, which could be driven by behavioral factors such as misinformation about penalty sizes. Another possibility is that their pre-reform behavior already reflected the expectation of future SRA increases. This could be true even if the reform under study was not itself expected, as our belief data show, which we elicited at a time when no SRA reform was imminent.

A strain of the macroeconomic literature explores the implications of objective pension policy uncertainty in general equilibrium models. Cottle Hunt (2021); Caliendo et al. (2019); Kitao (2018) assume scenarios with probability distributions over future policy parameters to quantify welfare cost of uncertainty about timing and design of inevitable retirement reform.[12] We contribute by showing that despite the undoubtedly negative effect on individual welfare, efforts to correct misbeliefs or eliminating policy uncertainty may conflict with potential policy goals of stimulating precautionary behavior. We abstract from fiscal or general equilibrium effects here. Including them could be an interesting extension to further qualify welfare effects.

We also contribute to a broader literature on the effects of policy uncertainty. Modeling subjective beliefs about late-in-life policies in structural models is complicated because of the non-stationarity of the policy environment (Koşar and O'Dea, 2023). In the macroeconomic literature, where policies under scrutiny often have tangible effects in the short term, modeling policy uncertainty is much more common. Examples include fiscal policy (Fernández-Villaverde et al., 2015), monetary policy (Born and Pfeifer, 2014), or trade policy (Caldara et al., 2020). Typically, the welfare effect of policy uncertainty is negative in these analyses. An exception to this is Fried et al. (2022), who show that climate policy risk reduces emissions and thereby supports policy objectives. We show another example, in which the presence of reform anticipation in a nonstationary environment can have favorable consequences for policymakers.

The rest of the paper is structured as follows. In Section 2, we outline the most important features of the German retirement system and describe our data. Section 3 describes the policy beliefs, how they are treated in our model, and how we estimate them. In Section 4, we explain our life-cycle model. In Section 5, we lay down our estimation methods and estimation results. In Section 6, we present our counterfactual policy simulations. Section 7 concludes.

[11]1. A notable expection is Carta and De Philippis (2024), who finds significant forward-looking increases in labor supply. 2. Note that for elderly workers who are close to retirement, however, an increase in employment is the typically observed response (in particular, Engels et al. (2017) in the German context; see also Pilipiec et al. (2021) for a literature review)

[12]Luttmer and Samwick (2018) quantifies welfare effects of subjective pension policy uncertainty with a survey experiment.

2. Institutional Background and Data

2.1. Public Pension Insurance in Germany

Germany has a pay-as-you-go pension system, which is financed by flat-rate contributions from employees and employers. The pension system is mandatory for nearly all employees and, as of 2023, covers 87 percent of the working population (70 percent of people aged 15-64). The most important exceptions are self-employed or marginally employed workers, civil servants, and military personnel.

Public pensions in 2023 provided a replacement rate of 48 percent according to the definition of the German Public Pension Insurance (around 44 percent according to that of the OECD). Pension size depends on work experience and labor earnings history. The pension formula is not inherently redistributive, so replacement rates are similar across income groups[13]. While replacement rates have fallen in recent years, contribution rates have been stable at around 19 percent (cf. figure 11). Both are linked to demographic change, so without further reform, replacement rates are expected to fall, while contribution rates are expected to rise.

There are two main paths to retirement in Germany: old-age pensions and disability-based pensions. Claiming an old-age pension is possible upon reaching the *Statutory Retirement Age* (SRA). The current SRA is a function of birth year and stands at 67 years for everyone born after 1964. Given certain requirements, claiming a pension is possible up to four years before this age,[14] but no earlier than 63 years. Early retirement generally comes at a penalty (*the Early Retirement Penalty*, ERP) of 3.6 percent of the pension value per year of early retirement, or 0.3 percent per month. [15] However, after a 2013 reform, claiming an old-age pension without penalty is possible up to two years before the applicable SRA for people with very long contribution histories of at least 45 years. The most important type of disability-based pension can be claimed at any age if the claimant can prove reduced capacity to work. The size of these occupation-based disability pensions is the same as that of their old-age pensions would have been if they had continued working at the same earnings level until reaching the SRA. Typically, disability pensions are subject to a penalty of three times the ERP, i.e., 10.8 percent.[16]

In 2007, a reform was passed, which gradually increased the SRA from 65 to 67 years for birth cohorts between 1947 and 1964 (cf. figure 2). To offset the erosion of replacement rates and the rise in contribution rates brought about by population ageing, there is a public debate about further increases in the SRA. For example, in 2023 the German Council of Economic Experts recommends a continued increase in the SRA by 0.5 years every 10 years (Grimm et al., 2023). This would imply an SRA of 68 years for the birth cohort of 1984 and of 69 years for the 2004 cohort.

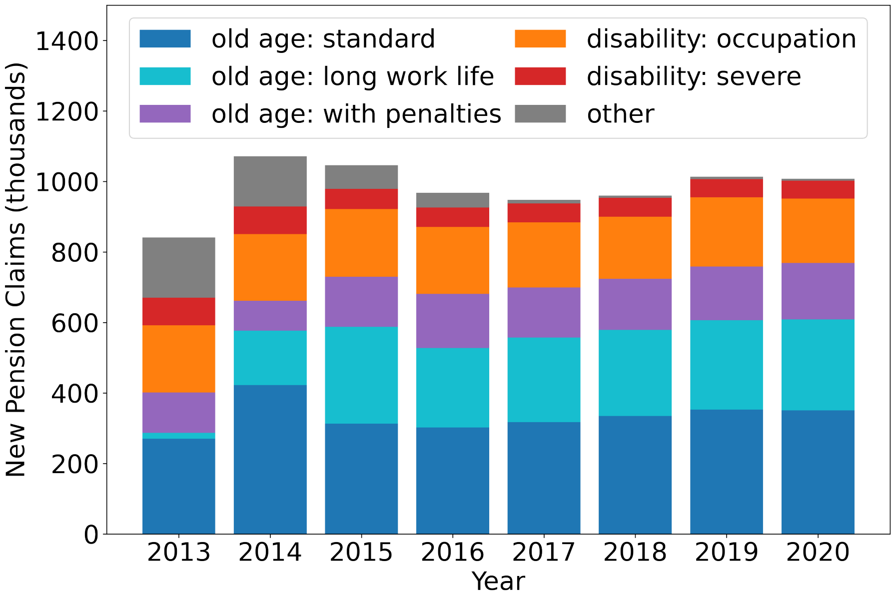
[13] This holds until a cap of roughly twice the average wage, beyond which no contributions have to be made and no claims are accumulated

[14] A claimant needs to have 35 years of *credited periods*. In addition to years of work, these include unpaid childcare and elderly care, as well as short-term unemployment and sickness.

[15] In 2023, one in three old-age pensions was claimed before the applicable SRA. On average, pensions that were claimed early were claimed 30 months in advance, implying an average penalty size of 9 percent. In theory, deferring retirement is also possible, which increases the pension size by 6 percent per year of deferral. However, in practice, this option is very rarely used.

[16] More precisely, the penalty for the ERP for every year of retirement before the SRA minus two years, capped at 10.8 percent. However, the majority of disability pensioners retire more than three years before the SRA.

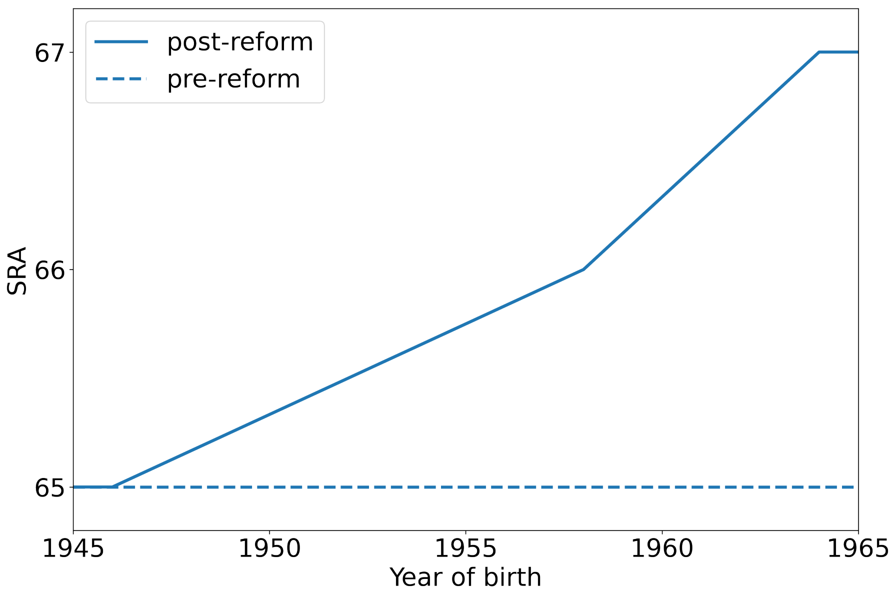
Figure 1: New Pension Claims 2013-2020 by Type of Pension



Notes: "Other Pensions" comprise the phased-out pensions for women and for the unemployed. "Occupation-based Disability" and "Severe Disability" Pension ("Erwerbsminderungsrente" and "Rente für Schwerbehinderte" in German) are based on different eligibility criteria and offer earlier retirement or with reduced penalties compared to the ordinary old age pension. Widower pensions are excluded here since they are transfers or existing entitlements rather than new claims.

Source: German Federal Pension Insurance (Deutsche Rentenversicherung, DRV).

Figure 2: 2007 Reform of the Statutory Retirement Age



Notes: Applicable SRA depending on birth year before and after the 2007 reform. The SRA is the reference year at which individuals can claim their old-age pensions without penalty.

2.2. Data

Our analysis relies on two main data sources, the German Socio-Economic Panel (SOEP) and the SOEP Innovation Sample (SOEP-IS). The SOEP-core is a rich and representative longitudinal household survey(Goebel et al., 2019). The SOEP-IS is a separate representative sample that is part of the SOEP infrastructure, receives the SOEP-core questionnaire, and additionally allows researchers to submit their own questions (Richter and Schupp, 2015). We elicit subjective policy beliefs from the SOEP-IS sample and use these to predict beliefs in the SOEP-core sample. We then estimate our model on SOEP-core data. In the following, we briefly describe our sample composition and restriction criteria.

Policy belief sample. In the 2022 wave of the SOEP-IS, we elicited probabilistic expectations about retirement and pension policy. Specifically, we asked respondents about their own expected pension claiming ages, as well as future development of Statutory Retirement Age and the current Early Retirement Penalty. [17] The sample consists of 798 adult individuals who are not yet retired and are representative of the German working-age population. The panel structure and availability of SOEP-core covariates allow us to account for history-dependence and relevant heterogeneities of beliefs when predicting beliefs in the SOEP-core sample. In section 3 we describe this in more detail.

Structural estimation sample. We estimate our structural model on data from the SOEP-core, which we link with administrative pension data to get more precise data on retirement timing(Lüthen et al., 2022). We limit the analysis to the years 2013-2020. Other sample restrictions stem mainly from model restrictions. We focus on individuals above 30 years of age, who are covered by public pension insurance (cf. section 2.1). In the model, there are certain state-choice combinations we do not allow. For instance, men cannot work part-time, and retirement is an absorbing state, meaning that we drop individuals who report having been retired in the past and later report working again.

In addition to the structural estimation sample, we create several auxiliary samples from the SOEP core to estimate processes outside the model, such as the evolution of health over the life-cycle (cf. section 4). We do not estimate these on the structural estimation sample because data availability requirements differ. Aside from the linked SOEP data, we rely on only a few external data sources. We use CPI data to deflate nominal variables and population mortality to estimate life expectancy. These data come from the German Federal Statistical Office.

[17] See appendix A.3.1 for the exact wording of the questions.

Table 1: Structural Estimation Sample Description

	Men		Women		
	High Educ.	Low Educ.	High Educ.	Low Educ.	Total
Unique Households	3,209	7,656	3,343	9,335	15,387
Unique Individuals	3,216	7,716	3,354	9,382	23,665
Observations	16,432	37,634	17,369	46,114	117,549
Share Full-time	0.695	0.568	0.347	0.207	0.412
Share Part-time	0.000	0.000	0.360	0.242	0.148
Share Unemployed	0.018	0.060	0.113	0.184	0.111
Share Retired	0.287	0.371	0.180	0.367	0.329
Share Good Health	0.850	0.736	0.847	0.734	0.767
Share Single	0.152	0.164	0.291	0.318	0.242
Average Work Experience	25.4	29.8	16.5	18.9	22.9
Average Wealth (1000 EUR)	411.7	196.7	317.9	192.3	242.9

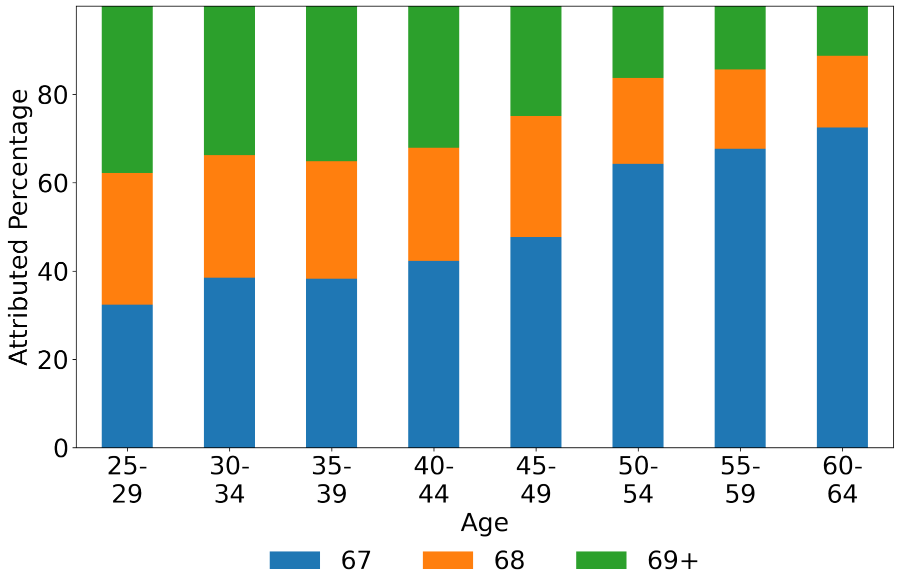
Notes: Data from the German Socio-Economic Panel (SOEP) 2013-2020. Sample restricted to individuals aged 30 and above who are covered by public pension insurance. High education is defined as having at least a university entrance qualification (Abitur). Single is defined as not living with a partner in the same household. Work experience is measured in years since labor market entry, with a year of part-time work counted as half a year. Wealth includes all reported financial and real assets minus debts, inflated to 2020 levels, censored at 0, and measured in 1000 euros.

