# DISCUSSION PAPER

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# Do Individuals Accept Fluctuations in Pension Income?

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# Do individuals accept fluctuations in pension income?

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## Abstract

How to invest and decumulate wealth during retirement has far-reaching consequences for consumption during retirement. We conduct an online experiment among 2,500 individuals representative of the adult German population. First, we investigate the choice between phased withdrawal plans with varying riskiness resulting in volatile retirement income. We find that 40% of the participants choose some risk and thus, accept fluctuations in retirement income. Second, we analyze the choice between the selected withdrawal plan and a lifelong annuity. Overall 56% of the respondents switch to the annuity. Switching behavior is more prevalent among individuals who chose the risk-free and medium-risk withdrawal plans as compared to the risky plan. Anchoring and fluctuation frames have small and significant effects on plan choice.

***Keywords:*** *Retirement planning, phased withdrawal plans, annuities, framing*

***JEL Classification:*** *D14, E21, G5, H55, J14, J26*

## 1. Introduction

Retirement planning and long-term financial decision-making are complex tasks. Much research focuses on the wealth accumulation process and individual saving behavior until retirement (see, e.g., Lusardi and Mitchell 2011, Behrman et al. 2012, Butt et al. 2018, Goldin et al. 2020). Recently, increasing attention is given to the question how to decumulate wealth during retirement. When deciding how to dissave accumulated wealth, individuals are confronted with various options: the choice between lifelong annuities, lump sums, or phased withdrawal plans. Most of the research so far has focused on the choice between lump sum payouts of accumulated retirement savings and lifelong annuities (e.g., Albrecht and Maurer 2002, Bütler and Teppa 2007, Brown 2009, Hurwitz and Sade 2020, Brown et al. 2021). Thus, the focus is on whether individuals insure against longevity risk or rather take a lump sum payment. In contrast, the design options among different withdrawal plans have not been investigated systematically. When deciding among different withdrawal plans, potential risk and rates of return on the capital market have to be taken into consideration. In phased withdrawal plans, wealth can be invested risk-free, or in the capital market with varying ratios of stocks and bonds with different consequences for the available pension income. A risk-free withdrawal plan provides regular monthly payments. Riskier options offer potentially higher monthly payments that can vary depending on the ratio between stocks and bonds. In this paper, we investigate, whether people are in principle willing to invest their retirement wealth in risky assets and accept the resulting fluctuations in their retirement income. We seek to answer the following research questions: Do people accept phased withdrawal plans? How much capital market risk are they willing to take when choosing phased withdrawal plans? How does framing and anchoring influence the acceptance of volatility in retirement income? Finally, how does the comparison of phased withdrawal plans with different risky shares affect the choice between these withdrawal plans and lifelong annuities?

We conduct an online experiment among about 2,500 individuals representative for the German adult population. Individuals are presented with a two-stage decision process. First, the participants must choose between three phased withdrawal plans with varying riskiness (withdrawal plan choice). Second, they have to decide whether they want to stick with their previously selected phased withdrawal plan or whether they prefer a lifelong annuity (annuity choice). Choices are taken in a hypothetical experiment, which is tailored to the individual situation depending on current and expected income and wealth. Within the choice experiment, we implement two frames in a 2x2 between-subjects design: an anchoring frame and a fluctuation frame. In the anchoring frame, participants in the treatment group are shown their total retirement income, i.e. the sum of their regular pension income that does not fluctuate and the "savings income"[4] that can fluctuate depending on the chosen investment strategy, rather than when both incomes are presented separately (control group). We aim at testing for mental accounting difficulties (Thaler 1985). In the fluctuation frame, individuals in the treatment group are shown

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[4] We define "savings income" as the monthly income from the withdrawal plan that is calculated based on the accumulated savings at retirement and the chosen investment strategy of the withdrawal plan.

potential gains and losses of the choices explicitly instead of the absolute values of the volatility (control group). This allows testing for the influence of loss aversion (Kahneman and Tversky 1979, 1992).