3. Policy Beliefs

3.1. Policy Uncertainty and the Statutory Retirement Age

We elicit probabilistic expectations of the SRA at the time respondents expect to retire (see A.3.1 for question wording). The results are twofold. First, respondents expect further increases in the SRA. The younger respondents are, the higher the SRA they expect. Second, the further away respondents are from expected retirement, the larger the uncertainty. Figure 4 illustrates these findings. In other words, uncertainty increases with age; policy and expectation converge over time.

Figure 3: Subjective Distributions over Future SRAs



Notes: Respondent probabilistic expectations of the SRA. Data from the 2022 wave of the SOEP Innovation Sample (SOEP-IS). Respondents were asked to attribute probabilities to different potential SRAs at the time they retire. See appendix A.3.1 for question wording.

In the formalization of these beliefs, we want to retain these features and quanitify the expected increase as well as the the uncertainty of the SRA. In particular, we assume agents of age t expect the SRA to evolve according to a random walk with drift:

$$SRA_{t+1} = \alpha + SRA_t + \upsilon_{t+1} \tag{1}$$

where υ_t is i.i.d. normally distributed with mean zero and constant variance σ^2_{SRA}. This formalization is similar to objective policy uncertainty in Hentall-MacCuish (2025), except that we allow for negative and non-integer shocks. This way, we can accommodate gradual reform and account for people born before 1964 to whom a non-integer SRA currently applies. As a result, at any time t before retirement, agents' expectations and associated uncertainty about the SRA at time $T \geq t$ are given by

$$SRA_T \sim N(SRA_t + (T-t)\alpha, (T-t)\sigma^2) \tag{2}$$

This model captures the key features of our survey data and abstracts from the determinants of expectation formations aside from current policy. One alternative would be to model reform expectations as a function of previous experience (Malmendier and Nagel, 2016; Kuchler and

Zafar, 2019), but as such reforms are rare, we are not able to do so with our sample.[18]

To estimate the key parameters α and σ^2 from our model, we first estimate for each individual a truncated normal distribution from their elicited probabilities. With this parametric assumption, we can construct for each observation i at age t their expected SRA $E\_SRA_{i,t}(t_i^R)$ and their subjective forecast variance of the SRA $VAR\_SRA_{i,t}(t_i^R)$ at the individual's expected retirement age t_i^R. This allows us to estimate α and σ^2 via OLS:

$$E\_SRA_{i,t}(t_i^R) - SRA_t = \alpha(t_i^R - t) + \epsilon_i \qquad VAR\_SRA_{i,t}(t_i^R) = \sigma^2(t_i^R - t) + \xi_i \tag{3}$$

Table (2) reports our estimate for the random walk of our policy belief process. As a benchmark, the implied expected SRA increase of 0.4 years every ten years is close to the 2023 German Council of Economic Experts recommendation, which is to raise it by 0.5 years every ten years (Grimm et al., 2023). We observe considerable heterogeneity in policy expectations across individuals. However, this heterogeneity cannot be explained by sex or education, the two factors that are time-invariant in our model. Therefore, we do not take expectation heterogeneity into account in our simulations and assign to every individual the same expectation process as a function of age and current SRA.

Table 2: Expectation Process Parameter Estimates

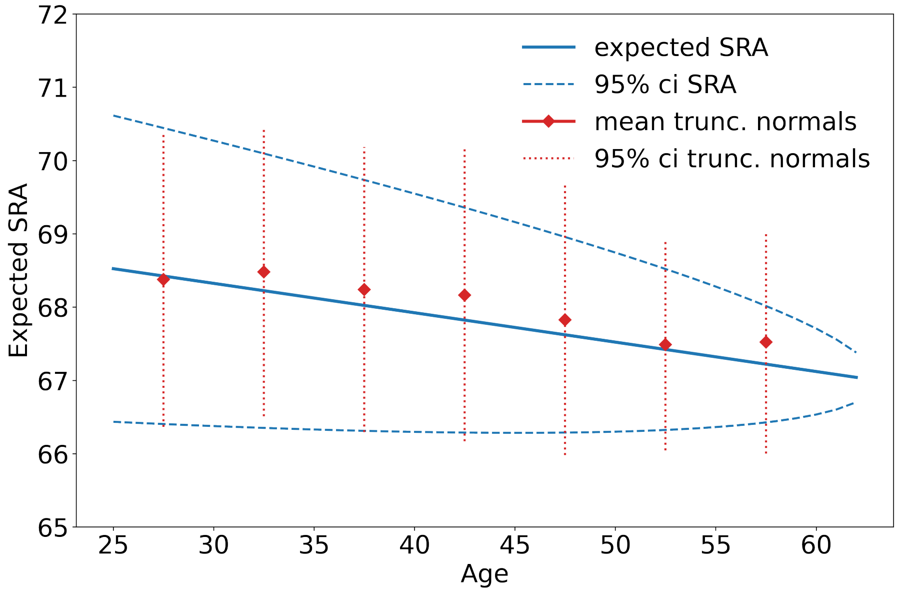
Parameter Name	Parameter	Estimate
Drift	α	0.040
		(0.0014)
Variance of Belief Process	σ^2_{SRA}	0.030
		(0.0010)

Notes: Estimates for parameters of Equation 1. Standard errors in parentheses.

Figure 4 illustrates the fit of the SRA belief process to the means and variances of the subjective probability distributions estimated for each observation. The process fits the expected value very well and captures the decrease of forecast variance of expected SRA at towards retirement. For older cohorts, individual forecast variance is slightly underpredicted by the process. This suggests that some residual uncertainty remains for people close to retirement, which cannot fully be captured by this model.

[18] Another alternative would be to model people's expectations about factors underlying pension policy, chiefly the evolution of demographic change, and assuming some mapping from these factors to policy, as is done in Cottle Hunt (2021). Doing so based on subjective expectations would require a lot more survey data, and some strong assumptions about agent understanding of political economy, which is why we leave it as a venue for future research.

Figure 4: Expectation Process Fit



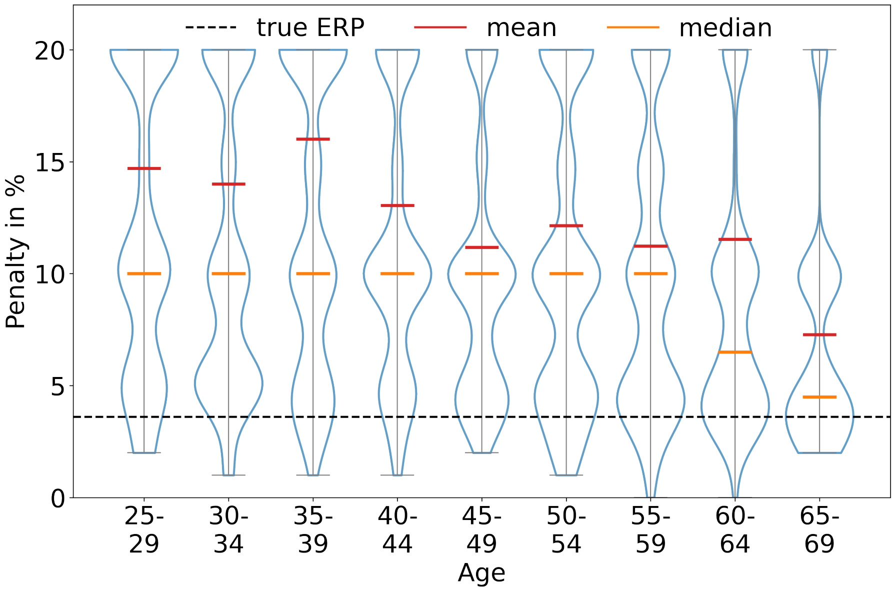
Notes: Fit of individual responses by SRA random walk (Equation 2). Individual responses are pooled by 5-year cohort. Mean and forecast variance are recovered by fitting truncated normal distributions through subjective probability distributions.

3.2. Misinformation and the Early Retirement Penalty

We further elicit probabilistic beliefs of the current ERP(see A.3.1 for question wording). Figure 5 illustrates the distribution of respondents' point estimates. Except for respondents in their 60s, the average belief about this number is around 12 percent across ages, while in reality, it is only 3.6 percent. This misinformation may significantly distort people's reasoning about retirement and how they react to reforms. While it may be too much to expect people to know the exact Early Retirement Penalty, knowing its magnitude is crucial for everyone who considers early retirement. At its true size, early retirement is a viable option for many[19]. By contrast, at the average reported ERP size of around 12 percent, early retirement would be prohibitively expensive for most people.

[19] In fact, many economists argue that 3.6 percent is too low and that the actuarially fair size should be 5-7 percent. Börsch-Supan et al. (2016).

Figure 5: Belief about Current ERP



Notes: Respondents' beliefs about the current ERP. Distributions in the figure are censored at 20 percent (does not affect the computation of the mean and median). See appendix A.3.1 for question wording.

To formalize the subjective beliefs about the ERP, we classify people into informed and misinformed, similar to Bairoliya and McKiernan (2025) do[20] Unlike their data, however, our survey results show that misinformation rates decline notably over the life-cycle. It appears that when the ERP becomes most relevant to them, people tend to become informed about it. This can be interpreted as evidence in favor of rational attention models (Brown and Jeon, 2024; Hentall-MacCuish, 2025), or it may be that a lack of salience, e.g., due to social networks in which few people are already retired, causes this lack of knowledge among younger people.

In our counterfactual model simulations, we are agnostic about the process of information acquisition. We formalize the increase in the share of informed individuals over the life-cycle with the evolution of a simple education-specific Markov process. The process is parameterized by a constant hazard rate λ to transition from misinformed to informed. We assume that the whole population is misinformed at age 0. While being misinformed, the agent expects a higher ERP $\tilde{ERP}$ for early retirement.

[20]We classify as informed a respondent who answered "5" or less to the question eliciting beliefs about the current ERP. We chose the threshold so respondents whose answers were below it were as close as possible to the true ERP.

Table 3: Early Retirement Penalty Parameter Estimates

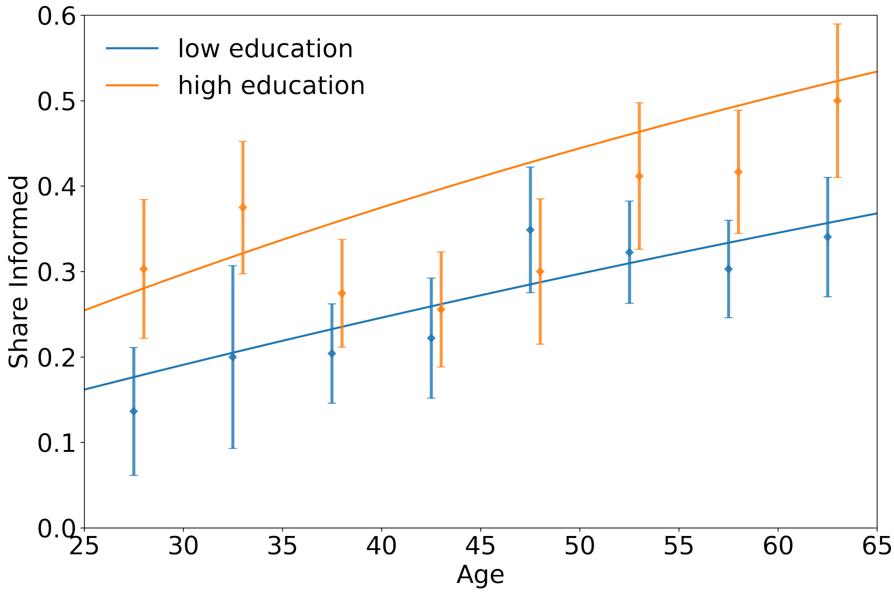
Parameter Name	Parameter	Estimates	
		Low Educ.	High Educ.
Hazard Rate	λ	0.007	0.012
		(0.001)	(0.002)
ERP Misinformed Belief	$\tilde{ERP}$	18.919	16.246
		(0.954)	(0.779)

Notes: Estimates of ERP updating process parameters from SOEP-IS. Standard errors in parentheses.

Table 3 summarizes the parameters of misinformation. While the share of low-educated misinformed only reduces by 0.7% per year, high-educated are informed faster with a reduction of the misinformed share by 1.2% per year. In terms of their behavioral implication, the ERP beliefs of respondents classified as misinformed are of similar magnitude for both education groups. Although high-educated respondents who we classify as misinformed expect a penalty that is around two percentage points lower, it is still over four times the actual penalty size, making early retirement too expensive to consider under normal circumstances.

We estimate the ERP beliefs as the average subjective belief among all misinformed individuals in our sample. For the transition rates, we use a Method of Moments estimator to match 5-year cohort bin shares. We fit the increase in the share of informed individuals over the life-cycle well. Figure 6 illustrates the education-specific moments, their standard error, as well as the predicted shares.

Figure 6: Belief about Current ERP



Notes: Predicted and observed shares of respondents who are classified as informed about the ERP by education level. "High education" means having at least a high school degree, which qualifies for university studies ("Abitur").

4. Model

To study the effects of subjective policy beliefs on retirement timing, forward-looking behavior, and welfare, we formulate a dynamic life-cycle model of consumption-saving and labor supply in the tradition of French (2005). We model men and women who completed either high or low education, determining four exogenous types $\tau \in \{men, women\} \times \{high, low\}$.[21] Agents choose labor supply and savings $\{d_t, c_t\}$ to maximize the discounted sum of expected utilities over their whole life, subject to an inter-temporal budget constraint from age 30 until their stochastic death. Upon death, agents bequeath all remaining assets.

Aside from uncertainty about the future policy environment through the stochastic statutory retirement age SRA_t, agents face uncertainty from transitory wage shocks, stochastic job offers, and destruction o_t, as well as the arrival, departure, and retirement of partners p_t, as well as the evolution of health h_t over the life cycle. In addition, agents differ on wealth a_t and work experience e_t. Together, these variables constitute the state x_t. An overview of the state, decision, and derived variables, including domain and notation, can be found in the appendix A.4.2.

4.1. Work, Health, and Paths to Retirement

At every age during their lives, agents choose discrete labor supply $d_t \in \mathcal{D} = \{0, 1, 2, 3\}$ representing retirement ($d_t = 0$), unemployment ($d_t = 1$), part-time ($d_t = 2$), and full-time work ($d_t = 3$) respectively. During their working life, agents may decide to work part- or full-time[22] if they have a job offer in the current period, i.e., $o_t = 1$. [23] Otherwise, they can always choose unemployment.

In our model, retirement and pension claiming happen simultaneously, and we do not distinguish between the two decisions. In the standard path to retirement, agents can choose to retire before the statutory retirement age (SRA) but no earlier than the Early Retirement Age of 63, following a simplified version of the current German law. Note that we assume that the Early Retirement Age does not automatically change with reforms of the SRA. Early retirement incurs permanent pension reduction penalties. To simplify further, we restrict decisions so that retirement is absorbing and from age 72 everyone must be retired.

Our model features the two main alternative paths to retirement beyond the standard old-age pension in Germany (cf. section 2.1). First, very long work life: agents can retire two years before the SRA without penalties if they worked 45 years of credited periods, denoted $CP(x_t)$. Credited periods are predicted from the current state x_t and are not a state variable in themselves. Agents can increase their stock in credited periods by working more, generating an additional incentive to work. Any reform of the SRA would also shift the age at which they can retire on this path.

Second, disability pension: agents can retire at any point in their lives if they are eligible for disability pensions. We track eligibility as a separate health state in the Markov health process

[21] From the model solution perspective, being informed about the early retirement penalty $\imath_t$ constitutes an additional type, as agents do not expect the penalty to change over time or for their belief about it to be updated.

[22] We allow for part-time work only for women, because few men work part-time and the decision usually is not well explained by observable data.

[23] The law of motion of o_t is described in Appendix (A.4.3)

h_t, in addition to good and bad health. If agents claim disability pension, they pay a reduced penalty of the true ERP times the difference in their retirement age to the Early Retirement Age, but only up to a maximum of three years. If they do, the counterfactual foregone work life if disability had not occurred is extrapolated until the currently applicable SRA for the calculation of the pension.

Work experience e_t increases by one year for full-time work and 0.5 years for part-time work.[24] Work experience is the main determinant of three key outcomes: wages, pension benefits, and credited periods for eligibility for the very long work life pension.

4.2. Income, Budget and Family Dynamics

Every period, agents choose continuous consumption $c_t \in \mathcal{C}_t = [0, a_t]$ on behalf of the household, where they may consume any amount up to their assets at the beginning of the period, a_t. As a result, borrowing is not allowed, and there is no explicit consumption floor in the model. However, we assume that the welfare state always provides a basic level of income, ensuring agents can always afford a positive level of consumption. Households include a potential partner p_t following a Markov process and a deterministic number of children conditional on the agent's age, sex, education, and partner state.[25]

At the end of each period, assets saved for future periods generate income at a risk-free interest rate of r. Assets evolve according to the following intertemporal budget equation:

$$a_{t+1} = (1 + r)(a_t - c_t) + Y_t(d_t, x_t), \tag{4}$$

where Y_t represents total household income, which consists of own income y_t (from work or pension), potential partner income y_t^p, household level benefits $B(\cdot)$ and taxes $T(\cdot)$:

$$Y_t(x_t, d_t) = y_t(x_t, d_t) + y_t^p(x_t) + B(x_t, d_t) - T(x_t, d_t). \tag{5}$$

If the agent works, she receives an hourly wage based on accumulated work experience e_t, and an i.i.d. normally distributed shock $\zeta \sim N(0, \sigma^2_{w,\tau})$. Part- or full-time income is then the product of hourly wage and the type-specific average annual hours. Returns to experience also vary by type τ:

$$y_t(x_t, d_t) = w_t(x_t)\, hrs(x_t, d_t), \text{ for } d_t \in \{2, 3\}. \tag{6}$$

The wage is given by

$$\ln w_t(x_t) = \gamma_{0,\tau} + \gamma_{1,\tau} e_t + \gamma_{2,\tau} e_t^2 + \zeta_t. \tag{7}$$

When retired, agents receive a pension that increases with work experience. In Germany, pensions depend on three factors: The pension points track the contributions over the working life, the pension-point value assigns a monetary value to the stock of pension points, and the deduction factor reduces the pension in case of early retirement. As contributions are a fraction of wages, each year of experience has a different type-specific effect on the stock of pension points. We, therefore, construct a function, mapping the state of an agent into pension

[24] We use a projection of the experience stock to the interval $[0, 1]$, following Iskhakov and Keane (2021).

[25] Note that while the partner state is stochastic, conditional on partner presence, age, sex, and education, the number of children is deterministic and might take fractional values.

points $PP(x_t)$. Appendix (A.4.4) details how we construct this function. The pension income of an agent who retires at the SRA is then given by:

$$y_t(x_t, 0) = PP(x_t) \times PPV. \tag{8}$$

If an agent retires before the SRA at age t^R, she incurs a permanent pension reduction, denoted by ERP:

$$\begin{aligned} y_t(x_t, 0) = {} & PP(x_t) \times PPV & (9) \\ & \times (1 - ERP \times (SRA_{t^R} - t^R) \times \mathbb{1}(SRA_{t^R} > t^R)). & (10) \end{aligned}$$

In our model, agents can be misinformed about the ERP when forming expectations. Dependent on the informed state i_t, the agent expects the following ERP:

$$ERP(i_t) = \begin{cases} \tilde{ERP}, & \text{if } i_t = 0 \\ 0.036, & \text{if } i_t = 1. \end{cases} \tag{11}$$

where $\tilde{ERP}$ is the expectation of misinformed agents. In our simulations, the expectations of the agent follow the above equations, while the realized reductions in pension for early retirement follow the true ERP.

Partner income $y_t^p(x_t)$ deterministically depends on the agent's state. For model sparsity, we do not track any state variables, such as work experience, for the partner. In particular, the partner's income depends on the agent's age, education, and sex. Conditional on x_t, we do not model any additional uncertainty in the partner's income (Blundell et al., 2016a; Adda et al., 2017). [26] We abstract from widow and survivor pensions by assuming that after age 75 the partner state does not change anymore, implying that the partner pensions continue contributing to household income.

Household-level benefits account for the presence of a partner, the agent's own labor supply decision, and the wages of both partners. Benefits also provide transfers based on the number of children in the household, proxied by age, education, and partner state. Child benefits vary depending on whether the agent is unemployed or working. We implement a simplified tax system with income brackets, which captures the progressivity of the German tax system and the structure of social security contributions. Notably, it features joint taxation for couples. Unemployed agents are exempt from taxes or contributions, while retired agents pay taxes but only reduced contributions. Working individuals are subject to full taxation and contributions.

4.3. Preferences and Model Solution

In each period of their lives, agents derive flow utility that is additively separable between consumption and leisure:

$$u(c_t, d_t, x_t) = \frac{(\frac{c_t}{n_t(x_t)})^{1-\mu} - 1}{1-\mu} - L_t(x_t, d_t) + \epsilon_t(d_t) \tag{12}$$

where $n_t(x_t)$ is the consumption equivalence scale, calculated as the square root of the household size. The term $L_t(x_t, d_t) \geq 0$ captures the disutility of work relative to retirement. This additively separable functional form is a simplifying assumption. However, unlike much of the

[26] Details on the approximation of partner income can be found in appendix A.4.4.

literature, we estimate both men and women who make consumption choices on behalf of the household, but have different utility parameters for work. Marginal utility of consumption conditional on state should therefore not differ between sexes, which it would if utility were multiplicative instead (as in Cobb-Douglas specifications). Our specification of the utility function follows most closely Iskhakov and Keane (2021).

The disutility of work has the functional form:

$$L_t(x_t, d_t) = \begin{cases} 0, & \text{if } d_t = 0 \\ Z_L(x_t, d_t)'\kappa_{d_t}, & \text{if } d_t > 0 \end{cases} \tag{13}$$

where $Z_L(x_t, d_t)$ is a vector of choice-specific characteristics that depend on the current state, such as the number of children, education, sex, and partner state to capture joint leisure motives. The vector κ_{d_t} is the collection of corresponding choice-specific disutility parameters. The transposed vector multiplication leads to a sum of characteristic times parameter entry.

The model features choice-specific utility shocks $\epsilon_t(d_t)$, which follow an i.i.d. extreme value distribution with mean zero and scale σ_u. Extreme-value shocks are widely used in studies using discrete choice models McFadden (1973). They capture unexplained choice behavior and improve the computational feasibility of these models (Adda et al., 2017). Apart from computational reasons, we include them to reflect empirical evidence showing that many retirement decisions result from idiosyncratic shocks (Caliendo et al., 2023).

Upon death or reaching the terminal age of 100, individuals bequeath their remaining wealth and derive utility from it, represented by the following bequest utility:

$$u_b(a_T) = \vartheta \frac{a_T^{1-\mu}}{1-\mu} \tag{14}$$

where ϑ measures the intensity of the bequest motive. A strong bequest motive is a simple way to model the gradual dissaving behavior observed among retirees (Ameriks et al., 2020; De Nardi et al., 2010).

The model tracks states and decisions annually, assuming they remain constant within each year. At the start of each period, the agent fully observes their state x_t, and the value of the decision problem is denoted by $V(x_t)$. It represents the sum of discounted expected utilities from future periods, given the agent's current state x_t. It is the solution to the Bellman equation:

$$V(x_t) = \max_{0 \le c_t \le a_t, d_t} u(c_t, d_t, x_t) + \beta \, \mathrm{E}\left[V(x_{t+1}|c_t, d_t, x_t)\right] \tag{15}$$

where c_t and d_t denote the consumption- and labor supply decisions, respectively. Assets at the beginning of the period, denoted by a_t, are part of the state vector x_t. The Bellman equation allows us to solve the problem via backward induction and obtain the optimal consumption and value functions conditional on state and labor-supply decisions. We employ the DC-EGM method by Iskhakov et al. (2017), which avoids computationally expensive root-finding procedures (Carroll, 2006).

4.4. Discussion

To illustrate how agents react to policy reform in our model, consider an agent of age t. Assume that she currently plans to retire exactly at the SRA she expects to be in effect when she retires, that is $E_t[t^R] = E_t[SRA_{t^R}]$. She plans to finance retirement household consumption and her desired level of bequest from three sources at the time of her retirement: the household financial wealth a_{t^R}, her pension wealth ω_{t^R}, denoted as the discounted sum of pension payments, formally

$$\omega_{t^R} = (R-1)^{-1}\left(1-(1+R)^{-(T-t^R)}\right)E_t[y_{t^R}(x_{t^R},0)] \tag{16}$$

and her partner's pension wealth $\omega^P_{t^R}$, which is defined analogously and in our model is entirely outside of her control.

Investments into financial wealth at time t yield for every Euro $R^{(t^R-t)}$ at the time of retirement. The agent can 'invest' in her pension wealth by increasing her labor supply before retirement, thus collecting more pension points. For instance, if she works full-time instead of being unemployed in period t^R-1, she increases her pension by

$$\Delta y(x_{t^R},0) = PPV \times (PP(x_{t^R}, d_{t^R-1}=3) - PP(x_{t^R}, d_{t^R-1}=1)). \tag{17}$$

Additionally, if she switches from unemployment to full-time work at her current age t, the contribution of all our future work towards her pension rises. This is because the additional year of experience increases her future wage, which in turn increases the pension points she collects in all future working years until retirement. The increase in expected pension size from working at age $t < t^R-1$ instead of being unemployed is then given by

$$\begin{aligned}\Delta E[y(x_{t^R},0)] = PPV \times E_t\big\{&(PP(x_t,d_t=3) - PP(x_t,d_t=1))\\ &+\sum_{j=t+1}^{t^R-1}(PP(x_j,d_j|d_t=3) - PP(x_j,d_j|d_t=1))\big\}.\end{aligned} \tag{18}$$

This implies that financial and pension wealth are substitutes for financing retirement consumption and the desired bequest. Investing in either one is more effective the earlier in life it is done.

Now, if instead she expects to retire earlier than $E_t[SRA]$, that is $E_t[t^R] < E_t[SRA_{t^R}]$, she expects to incur a penalty on her pension. Investments into pension wealth by working an additional year at age $t < t^R$ will then yield a lower increase in pension size, as the penalty applies to the entire pension. Equations 17 and 18 would then be multiplied by $(1 - ERP \times (E_t[SRA_{t^R}] - E_t[t^R]))$. This reduces the incentive to invest in pension wealth, making investments into financial wealth relatively more attractive.

SRA reform. Having established the returns to investing in financial wealth versus pension wealth, we now examine how agents respond to an SRA reform that revises upward their expectation $E_t[SRA_{t^R}]$ by one year. Say, they previously expected to retire at the SRA. Re-optimizing the problem in equation 15 means jointly choosing new paths for consumption, savings, and labor supply over the life cycle. However, to gain intuition for the direction of reform effects, it is illustrative to consider the three possible revisions to the agent's expected choice in period t^R: she may plan to be retired, unemployed, or working. We examine each case in turn.

First, consider an agent who does not update her expected retirement age, meaning she still expects to claim her pension at age t^R and now expects to pay a penalty for early retirement.

There are two effects. As established, the expected penalty makes 'investments' into pension wealth (i.e., working) a less attractive way to finance retirement consumption relative to investments into financial wealth. A substitution effect may therefore entice the agent to work less and save more in periods $\{t, ..., t^R - 1\}$. On the other hand, the increase in penalty size represents a reduction in lifetime income to the agent. Depending on how large it is, the income effect of that reduction may make her more inclined to increase labor supply during those years. In summary, her labor supply reaction is ambiguous, while her savings should increase.

Second, consider an agent who expects to postpone claiming by one year in response to the expected increase in $E_t[SRA_{t^R}]$ by being unemployed in t^R and claiming the pension in $t^R + 1$. Her expected pension size will not change. Yet, her expected pension wealth will decrease due to the forgone year of payments (cf. equation 16). If we include the period t^R in her retirement time, since - presumably - the unemployment benefits are below her permanent level of lifetime consumption, then the direction of the two effects does not change. Just as in the first case, it becomes more profitable to substitute pension wealth with private wealth, and the agent's lifetime income decreases. Again, her savings should increase, while her labor supply reaction is ambiguous.

Third, consider an agent who expects to postpone claiming and to extend her work life into age t^R. Assume that the income she earns in t^R is higher than her permanent level of lifetime consumption, meaning her retirement life is shortened. Now the income effect reverses as her total lifetime income increases, meaning she could work less. However, when re-balancing between financing retirement consumption through public pension wealth or financial wealth, note that the return to working more in order to invest in public pension wealth now increases. This is because additional labor supply in the current period t increases the wage and therefore the number of pension points generated in a longer working life (i.e., the second term in equation 18).