The experiment provides us with three main findings. First, we show that in a representative sample of the German population, 38.8% of the participants are willing to accept at least some fluctuations in retirement income. This share is surprisingly high considering the large size of the German annuity market and the low average willingness of German households to participate in the capital market. It is about half of what Kieren and Weber (2021) find in a similar experiment, but with wealthier and more educated participants. The authors show that 81.4% of the participants in their experiment prefer risky strategies. Furthermore, our results reveal that individuals with below-median risk tolerance and below-median income are less likely to choose risky phased withdrawal plans. Previous experiences with financial holdings (e.g., stocks, equity funds, and property funds) increase the likelihood to choose riskier options.

Second, the anchoring frame and the fluctuation frame have small but statistically significant effects on the choice between the three phased withdrawal plans. On the one hand, the anchoring treatment, i.e. showing individuals their total retirement income vs. two separate pots of which only one fluctuates, nudges individuals to choose the risk-free option and refrain from the medium-risk option. This suggests that participants prefer a save retirement income at display and cannot mentally account for the anchoring. On the other hand, the fluctuation frame, i.e. showing the fluctuations in retirement income either as absolute values vs. as the gains and losses explicitly, influences the decision-making for the riskiest phased withdrawal plan. Here, individuals are less likely to choose the riskiest option, hinting towards loss aversion.

Third, the annuity choice crucially depends on the type of withdrawal plan selected in the withdrawal plan choice. While in the full sample, the majority of the participants (56%) switches to the lifelong annuity option, this pattern changes when conditioning on the withdrawal plan choice. Participants who chose the risk-free option in the first step are more likely to switch to the annuity option (62%) than those picking a riskier option (48% for the medium-risk and 43% for the high-risk withdrawal plan). Especially the fear that assets are used up at the end of a withdrawal contract is an important determinant of the switching behavior. Overall, we end up with 56.1% of the population who choose a life-long annuity, 23.3% who choose a risk free withdrawal plan and 15.5% and 5.1% of the population who choose either a medium or high-risk withdrawal plan, respectively.

We contribute to the literature in the following manner: First, we extend the literature on wealth decumulation by analyzing a realistic choice set for a representative sample of the German population.[5] The paper is closely related to Kieren and Weber (2021). We extend their two-stage decision process to a representative sample of the German population. In addition, we introduce two frames to the

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[5] While this is still a hypothetical setting, it is more realistic than vignette cases where participants are asked to make decisions for third parties (e.g., Brown et al. 2008, 2021, Samek et al. 2019).

experiment. With the anchoring frame, we aim at understanding potential mental accounting struggles better. With the fluctuation frame, we emphasize the volatility of the "savings income" and, hence, try to understand how relevant this key feature of our setting is. Furthermore, our setting offers the opportunity to individualize the values presented in the experiment in order to provide a more realistic decision context.

Second, we contribute to the annuity literature by showing that the examination of phased withdrawal plans with varying riskiness is an essential feature in the choice set that has not been examined before. Prior literature has focused on analyzing the annuity puzzle by comparing annuities with lump-sum payments (for example Brown et al. 2007, 2008, 2021). Most of the previous literature only compares a constant, i.e. risk-free, withdrawal plan and an annuity.[6] To the best of our knowledge, we are the first (with the exception of Kieren and Weber 2021) to consider withdrawal plans with vary in their capital market risk.

Third, our paper contributes to the framing literature by introducing and testing an anchoring and a fluctuation frame. We show how these frames might influence individuals' willingness to accept fluctuations in retirement income. Prior research has shown that how information is presented is crucial in the decision-making process (e.g., Saez 2009). Different framing approaches have been tested when aiming at explaining the annuity puzzle. For the American context, Brown et al. (2008) test the traditional investment frame against a broader formulated consumption frame that also considers the term of contract. They find that the consumption frame nudges individuals towards the lifelong annuity option. Empirical results from the Netherlands are in line with these findings (e.g., Bockweg et al. 2018). Eberhardt et al. (2020) address another standard frame setting, namely gain versus loss framing, and suggest an alternative formulation in the context of pension communication: investment versus assurance framing. They criticize that loss frames more likely evoke negative emotions, which is not desirable in the retirement context. Other factors such as the mode of communication (e.g., Samek et al. 2019), the complexity of the annuitization decision (Brown et al. 2021), individuals saving preferences (e.g. Alonso-García et al. 2022), and the usage of heuristics in the decision process (Bateman et al. 2017, Binswanger and Carman 2012) have been investigated.