In summary, in our model the direction of the substitution effect depends on whether agents extend their expected working life in response to the SRA increase. When agents keep their working life constant (scenarios 1 and 2), the substitution effect incentivizes less labor supply and more private savings, as pension wealth becomes relatively less attractive. When agents extend their working life (scenario 3), the substitution effect reverses because the return to investing in pension wealth increases. In all cases, the income effect opposes the substitution effect, rendering the net labor supply response theoretically ambiguous and consistent with the mixed empirical findings in the literature.

5. Estimation

In the parametrization of the model, we distinguish between three sets of parameters. The first set is calibrated using external data sources and established literature estimates. This set includes policy parameters that are assumed to remain constant within the model (e.g., tax brackets), as well as standard parameters such as the interest rate r, the discount factor β, and the inter-temporal elasticity of substitution μ. The interest rate is set to $r = 0.03$, the discount factor $\beta = 0.97$, and the inter-temporal elasticity of substitution $\mu = 1.5$.

The second set of parameters is estimated in a first step on data, outside of the model. The estimates and corresponding estimation strategies are detailed in the appendix. The set includes transition probabilities for partner status (A.4.3), health and mortality (A.4.3), and job destruction (A.4.3). Additionally, it comprises wage parameters, such as the return to experience and the variance of income shocks (A.4.4). As described in Section 3, we also estimate the policy belief and misinformation parameters separately and use them to parameterize the model.

We obtain the third set of deep structural parameters governing the labor supply decision by estimating the model with maximum likelihood following Rust (1994). In the following, we describe the estimation procedure, report the estimates of the structural parameters, and show how our model fits the data.

5.1. Structural Estimation

Identification. We estimate three different groups of deep structural parameters in the model with maximum likelihood. First, we estimate the structural disutility parameters governing the utility reduction of each choice in comparison with retirement (equation 13). We identify these parameters in particular from observations, where we observe the job offer status in the data. These are all observations of people who have been working part-time or full-time last year. Second, we estimate the parameters determining the probabilities of a job offer for unemployed individuals. In the data, we observe whether individuals start a job after being unemployed the previous year, but not whether they reject a job offer. Job offer probabilities. Job offer probabilities are identified by the observed decisions of the unemployed, which directly impact them. Similar to job offers, we do not observe disability pension eligibility and instead only observe take-up. We also estimate these parameters jointly via Maximum Likelihood.

Likelihood. Formally, we can derive the likelihood function as follows: Let $\mathcal{M}$ denote the dataset of observed states and choices. It contains for each observation their labor supply decision d_k and their observed states. In the following, we denote an agent's state, excluding the taste shock's realization, which we do not observe, by x_k. The likelihood of a fully observed state x_k and decision d_k is given by the choice probability of d_k (Rust, 1987). As the choice-specific taste shocks $\epsilon_k(d_k)$ are assumed to be i.i.d. extreme value distributed and enter the utility function additive separable, the choice probabilities have a closed form solution (McFadden, 1973). Therefore, the probability to observe choice d_k in state x_k, is given by:

$$P(d_k|x_k) = \frac{\exp\{V(d_k|x_k)\}}{\sum_{d\in\mathcal{D}} \exp\{V(d|x_k)\}}$$

where $V(d_k|x_k)$ is the conditional value function given by

$$V(d_k|x_k) = \max_{c_t}\{u(x_k, d_k) + \mathbb{E}[V(x_{it+1})]\} \tag{19}$$

The agent's policy belief on how the SRA develops in the future enters the value function through the expectation of future states. They can be seen as an additional parameterization of the value function and therefore of the choice probabilities, i.e., the likelihood contributions. Maximum likelihood estimation allows us to directly use the beliefs, without imposing additional assumptions on realized policy regimes. This is a clear distinction from an alternative method of the simulated moment estimator, where simulation from the model would require direct assumptions about the evolution of the policy environment.

Additionally, our agents differ in the knowledge of the ERP, captured by the information state i. We do not observe i in our dataset $\mathcal{M}$. Recall that the agent does not expect her information state to change, so the value function only depends on the current information state. We use our survey evidence from the SOEP-IS to predict agent-specific information probabilities $G_k(i)$. The choice probability of an observation k, where all other states are observed, is formally given by:

$$\sum_i P(d_k|x_k, i) * G_k(i) \tag{20}$$

In the SOEP-Core, we do not observe the job offer and disability eligibility state.[27] Let

$$\pi_o(o_k = 1|x_k) = \Lambda_o\bigg(Z_o(x_k)'\phi_o\bigg) \quad and \quad \pi_h(h_k = 2|x_k) = \Lambda_{dis}\bigg(Z_{dis}(x_k)'\phi_{dis}\bigg) \tag{21}$$

be the probabilities of receiving a job offer conditional on being unemployed last period and of being disability pension eligible, conditional on having experienced a bad health shock in this period. Then the probability of choosing d_k of an observation k in state x_k, where we do not observe a job offer and disability pension eligibility, is given by:

$$\sum_o \sum_h \sum_i P(d_k|x_k, i) G_k(i) \pi_o(o|x_k) \pi_{dis}(h|x_k) \tag{22}$$

The likelihood function is then a composition of separate likelihoods, where we observe the state fully or do not observe disability pension eligibility and the job offer.[28] The log likelihood of all states where we fully observe x_k, including h_k and o_k is given by:

$$\mathcal{LL}_{fo} = \sum_k \log\bigg(\pi_h(h_k|x_k)\pi_o(o_k|x_k) \sum_i P(d_k|x_k, i) * G_k(i)\bigg) \tag{23}$$

and the log likelihood of states x_k, where we do not observe both h_k and o_k is given by:

$$\mathcal{LL}_{uo} = \sum_k \log\bigg(\sum_o \sum_h \sum_i P(d_k|x_k, i) * G_k(i)\pi_h(h|x_k)\pi_o(o|x_k)\bigg). \tag{24}$$

We then estimate the deep structural parameters θ by

$$\hat{\theta} = \arg\max LL(\mathcal{M}, \theta) \tag{25}$$
$$= \arg\max LL_{fo}(\mathcal{M}, \theta) + LL_{uo}(\mathcal{M}, \theta) \tag{26}$$

and use Gabler (2022) with the limited memory Broyden–Fletcher–Goldfarb–Shanno algorithm from Virtanen et al. (2020) to maximize the log-likelihood. We use the algorithm's approximation of the inverse Hessian to obtain standard errors of the estimates.

5.2. Estimation Results and Model Fit

After parametrizing the model with the estimates from the literature and our first step estimation, we use maximum likelihood to estimate the disutility parameters of our model (cf. equation 13). Table (4) reports our estimates of the structural parameters.

[27] We assume that individuals in good health can never be eligible for disability.
[28] The case where we observe disability pension eligibility or the job offer follows directly.

Table 4: Disutility Parameters

Parameter Name	Estimates	
	Men	Women
Unemployed	1.4057	0.9600
	(0.0168)	(0.0217)
Full-time; Bad Health	1.2649	1.8497
	(0.0419)	(0.0076)
Full-time; Good Health	0.3896	1.4565
	(0.0220)	(0.0328)
Part-time; Bad Health		1.6879
		(0.0326)
Part-time; Good Health		1.2784
		(0.0192)
Children; Full-time; Low Education		0.2123
		(0.0375)
Children; Full-time; High Education		0.1197
		(0.0375)
Taste shock scale	0.4851	0.4851
	(0.0433)	(0.0433)

Notes: Maximum likelihood estimates of structural parameters. Standard errors in parentheses.

Table 5 reports logit parameters of the job offer process.(cf. A.4.3). We document a negative age trend for job offers, in line with estimates from similar contexts in the literature.

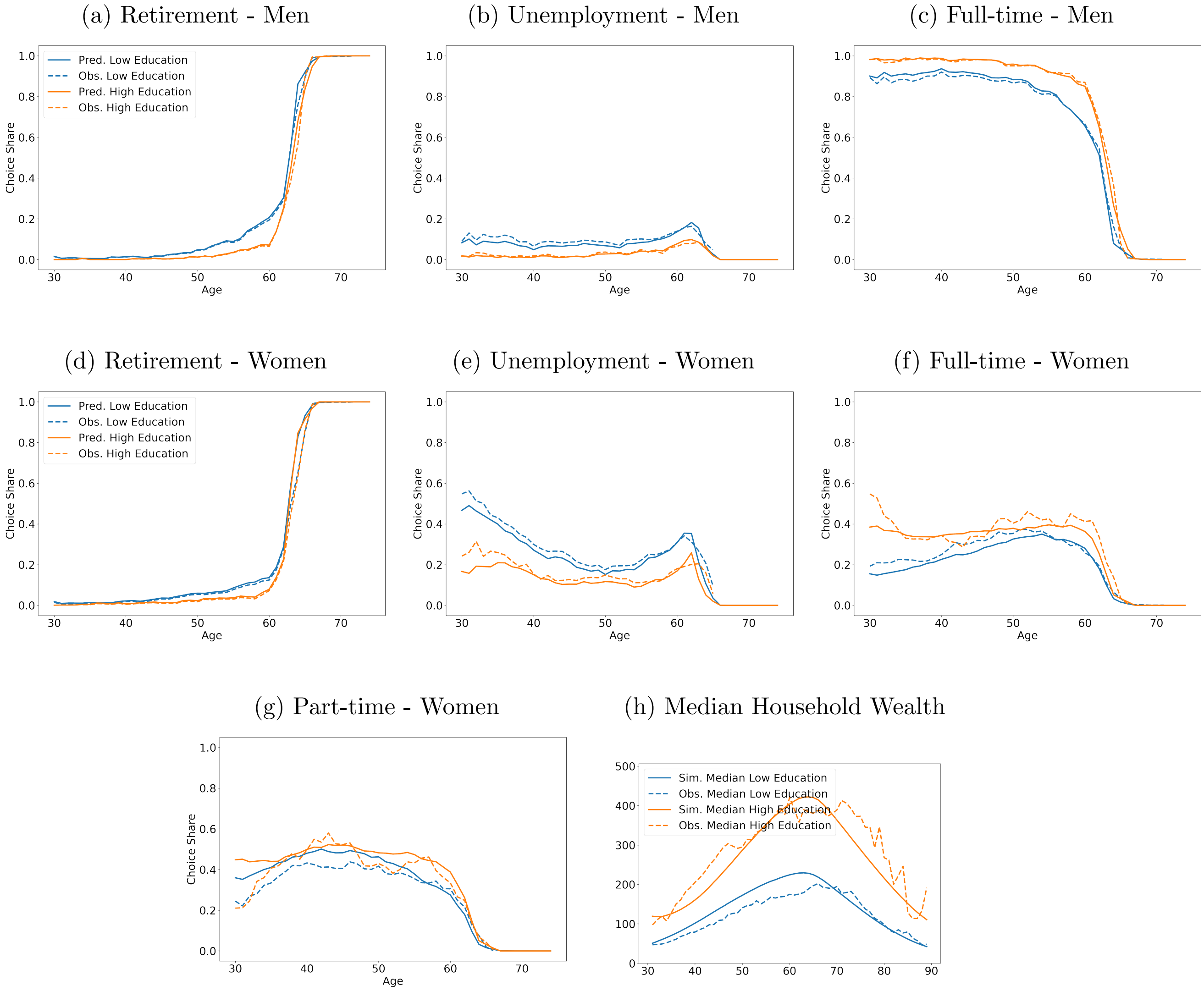
Table 5: Job Offer Parameters

Parameter Name	Estimates	
	Men	Women
Constant	0.7138	0.7226
	(0.0023)	(0.0366)
Age	-0.0409	-0.0586
	(0.0127)	(0.1087)
High education	-0.2733	0.5729
	(0.1113)	(0.0025)

Notes: Maximum likelihood estimates of structural parameters. Standard errors in parentheses.

Figure (7) shows the fit of our estimated model to the data for low-men (upper panel) and women (lower panel), split by education group. The figure is constructed by solving the model for the estimated parameters and assigning each observation the calculated choice probabilities. The observed choice shares are directly calculated from the observed choices, while the predicted ones are the average choice probabilities of all observations at a particular age. Our model can predict the working choice and retirement patterns of individuals of all four types in the dataset very well. If we simulate life-cycles instead and draw the initial conditions

Figure 7: Model Fit - Observed and Predicted Choice Shares and Median Wealth



Notes: Estimated and observed choice shares by sex and labor market state. Legend shown in retirement panels. Untargeted median household wealth by education group.

from observed distributions, choice patterns look similar. This gives credence to the results of our counterfactual policy simulations.

6. Results

This section presents the results on the importance of subjective policy beliefs. We evaluate the effects of policy beliefs by using the estimated model to simulate life cycles of initially 30-year-old agents. In each simulation, we make specific assumptions about the future evolution of the policy regime and the agents' policy beliefs. Policy beliefs in our benchmark model are characterized by uncertainty and misinformation, as specified and parametrized in Section 3. The policy regime always starts at an SRA of 67 years, as the current German law prescribes, and we consider different scenarios for future increases by up to three years.

Outcomes we examine include individual labor supply, annual household savings, financial wealth, pension wealth, and individual welfare. We report annual labor supply in hours as a way of aggregating discrete choices.[29] We report annual labor supply and savings separately for agents' "work lives", i.e., the time before agents turn 63 and can first retire without qualifying for disability pension. Pension wealth is the present value of an agent's expected future pension payments.[30] For the welfare analysis, we follow Low et al. (2010) and construct a welfare measure that describes the welfare difference as the percentage change of consumption in each period over the lifecycle that would make an agent indifferent between baseline and counterfactuals (refer to appendix A.5.1 for details).

6.1. Baseline beliefs

Before we commence, it is useful to understand the initial expectations of the agents in our simulations and how they depend on policy beliefs. Specifically, consider the modal 30-year-old woman in our simulation sample. She is low-educated, meaning she does not have a high school degree, which would qualify her to enter university. She has a job, a partner, and is in good health. So far, she has accumulated 8 years of work experience and 8,300 euros in household wealth. Table 6 summarizes her expectations. We investigate her expectations in four cases. Columns (1) and (3) illustrate the agent's expectations in the case of no uncertainty. Here, the SRA is expected to stay at the current value of 67. Columns (2) and (4) illustrate the case of policy uncertainty, and the SRA is expected to reach 68.32 years. Columns (2) and (4) also illustrate the considerable SRA uncertainty the agent holds. The maximum SRA increase in her 95% confidence interval is 1.94 years.

Columns (1) and (2) summarize what the agent would expect if she were informed about the true ERP, which, according to our estimates, she most likely is not. If she were sure that the SRA would remain at 67 (column 1), she would expect to retire at age 64 and 3 months, with around 223,190 euros in household wealth and a present value of 129,800 euros of pension wealth. If she expects an increase in the SRA (column 2), she would only expect to retire about one and a half months later, with a smaller pension wealth (-6,300 euros) and higher financial wealth (+2,900 euros).

By contrast, being misinformed (column 3) and knowing that the SRA stays at 67 implies that she expects to retire around age 66 and 6 months. If she expects an SRA increase instead, her expected retirement age increases by 9 months. The higher perceived penalty shifts her expected retirement age closer to the SRA. The perceived lower generosity of the pension system leads to a substitution effect from the public pension system towards private savings. However, the adjustment of retirement timing generates a substantial income effect. Investments in human capital become more attractive, leading the agent to work more during her working life. Retirement adjustment and increased labor supply raise the expected pension income by 500 to 600 euros. This increases the relative importance of pension wealth over financial wealth at retirement.

We can observe that the lower generosity of the pension system, due to an expected increase in the SRA, leads to a substitution from the importance of pension wealth to financial wealth.

[29] Since we only allow for limited reactions at the intensive margin, these largely reflect probabilities that agents quit jobs or accept job offers. For women, this measure includes switching between part-time and full-time work.

[30] This does not include the expected present value of her partner's pension wealth, because it is exogenous in our model.

Table 6: Example Agent Initial Expectations and Policy Beliefs

Expected Outcome	Informed		Misinformed	
	No Unc. (1)	Unc. (2)	No Unc. (3)	Unc. (4)
Retirement				
SRA at 63	67.00	68.32	67.00	68.32
Retirement Age	64.25	64.36	66.50	67.23
Pension Wealth	129.80	123.60	122.44	114.81
Financial Wealth	223.19	225.09	207.81	201.67
Annual Pension Income	7.95	7.60	8.42	8.23
Share with Pension before 63	0.19	0.19	0.20	0.20
Work Life (< 63)				
Annual Labor Supply (hrs)	1024.48	1021.76	1044.18	1042.47
Annual Consumption	32.20	32.14	32.45	32.46
Annual Savings	5.42	5.48	5.16	5.11
Lifecycle (30+)				
Annual Labor Supply (hrs)	626.59	625.29	672.81	679.92
Average Financial Wealth	101.46	102.61	98.81	98.45
Welfare				
Compensating Variation (%)	0.00	-0.17	-1.04	-1.50

Notes: Expected outcomes of a 30-year-old woman conditional on policy beliefs. Expectations are averages of model-simulated outcomes in which policy evolves exactly as the agent expects it. Financial numbers are expressed in 1000 euros.

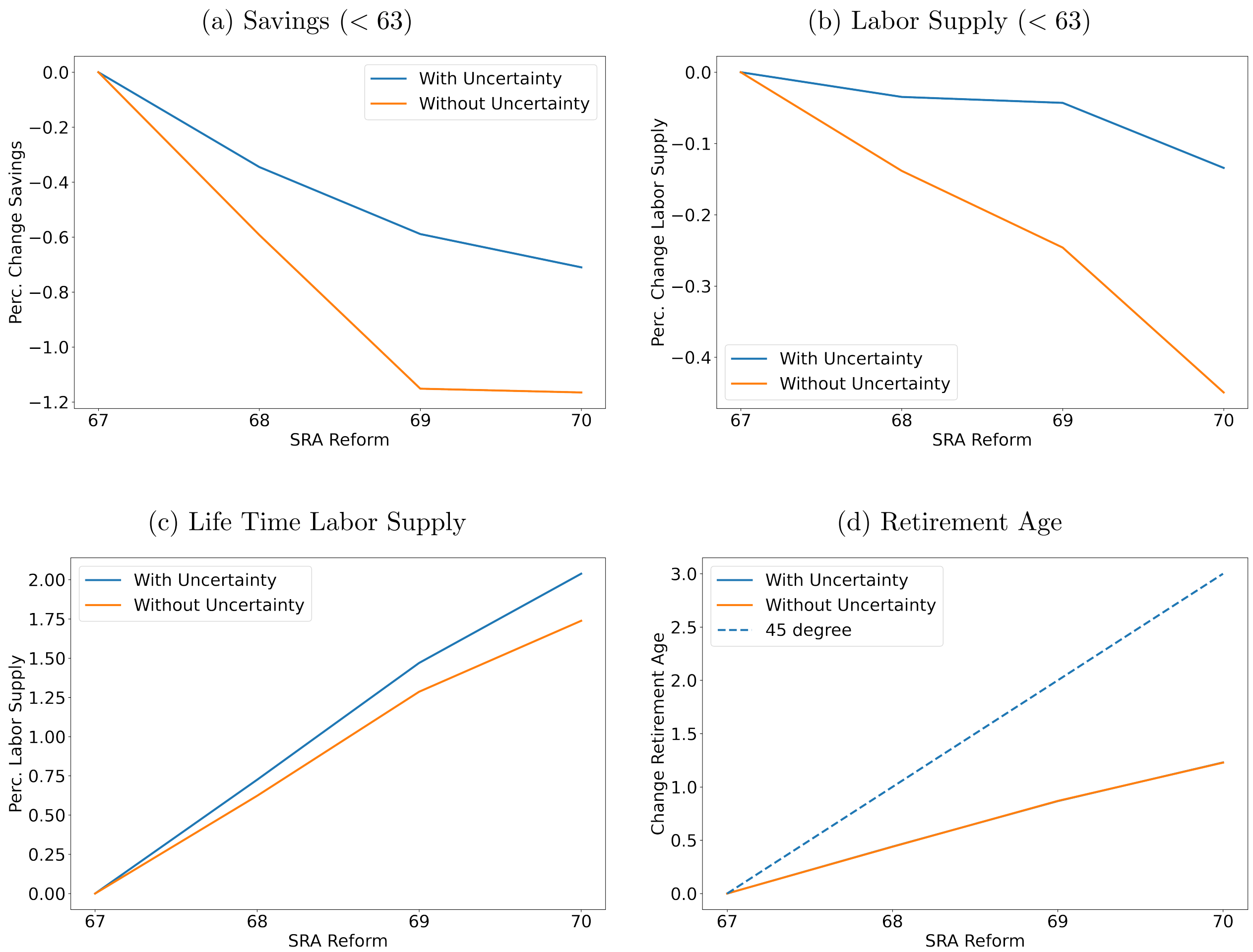
Interestingly, we can see the income effect flip the resulting change in the financial wealth. When the agent is informed, the expected SRA increase leads to a small reaction in retirement timing and thus a small income effect. This makes the agent increase her financial wealth by saving more and consuming less. In the case of misinformation, however, she expects to react strongly and adjust her retirement timing by 9 months. She uses this additional income to save less and overall reduce her financial wealth at retirement.

Table 6 illustrates a heterogeneity in how policy uncertainty affects welfare for informed and misinformed agents. Both policy uncertainty and misinformation generate welfare losses for agents. For informed agents, policy uncertainty generates a welfare loss of 0.17%. For misinformed agents, policy uncertainty produces a welfare loss of 0.46 percentage points compared to no uncertainty. Misinformed agents experience a welfare loss from policy uncertainty that is more than three times larger than that experienced by informed agents.

6.2. Retirement Age Increases and the Role of Reform Expectations

Differences in policy beliefs translate into differences in responses when the policy is reformed. In this section, we examine the impact of SRA increases on behavior and how subjective reform expectations moderate their effects. We simulate the life cycles of 30-year-old agents under different SRA reform scenarios. We use the whole set of 30-year-olds in our sample and simulate 1000 possible life-cycles for each. We compare a baseline scenario in which the SRA stays at 67

Figure 8: Reform Effects and Reform Expectations



Notes: Responses to SRA reforms in comparison to baseline scenario, where SRA remains at 67. Effects are calculated as differences to separate baselines, including policy uncertainty or without uncertainty.

throughout agents' lives with a gradual[31] increase of the SRA to 68, 69, and 70. We make this comparison under two sets of assumptions for agents' beliefs: (i) agents know the future policy regime from the start, as traditional models assume, and (ii) our benchmark model with probabilistic reform expectations. Figure 5 illustrates the results for behavior during the working life, i.e., below the age of 63, on the left panel, while the right panel shows the overall change in working hours and retirement age.

Examining reform effects without policy uncertainty first, we find that SRA increases cause reduced savings and labor supply. At the end of their working lives, actual retirement is delayed by around 0.3-0.4 years for each year of SRA increase. Referring to the discussion in Section 4.4, this implies two key points. First, the extension of expected working lives due to the SRA increase is strong enough to generate an income effect, such that the agent reduces their savings, and second, the income effect outweighs the substitution effect, such that the agents work less during their working life.

Reform expectations significantly attenuate forward-looking responses. This can be under-

[31] In this exercise, we abstract from the timing of reform announcement by having increases occur gradually over the course of agents' lives.

stood in light of the preceding description of agent expectations in the baseline. The fact that agents expect reform even when it does not occur causes them to pre-empt some of the reform effects—in this case, working and saving less. Therefore, the forward-looking effects of actual reforms are weaker. Contributing to this attenuation is the fact that in the counterfactuals where reforms do occur, probabilistic expectations imply that particularly younger agents remain uncertain. They optimize for a mix of possible scenarios, so their actual choices do not fit the true policy trajectory perfectly.

The final result is that at the intended margin of the policymaker—actual retirement age—agents react more strongly when they hold reform expectations. Compared to agents who know the true policy, those with probabilistic expectations arrive in their 60s with fewer financial assets and a higher pension claim, giving them a stronger incentive to avoid early retirement penalties. In sum, we find that probabilistic reform expectations weaken unintended life-cycle effects while slightly strengthening the main intended reform effect at the margin of retirement timing.

6.2.1. Welfare analysis

We start by comparing the ex-ante welfare differences in Table 6 with the ex-post welfare in Table 7 for the modal low-educated woman. Recall that in the ex-ante analysis, we evaluate the agents' expectations. Thus, the ex-ante and ex-post scenarios differ in two dimensions. First, in the ex-ante, the SRA follows the agent's expectation, i.e., the SRA follows a random walk with possible positive or negative shocks to the SRA. In the ex-post policy, the SRA follows a pre-specified path without any uncertainty. We study two scenarios: one with no reform, where the SRA remains at 67, and another where the SRA incrementally increases to the expected SRA of 68.32. Second, since the agent does not expect to become informed, she can never transition from being misinformed to the informed state in the ex-ante simulations. In the ex-post simulations, however, an initially misinformed agent can be informed with a constant probability every period. Naturally, informed agents stay informed in both the ex-ante and ex-post simulations.

Table 7: Ex Post Welfare of Example Agent

Realized Outcome	Initially Informed		Initially Misinformed	
	No Reform (1)	Reform (2)	No Reform (3)	Reform (4)
Welfare				
Compensating Variation (%)	-0.01	-0.19	-0.61	-1.01

Notes: Ex post welfare for the modal low-educated woman with subjective policy uncertainty. Welfare is calculated in comparison to a scenario where the agent has no uncertainty and the SRA stays at 67. In Reform Scenarios, the SRA evolves according to the agent's expectations.

The cost of policy uncertainty is small for informed agents, while the realized welfare loss of a reform is actually lower than expected. In column (1) of Table 7, we show the welfare loss of expecting a reform, but the SRA stays at 67, and the agent is informed. The loss is only 0.01%, which is relatively small. The welfare loss of the misinformed in column (3) is harder to interpret because it also captures the loss of being partly misinformed over the lifetime. Recall that our survey shows that this is a large part of the population. We can compare directly the

Table 8: Ex-Post Welfare Costs of SRA Reforms for the Whole Sample

Expectations	SRA 67	SRA 68	SRA 69	SRA 70
No Uncertainty	0.00	-0.32	-0.63	-0.91
Uncertainty	0.00	-0.31	-0.62	-0.92

Notes: Compensating variations on comparison to the scenario of no SRA increase, i.e., SRA stays at 67. We distinguish between a model with perfect foresight on future SRA and one with uncertainty about the evolution of SRA.

welfare loss differences of columns (1) and (2), as well as (3) and (4), in both tables. While the welfare difference for the informed to expect a reform and in comparison experience one is similar, the loss is 15% higher for initially misinformed.

The welfare costs of SRA reforms are similar in models with perfect foresight and in a model including policy uncertainty. Table 8 illustrates the welfare costs in different SRA scenarios and policy beliefs. We compare the welfare costs for each set of expectations against the scenario where the SRA remains at 67. For both models, each additional year of SRA causes a 0.3% welfare loss.

6.3. De-Biasing and the Puzzle of Retirement Bunching

A natural question in a model with biased expectations is what would happen if the bias were eliminated. The purpose of this counterfactual exercise is to uncover the effect of misinformation on individual behavior and welfare, both at the margin of retirement timing and over the lifecycle.

We again simulate the life cycles of a representative cohort of 30-year-old agents. The true SRA is gradually increased from 67 to 69, and agents hold probabilistic expectations about it. In the baseline simulation, the majority is initially misinformed (xx to xx percent, depending on education type) and gradually updates their beliefs according to the estimated Markov transition process. In the counterfactual, everyone is correctly informed about the ERP from age 30 onward. Table 10 summarizes the results.

Table 9: Effects of Removing Early Retirement Penalty Bias

Outcome	Baseline with Misinformed	Only Informed	Difference (%)
Work Life (< 63)			
Annual Labor Supply (hrs)	1425.90	1430.59	+0.33
Annual Consumption	3.85	3.86	+0.28
Annual Savings	0.56	0.55	-1.33
Retirement			
Retirement Age	64.02	62.98	-1.62
Retirement Age	66.12	64.84	-1.93
Pension Wealth	163.20	160.40	-1.73
Financial Wealth at Retirement	328.20	323.00	-1.58
Lifecycle (30+)			
Annual Labor Supply (hrs)	934.86	912.26	-2.42
Average Financial Wealth	179.10	175.50	-2.02
Welfare			
Compensating Variation			+0.98

Notes: Averages for simulated lifecycles of 10,000 agents. Statutory Retirement Age increases gradually from 67 to 69 years. In *Baseline* scenario, agents are partially misinformed about the ERP and learn over time. In *Only Informed*, everyone is informed from age 30. Monetary quantities in 1000 Euros.

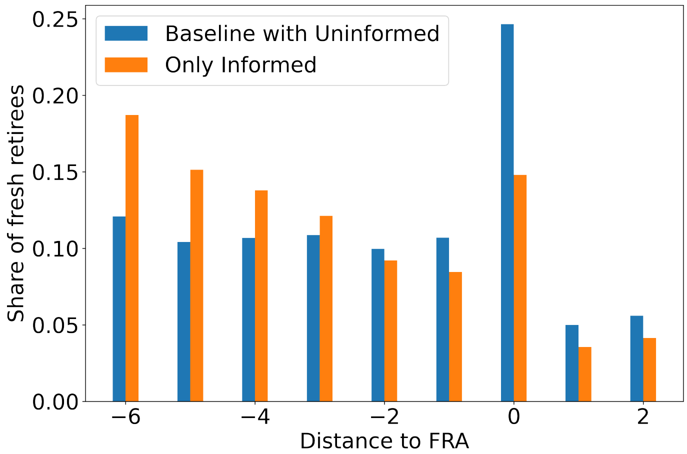
Eliminating the bias has strong behavioral effects. During their working lives, agents on average work slightly more but reduce their savings by around 1.3 percent. Removing the bias in expected penalty size increases the value of investing in pension wealth through work relative to investing in financial wealth through savings (cf. section 4.4). Intuitively, removing the Early Retirement Penalty overestimation significantly shifts retirement timing. Excluding agents who claim a disability pension, the average pension claiming age is reduced by 1.96 years. The stock of financial assets at retirement is around 1.58 percent lower due to the lower savings rate. Both results are driven by men—especially low-educated men—who are most likely to be the main income earners in the household and would under hardly any circumstances consider early retirement when facing high penalties.

From a life-cycle perspective, the strong increase in early claiming more than compensates for the working-life increases in labor supply, so that aggregate labor supply and savings both decrease by over 2 percent. At the same time, removing the bias increases individual welfare according to the Low et al. (2010) measure by 0.98 percent. In sum, while removing the bias increases welfare, both aggregate labor supply and aggregate savings decline. We abstract from general equilibrium effects as well as positive fiscal and other externalities of work. Accounting for these would likely amplify the adverse behavioral effects and thereby dampen or even reverse the positive welfare effects.

Retirement Bunching Puzzle. Our model fits historical choice data very well, as shown in Figure 7, and can therefore reproduce the well-known spike in claiming decisions at the SRA, which seems to contradict the smooth evolution of economic incentives around the cutoff. This raises the question of whether this behavior persists when incentives change.

For better comparability with the recent literature, we define the *Full Retirement Age* (FRA), which is the same as the SRA unless the conditions for early retirement based on long working life are met (cf. section 4.1), in which case it is the SRA minus two years. Figure 9 illustrates that despite changing incentives at higher ages, in this counterfactual world, in which the SRA is increased by 2 years, the spike persists in our baseline model. By comparison, in the counterfactual, retirement evolves more smoothly around the cutoff.

Figure 9: Information Effect on Retirement Bunching



Notes: Share of retirement/ pension claiming choices relative to the *Full Retirement AGE* (FRA). The FRA is the Statutory Retirement Age (69, in this simulation), except when the number of credited periods is high enough for the agent to qualify for penalty-free early retirement due to long working life. In this case, the FRA is 67. Choice share is relative to all agents in the sample.

The reason is intuitive. People on average would prefer to retire before the FRA, but the misinformed consider early retirement prohibitively expensive except in rare circumstances.[32] Furthermore, even agents who spend most of their lives misinformed but become informed a few years before retirement have saved less than they would have if informed from the start. Therefore, they are less less likely to retire early than their counterfactual counterparts.

This finding is in line with Hentall-MacCuish (2025), who shows that misbeliefs about the policy environment can complement existing explanations of retirement spikes around the SRA. We discuss it in context of the recent literature in the concluding section.

7. Conclusion

This paper quantifies how subjective policy beliefs shape behavioral responses to pension reform. We develop and estimate a structural life-cycle model in which forward-looking agents hold probabilistic expectations about the future Statutory Retirement Age and are systematically misinformed about the Early Retirement Penalty. Using survey-elicited beliefs from the German SOEP, we estimate the model and simulate counterfactual policy scenarios.

[32] Examples include low-income singles whose pension claim is so low that they will rely on social assistance anyway, or people in bad health with very low pension claims—usually women with short employment histories—who expect to live off financial assets and spousal income during retirement.

Our findings have important implications for policymakers. Agents already anticipate future SRA increases, behaving as if reform were imminent. Consequently, lifecycle responses to actual reforms are attenuated compared to models that assume perfect foresight or no reform expectations. This suggests that the adverse behavioral effects policymakers might fear—such as reduced savings or labor supply during working life—emerge more weakly than traditional models predict. The analysis thus raises questions about whether policymakers should prioritize eliminating policy uncertainty. Similarly, while misinformation about the ERP makes agents uncomfortable with early retirement—because they overestimate penalties and thus their own behavioral response—correcting these beliefs generates adverse spillovers. De-biasing increases individual welfare but significantly reduces old-age labor supply, particularly affecting the retirement timing margin.

For the literature, our results demonstrate the importance of modeling expectations explicitly to avoid overestimating policy responses. Moreover, we offer a belief-based mechanism for retirement bunching at the SRA. Like reference-dependent preferences, our mechanism generates testable predictions: bunching should diminish when misinformation is corrected, whereas reference-dependent models predict persistence. These competing mechanisms could be distinguished empirically through targeted information interventions.

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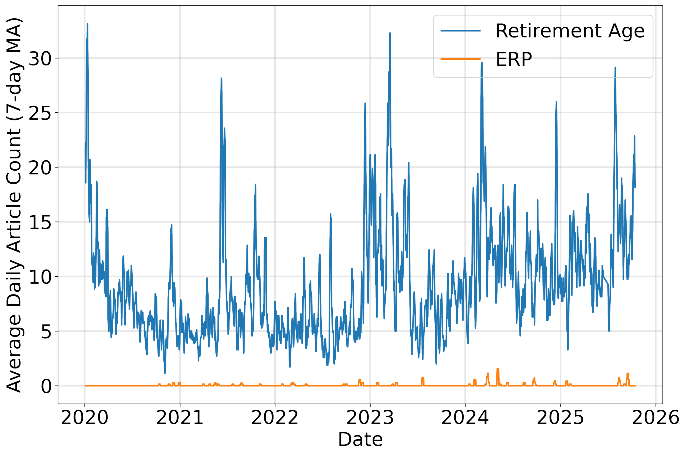
A. The appendix

A.1. Introduction

A.1.1. Media Analysis – Pension Debate in Germany

Figure 10: Replacement Rate and Contribution Rate

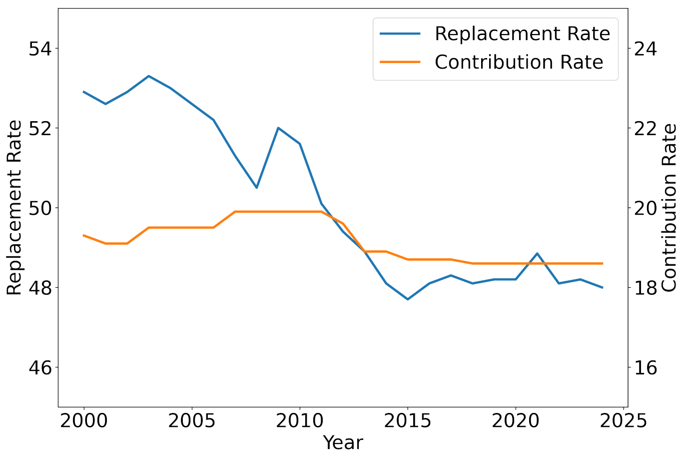


Notes: Comparison of articles covering pension deduction or retirement ages. The figure includes all articles that appear in major German news outlets. Information retrieved via the GDELT project.

A.2. Data and Institutional Background

A.2.1. Pension Rates

Figure 11: Replacement Rate and Contribution Rate



Notes: Contribution rates are a percent of gross wages, half of which is owed respectively by employer and employee. The replacement rate is defined as the ratio GI/GP, where GI is the gross pension which a worker after 45 years of working at the average wage would get and GP is the average gross income of all insured workers.

Source: German Pension Insurance (DRV)

A.3. Policy Beliefs

A.3.1. Questions

Current Early Retirement Penalty (ERP)

> *What percentage do you think the pension insurance company deducts from one's monthly pension if a person retires one year before their regular retirement age?*
>
> *(Answer: X percent)*

Robustness Questions:

> *How likely do you think it is that the pension insurance will deduct [1.5*X] percent or more from your monthly pension if you retire one year early?*
>
> *How likely do you think it is that the pension insurance will deduct [0.5*X] percent or more from your monthly pension if you retire one year early?*

Original (DE): Was glauben Sie wie viel Prozent die Rentenversicherung von der monatlichen Rente abzieht, wenn man ein Jahr vor dem gesetzlichen Renteneintrittsalter in Rente geht?

Expected Statutory Retirement Age (SRA)

> *Under the current system, the retirement age is increased to 67. How likely do you think the following three statutory retirement ages will be at the time of your retirement? Please answer so that your three statements add up to 100%.*
>
> *(The possible retirement ages are "67", "68", and "69 and above".)*

Original (DE): Im jetzigen System wird das Renteneintrittsalter auf 67 Jahre erhöht. Für wie wahrscheinlich halten Sie die folgenden drei Renteneintrittsalter zum Zeitpunkt Ihres Ruhestands?

Expected Claiming Age

> *At what age do you yourself expect to start receiving benefits from the statutory pension scheme (e.g. pension, retirement pension)?*
>
> *(Answer: X years)*

Robustness Questions:

> *How likely do you think it is that you will not start receiving benefits from the statutory pension scheme until age [X+1] or later?*
>
> *How likely do you think it is that you will start receiving benefits from the statutory pension scheme as early as age [X-1] or earlier?*

Original (DE): Ab welchem Alter erwarten Sie selbst, erstmals Leistungen aus der gesetzlichen Altersvorsorge (z.B. Rente, Pension) zu beziehen?

A.4. Model

A.4.1. Static Retirement Model

A Static Model of Consumption, Labor Supply, and Retirement

To build intuition for the mechanisms in our dynamic model, we consider a static, one-period setting in which individuals choose consumption while working (c_1), labor supply (l), and the timing of retirement (t_R). The working phase lasts t_R periods and retirement lasts $T - t_R$ periods.

Budget and pension. Working income is $y_1 = w\,l$. Individuals can save for retirement:

$$s = y_1 - c_1 = w\,l - c_1.$$

Savings are unaffected by the statutory retirement age $\bar{t}$ or the penalty parameter. The perceived pension benefit is proportional to earnings and reduced linearly if the agent retires before $\bar{t}$:

$$B(l, t_R; \bar{t}) = a\,w\,l\,\big[1 - e\,(\bar{t} - t_R)\big],$$

where $e > 0$ is a (possibly misperceived) scalar penalty parameter. The second-period consumption equals savings plus the pension:

$$c_2 = s + B = w\,l - c_1 + a\,w\,l\,[1 - e(\bar{t} - t_R)].$$

Equivalently,

$$c_2 = w\,l\Big[1 + a\big(1 - e(\bar{t} - t_R)\big)\Big] - c_1.$$

Preferences. Utility is

$$U = t_R\,u(c_1) + (T - t_R)\,u(c_2) - v(l),$$

with $u' > 0$, $u'' < 0$, $v' > 0$, and $v'' > 0$.

First-order conditions. Let

$$W(l, t_R; \bar{t}) := w\,l\Big[1{+}a\big(1{-}e(\bar{t}{-}t_R)\big)\Big], \quad W_l := \partial_l W = w\Big[1{+}a\big(1{-}e(\bar{t}{-}t_R)\big)\Big], \quad W_t := \partial_{t_R} W = a\,w\,l\,e.$$

Using $c_2 = W - c_1$, the interior FOCs are:

$$F_1: \quad t_R\,u'(c_1) - (T - t_R)\,u'(c_2) = 0, \tag{27}$$
$$F_2: \quad v'(l) - (T - t_R)\,u'(c_2)\,W_l = 0, \tag{28}$$
$$F_3: \quad u(c_1) - u(c_2) + (T - t_R)\,u'(c_2)\,W_t = 0. \tag{29}$$

Comparative statics with respect to $\bar{t}$. Let $x := (c_1,\, l,\, t_R)^\top$, $F := (F_1, F_2, F_3)^\top$, and $J := \partial F / \partial x$. By the Implicit Function Theorem,

$$\frac{dx}{d\bar{t}} = -\,J^{-1}\,\frac{\partial F}{\partial \bar{t}}, \tag{30}$$

with the direct $\bar{t}$-partials (holding x fixed) given by

$$\frac{\partial F}{\partial \bar{t}} = \begin{pmatrix} (T - t_R)\,u''(c_2)\,a\,w\,e\,l \\ (T - t_R)\,\big[u''(c_2)\,a\,w\,e\,l\,W_l + u'(c_2)\,a\,w\,e\big] \\ a\,w\,e\,l\,\big[u'(c_2) - (T - t_R)\,u''(c_2)\,a\,w\,e\,l\big] \end{pmatrix}.$$

(Here we use $\partial_{\bar{t}} W = -awe\,l$, $\partial_{\bar{t}} W_l = -awe$, and $\partial_{\bar{t}} W_t = 0$.)

—

Direct Effects of an Increase in the Statutory Retirement Age

Holding all behavioral responses fixed, a higher statutory retirement age $\bar{t}$ affects each first-order condition through its direct derivatives $\partial_{\bar{t}} F_i$.

- **Work-life consumption (c_1):** The direct effect $\partial_{\bar{t}} F_1 > 0$ implies $dc_1/d\bar{t} < 0$. *Intuition:* a higher $\bar{t}$ increases the perceived reduction in pension benefits via $e(\bar{t} - t_R)$, lowering expected lifetime resources and therefore current consumption.

- **Labor supply (l):** From F_2, the direct effect is

$$\partial_{\bar{t}} F_2 = (T - t_R) awe \big[u''(c_2)\, W + u'(c_2)\big], \quad \text{where } W = lW_l.$$

  The bracketed term contains two opposing forces:

  [label=()]*Future consumption channel:* The term $u''(c_2)W < 0$ captures that a higher $\bar{t}$ reduces future consumption c_2, raising its marginal utility and thereby increasing the incentive to work. *Effective wage channel:* The term $u'(c_2) > 0$ reflects that the marginal product of labor W_l falls when $\bar{t}$ rises, lowering the return to work and reducing labor supply.

  The overall sign of $\partial_{\bar{t}} F_2$—and hence of $dl/d\bar{t}$—is ambiguous. However, since $lW_l = W > c_2$, the first term dominates whenever relative risk aversion

$$R(c_2) = -\frac{c_2 u''(c_2)}{u'(c_2)}$$

  exceeds $c_2/W < 1$. For empirically common calibrations with $R \geq 1$, the substitution effect through $u''(c_2)$ dominates, so the direct effect of raising the SRA tends to *increase* labor supply.

- **Retirement timing (t_R):** From F_3, we obtain

$$\frac{dt_R}{d\bar{t}} = -\frac{\partial_{\bar{t}} F_3}{\partial_{t_R} F_3}.$$

  Since $\partial_{\bar{t}} F_3 = u'(c_2)\, w\, a\, e\, l > 0$ and $\partial_{t_R} F_3 < 0$ under standard curvature assumptions ($u'' < 0$), it follows that $dt_R/d\bar{t} > 0$. *Intuition:* a higher statutory retirement age increases the perceived reduction in pension benefits from retiring early, leading individuals to retire later.

Indirect Effects Through Retirement Timing

When individuals perceive the early-retirement penalty e to be large, the responsiveness of retirement timing to the SRA, $dt_R/d\bar{t}$, becomes quantitatively important. The total effect of an increase in $\bar{t}$ on consumption and labor supply can then be written, using the IFT decomposition,

$$\frac{dx}{d\bar{t}} = -\, J^{-1} \frac{\partial F}{\partial \bar{t}} = -\, J^{-1} \begin{pmatrix} \partial_{\bar{t}} F_1 \\ \partial_{\bar{t}} F_2 \\ \partial_{\bar{t}} F_3 \end{pmatrix}, \qquad x = (c_1, l, t_R)'.$$

Hence, for each choice variable $x_i \in \{c_1, l, t_R\}$,

$$\frac{dx_i}{d\bar{t}} = -\frac{1}{\partial_{x_i} F_i} \left(\partial_{\bar{t}} F_i + \partial_{c_1} F_i \frac{dc_1}{d\bar{t}} + \partial_l F_i \frac{dl}{d\bar{t}} + \partial_{t_R} F_i \frac{dt_R}{d\bar{t}} \right),$$

where the last term captures the indirect contribution from the retirement response.

Indirect effect on savings and consumption. For c_1, the relevant decomposition is

$$\frac{dc_1}{d\bar{t}} = -\frac{1}{\partial_{c_1} F_1}\Big(\partial_{\bar{t}} F_1 + \partial_{t_R} F_1 \frac{dt_R}{d\bar{t}}\Big),$$

since $\partial_l F_1$ is small. The direct component $\partial_{\bar{t}} F_1 > 0$ lowers c_1, but the indirect term $\partial_{t_R} F_1(dt_R/d\bar{t})$ can offset it. A larger t_R raises lifetime income by extending working life and the pension base ($\partial_{t_R} F_1 < 0$), so for sufficiently strong retirement responses

$$\frac{dt_R}{d\bar{t}} > -\frac{\partial_{\bar{t}} F_1}{\partial_{t_R} F_1} \quad \Rightarrow \quad \frac{dc_1}{d\bar{t}} > 0,$$

implying higher work-life consumption and lower savings. This mechanism generates the empirically observed decline in saving when individuals expect large increases in effective retirement age.

Indirect effect on labor supply. For labor supply,

$$\frac{dl}{d\bar{t}} = -\frac{1}{\partial_l F_2}\Big(\partial_{\bar{t}} F_2 + \partial_{t_R} F_2 \frac{dt_R}{d\bar{t}}\Big),$$

with $\partial_{t_R} F_2 = u'(c_2)W_l - (T - t_R)\big[u''(c_2)W_t W_l + u'(c_2)\partial_{t_R} W_l\big]$. The sign of the first term in brackets (the direct effect) was discussed above; the second term represents how a change in optimal retirement timing feeds back into labor incentives.

An increase in t_R affects F_2 through two channels: (i) it lengthens the horizon over which retirement utility is weighted, scaling the $(T - t_R)$ term, and (ii) it raises post-work income $W_t > 0$, which lowers $u'(c_2)$. Both reduce the marginal utility gain from supplying additional labor, so $\partial_{t_R} F_2 > 0$ and the retirement-channel term

$$-\frac{\partial_{t_R} F_2}{\partial_l F_2}\frac{dt_R}{d\bar{t}}$$

typically decreases l. Thus, while the direct effect of a higher SRA tends to increase labor supply under moderate risk aversion, the indirect adjustment through delayed retirement dampens this response and can even reverse it if the perceived penalty e is very large.

Summary. Overall, the indirect retirement channel operates like an "income effect" in expectations: when individuals believe that raising the SRA forces a much later retirement, they perceive higher lifetime resources and react by consuming more and reducing work effort. The strength of this channel depends on e and the elasticity of retirement timing $dt_R/d\bar{t}$; in the limit where $e \to 0$ (no perceived penalty), the indirect terms vanish and only the direct substitution effects remain.

A.4.2. Variable Overview

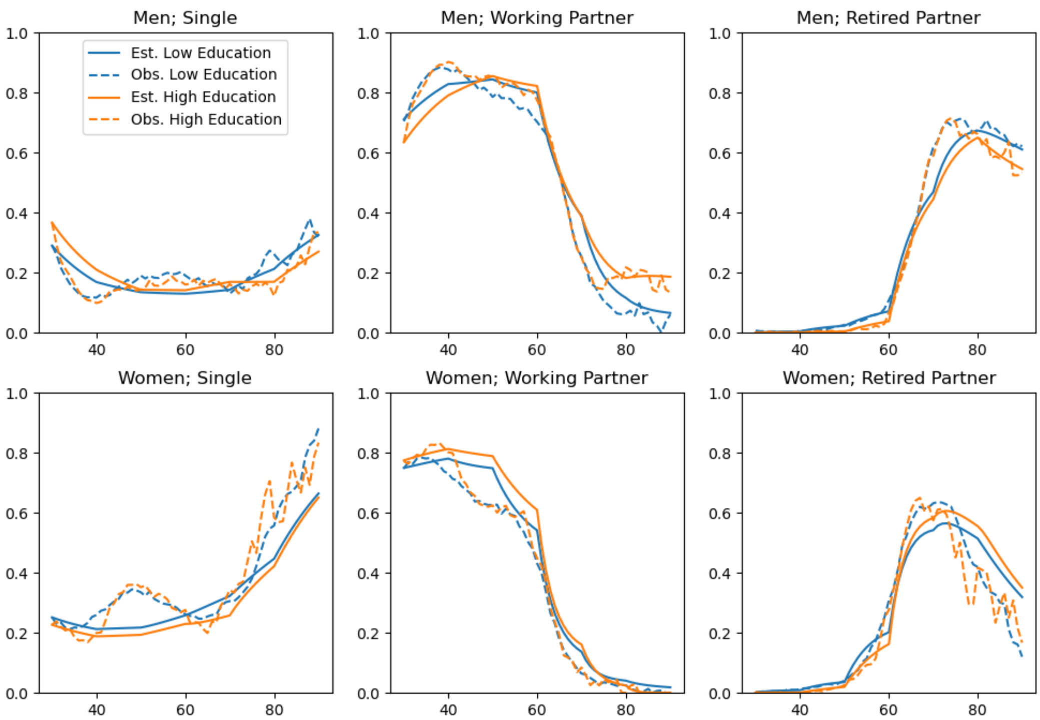
A.4.3. Auxiliary Markov Processes

Partner Transitions The partner state p_t influences utility through the consumption equivalence scaling factor and budget through partner income, taxation, and child benefits. It evolves stochastically with transition probabilities that depend on sex, education, age, and current partner state, none of which the agent can control. Formally, its transition is given by:

$$\pi(p_{t+1}|x_t) = \Lambda_p\Bigg(Z_p(x_t)'\,\phi_p)\Bigg) \tag{31}$$

where Λ_p is the three-dimensional multinominal logistic distribution function. It provides transition probabilities for the state's single, working-age partner, and retired partner. The characteristics in $Z_p(x_t)$ are, as explained earlier, the sex, education, age, and current partner states. However, we estimate the partner transitions for the four types separately. We use SOEP-Core data to estimate partner transitions. As the SOEP is a household panel, all members, including the partners, are also interviewed. We can classify them directly into retirement and working age. Simulating with our estimated transition probabilities from the initial share at age 30 of partner states in the data, we can replicate the shares in population:

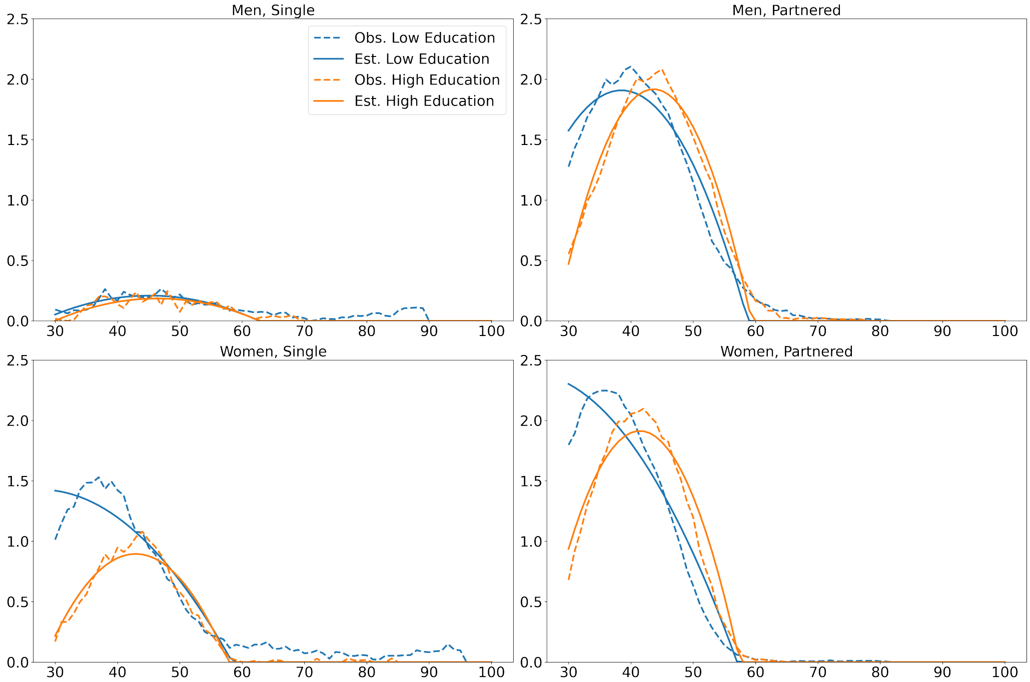
Figure 12: Shares of population in partner states



Notes: Simulated shares of individuals in each partner state from estimated transition probabilities. *Data:* SOEP-Core

The partner state, together with type (sex, education) and age, determine the number of children in the household. We use the number of children to construct the consumption equivalence scale and, if working, for additional disutility. We approximate the number of children by OLS. We provide the goodness of approximation:

Figure 13: Number of Children



Notes: OLS estimation of number of children in the household conditional on type and partner state over the life-cycle.

Data: SOEP-Core

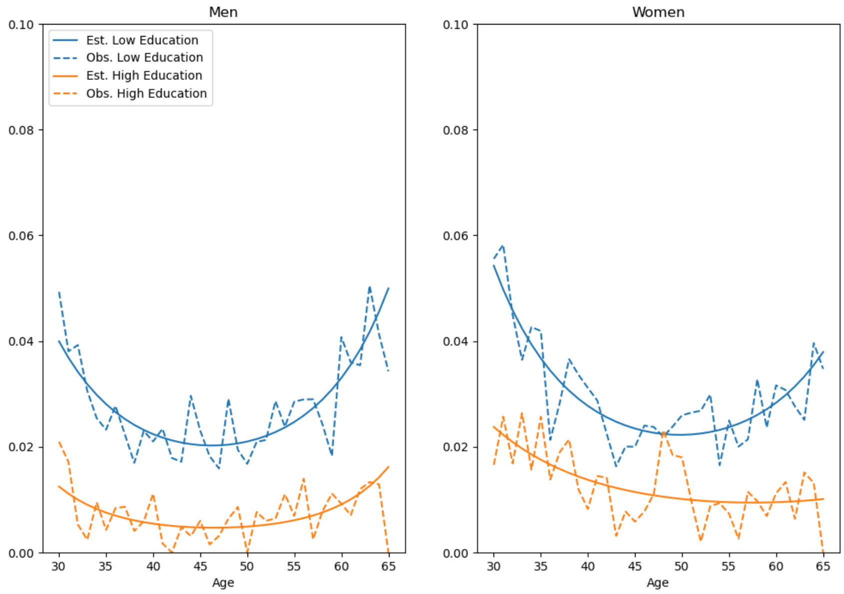
Job-offers and Destructions The job offer state governs the agent's ability to choose employment; the agent can choose part- or full-time if the job offer state o_t equals 1. We incorporate two processes with the job-offer state. Namely, job destruction and job offer. If the agent chooses employment in the current period, the job could be destroyed, and she has job offer state $o_{t+1} = 0$ in the next period, forcing her to choose unemployment[33]. In this case, the transition probability for the job offer state is given by:

$$\pi(o_{t+1} = 0 | x_t, d_t \in \{2, 3\}) = \Lambda_{sep}\left(Z'_{sep}\phi_{sep}\right) \tag{32}$$

where Λ_{sep} is the logistic distribution function, which predicts a job separation, conditional on education, age, and a constant. We separately estimate the probability of job separation for men and women. We estimate the probability from SOEP-Core data, where individuals are asked why they left their jobs. We only consider involuntary job loss as job separation. We restrict our sample to the start age of our model and 65 to have enough observational power. We assume that job separation rates remain constant after 65 to the age of forced retirement (72). The fit of our estimated probability can be seen in Figure 16:

[33]The agent can also choose retirement with $o_t = 0$, but we abstract from that for clarification.

Figure 14: Share of Job separations



Notes: Estimated job separation probabilities using logistic regression. Data is weighted and shares are computed using a moving average with a three-year bandwidth.

Data: SOEP-Core

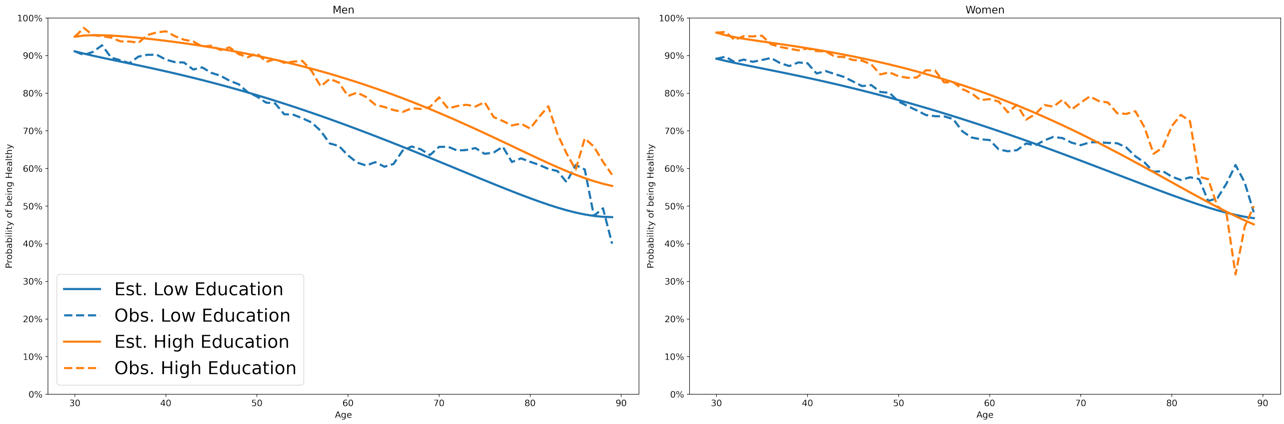
The second process incorporated in the job offer state is the job offer process for unemployed agents. If the agent chooses unemployment during this period, it predicts the probability of being able to choose employment in the next period ($o_{t+1} = 1$). Why and how we estimate this process via maximum likelihood can be found in Section (5.1).

Health and Death The state of health directly affects the disutility of work and the probability of survival. We, therefore, track three health states: Bad Health, Good Health, and Death. For good and bad health we use the SOEP-Core question on self-reported health, following closely Haan and Prowse (2014). We then use a logistic regression to estimate and predict the probabilities of bad (from good state to bad) and good (from bad state to good) health shocks. We use the following empirical specification:

$$\pi(h_{t+1}|x_t) = \Lambda_h\Big(Z_h'\phi_h\Big) \tag{33}$$

where Z_h includes current health state and age. Below, we document the sample fit using the predicted transition rates, and simulate with them from the initial share of healthy individuals. We fit the share of healthy individuals well:

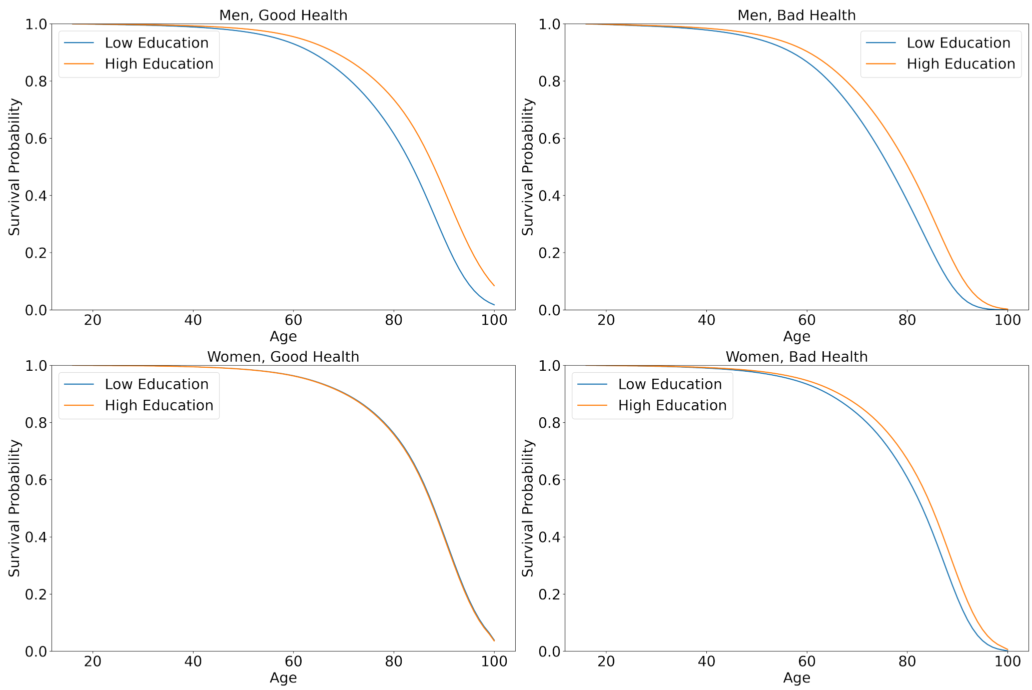
Figure 15: Share of People in Good Health



Notes: Predicted of healthy people in comparison to data.
Data: SOEP-Core

The third state of our health process is the state of death. In the case of death, the agent bequeathed all its wealth and received a bequest utility. The probability of dying depends on health. Therefore, we use a joint Markov process together with health. To estimate survival probabilities, we can not only rely on the SOEP. Instead, we follow Lampert et al. (2019) and use a two-step procedure: First, we generate group-specific hazard ratios with the SOEP. Second, we use the Lifetables from the German statistical office to correct and match the German mean death probability. The procedure relies on the assumption of randomness (independent of the groups we consider) that death is observed in the SOEP data. Here are the estimated survival functions over the lifetime:

Figure 16: Share of People Alive



Notes: Estimated survival functions.
Data: SOEP-Core and Lifetables from Destatis

A.4.4. Modelling and Estimation of Income

Pension calculation The formula for calculating pension claims in Germany consists of three parts. First is the pension point value, which we use as the population-weighted average from the 2010 pension point values for East and West Germany. Second, the pension points themself accumulated over the working life, and third, the deduction factor if the individual retired early. The second and third factors we track through the experience stock, which we will outline in this section.

Each individual receives pension points in the ratio of their yearly income compared to the overall mean wage of all working individuals. Let w_m be the mean wage, and h_t be the agent's work hours(either part- or full-time). The average (averaging over income shocks) yearly income for any experience level e_t is given by

$$exp(\gamma_{0,\tau} + \gamma_{1,\tau} \ln (e_t + 1)) * h_t$$

Therefore, the pension points at any age t, working h_t hours are:

$$\frac{exp(\gamma_{0,\tau} + \gamma_{1,\tau} \ln (e_t + 1)) * h_t}{w_m}$$

If an agent retires at age t, she has a certain number of years of experience e_t. This corresponds to working full-time hours for e_t years. Let $h_{f,\tau}$ be the type specific full-time hours and define $w_{m,\tau} = w_m/h_{f,\tau}$. We approximate the number of pension points by assuming the agent has worked e years full-time. This yields the following pension points:

$$\begin{aligned} PP(x_t) = &\int_0^{e_t} \frac{exp(\gamma_{0,\tau} + \gamma_{1,\tau}x + \gamma_{2,\tau}x^2) * h_{f,\tau}}{w_m} dx \\ &\frac{1}{w_{m,\tau}} \int_0^{e_t} exp(\gamma_{0,\tau}) exp(\gamma_{1,\tau}x + \gamma_{2,\tau}x^2) dx \\ &\frac{exp(\gamma_{0,\tau})}{w_{m,\tau}} \left[\frac{1}{\gamma_{1,\tau} + 1} (x+1)^{\gamma_{1,\tau}+1} \right]_0^{e_t} \\ &\frac{exp(\gamma_{0,\tau})}{w_{m,\tau}(\gamma_{1,\tau} + 1)} \left[(e_t + 1)^{\gamma_{1,\tau}+1} - 1 \right] \end{aligned}$$

Therefore, we have a closed-form solution for the pension points and can calculate the monthly pension by:

$$y_t(x_t, 0) = PP(x_t) * PPV \tag{34}$$

The factor PPV is the pension point value, for which we use the 2020 east-west weighted average. Note that the function above is invertible. Assume that an agent retires one year early. Her pension would be given by:

$$y_t(x_t, 0) = PP(x_t) * PPV * (1 - 0.036) \tag{35}$$

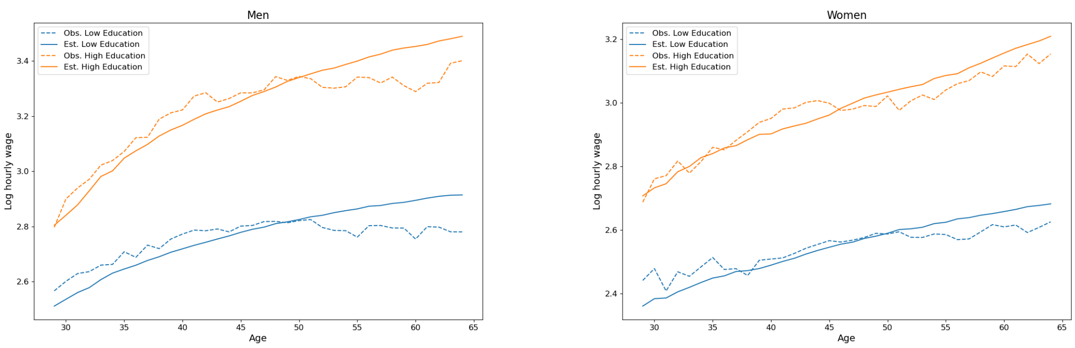
Given the type of the agent, we can map the new pension back to the experience stock, such that the reduced pension corresponds to an unreduced pension with a new experience stock e_t'. With this method, we can track pension deductions for the experience stock without tracking the retirement age.

Wage Process In the model, we assume that individuals can invest in their human capital by working full-time or part-time. We estimate their returns to experience with two-way fixed effects regressions using SOEP core panel data. The estimation sample is the same as the one used for the model estimation, i.e., men and women over 30 who work full- or part-time throughout the estimation period 2010-2017. Since time-fixed effects absorb the effects of aggregate income growth and inflation, all monetary quantities in the model are expressed in 2010 Euros. The returns to experience are identified as individual variations in wages over time. We estimate the following equation for each sex and education type using observations of wages and experience for each individual i and time t:

$$log(w_{it}) = \gamma_{0,\tau} + \gamma_{1,\tau} * log(exp_{it} + 1) + \xi_i + \mu_t + \zeta_{it}. \tag{36}$$

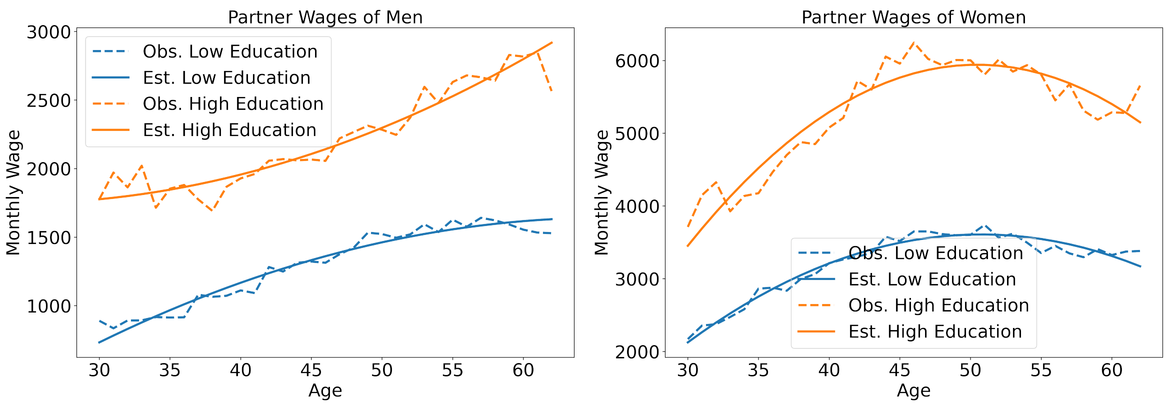
Our estimates of $\gamma_{0,\tau}, \gamma_{1,\tau}$, directly correspond to the parameters in equation (7). We cluster standard errors across individuals and time and estimate the wage process's variance σ_w^2. We document the fit of our estimates below:

Figure 17: Wage fit



Partner Income Process We approximate the partner's income through state variables of the agent himself. First, consider the partner state: If the agent is single, there is no partner income. When having a partner in working age life, we approximate the partner's wage by OLS of wages onto the agent's age and age squared. We assign unemployed partners a wage of zero. Therefore, the partner income is a mixture between the wages of partners and unemployed partners. We do the approximation for education and sex separately. Below, we show the fit of the

Figure 18: Wages of working age partners



Having a wage prediction over the life-cycle, we use these to approximate the partner's pension, which remains constant over retirement.

A.5. Counterfactuals

A.5.1. Welfare Measure

For the welfare analysis, we follow Low et al. (2010) who measure the welfare effects by the consumption variation that is welfare equivalent to the change from one scenario to the other. Formally, let A denote the counterfactual environment and let B denote the baseline scenario. The welfare value of scenario A is denoted by γ_A and solves $V_B(\gamma_A) = V_A(0)$, where

$$V_e(\gamma) = \mathbb{E}\left[\sum_{t=30}^{T} \beta^t u(c_t(1+\gamma), d_t, \theta, X_t)\right], \text{for } e \in \{A, B\}. \tag{37}$$

Thus, γ_A describes the relative increase in per-period consumption to equal the average discounted utility in the counterfactual scenario [34]. Consequently, a positive value is associated with a welfare gain in the counterfactual and a negative vice versa.

Table 10: SRA Increase Baseline

Expected Outcome	SRA 67		SRA 69	
	No Unc. (1)	Unc. (2)	No Unc. (3)	Unc. (4)
Retirement				
Retirement Age	63.34	63.34	64.04	64.04
Retirement Age (excl. Disability)	65.77	65.77	66.64	66.64
Pension Wealth (PV at Retirement)	193.94	193.49	183.01	182.83
Pension Wealth (excl. Disability)	183.26	182.80	170.34	170.14
Financial Wealth at Retirement	287.53	286.71	283.04	282.97
Financial Wealth (excl. Disability)	300.14	299.25	295.14	295.03
Annual Pension Income	12.61	12.58	12.34	12.32
Annual Pension Income (excl. Disability)	12.90	12.87	12.59	12.58
Share with Disability Pension	0.20	0.20	0.22	0.22
Share with Pension before 63	0.16	0.16	0.16	0.16
Work Life (< 63)				
Annual Labor Supply (hrs)	1338.25	1334.25	1334.95	1333.68
Annual Consumption	37.84	37.82	37.84	37.83
Annual Savings	4.89	4.86	4.83	4.83
Lifecycle (30+)				
Annual Labor Supply (hrs)	863.66	861.08	874.76	873.73
Average Financial Wealth	161.45	161.01	161.41	161.44

Notes:

[34] In this calculation, the consumption adjustment γ_A is implemented ex-post and, therefore, does not affect behavior.