Finally, our findings contribute to the policy debate on effective pension provision. The debate in many countries ranges around funded retirement plans in the accumulation phase but disregards a discussion about investments during retirement.[7] The life insurance business is very important in Germany. In 2021, the portfolio of main insurance policies amounted to around 82.7 million contracts. Insurance benefits paid out in 2021 summed up to around 84.5 billion Euro (GDV 2022). In times of increasing relevance of funded individual retirement plans, optimal plan design and choice settings also need to address

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[6] Brown et al. (2007), for example, use a constant interest rate of 4% in their "savings account" option.

[7] An exception are the Netherlands, for example. Here, research is conducted on "Choice guidance regarding fixed and variable pensions" (see https://www.netspar.nl/en/project/keuzebegeleiding-rond-vast-en-variabel-pensioen/ for details, last accessed 06.02.2023).

individuals' willingness to accept fluctuations in retirement income. Thus understanding what drives annuity demand and which preferences individuals have about payout design is very relevant for the design of policies.

The paper is structured as follows: Section 2 introduces the experimental design and the hypotheses, and contains summary statistics. Section 3 discusses the decision between three phased withdrawal plans with varying riskiness. In Section 4, the results from the annuity choice (between the previously selected phased withdrawal plans and a lifelong annuity) are presented and discussed. Section 5 concludes.

## 2. Experimental design and summary statistics

### 2.1. Data set and sample selection

To study phased withdrawal plans and analyze the effect of framing on the acceptance of fluctuations in retirement income, we conduct an online experiment with a representative sample of the German population aged 30 and older (N=2,518). The survey was implemented between October 8 and December 9, 2020. The answers were collected with a self-completion questionnaire, which was filled out online.[8] On average, the complete interviews took 34 minutes. The overall aim of the survey called "Social security systems" is to obtain a comprehensive overview of the retirement provision situation of households in Germany. The focus is on wealth decumulation and households' wealth management during retirement. The questionnaire contains question blocks (in the following order) on expectations, home ownership, preferences and attitudes, retirement provision, wealth, financial literacy, debt, marital status and household composition, and household income. Our experiment was executed after the wealth block, hence, approximately in the middle of the survey.

### 2.2. Experimental design

*Experimental flow*

In the experiment, we introduce the participants to different ways how saved assets can be converted into a payment stream during retirement, i.e. how to "dissave". Hence, participants are introduced to the following decision situation: *Suppose you retire at the age of 67 and have saved up financial assets over the course of your professional life. These assets increase your regular retirement income, which you receive from the statutory pension insurance, civil servants' pension or from a pension fund. In order to*

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[8] Participants were recruited using both CATI (Computer Assisted Telephone Interviewing) (N=395) and an online panel (N=2,123). The CATI target selection consists of two components. First, using landline phone numbers, participants were selected with the "next birthday method" within a selected household. Second, using mobile phone numbers, the called party was the immediate target for questioning. CATI has the disadvantage that younger target groups, e.g. those under than 40 years, are harder to reach by telephone because they no longer have a landline phone. In addition, they more likely block unknown numbers on their cell phones to avoid advertising calls, for example. In contrast, online panels can more easily represent a younger target group. However, online panels alone also cannot provide representative results since only 80% of the German population uses the internet. Hence, the combination of these two recruitment methods ensures the representative sample of the German-speaking resident population. Participants recruited by phone received a five Euro shopping voucher, while the panel operator compensated the online panel participants.

*achieve a desired standard of living, you have to think about how you can best distribute the wealth you have saved over your retirement period, i.e., "dissave" it.* Participants are faced with a two-stage decision process to decide how to decumulate wealth during retirement. Figure 1 shows the experimental design. First, in the withdrawal plan choice, individuals choose between three alternative withdrawal plans, which vary in their riskiness. This design element distinguishes our contribution to the annuity literature from previous works. We extend the trade-off between annuities and lump-sum payments – solely focusing on the longevity risk – by considering capital market risk in the choice set as well. The risk-free portfolio has a fixed underlying interest rate and thus, there are no fluctuations in the resulting monthly pension payments. The mixed portfolio consists of 40% bonds and 60% stocks and is the medium-risk option, the resulting pension payments fluctuate. In the stock portfolio, 100% of the wealth is invested in stocks and, hence, is the riskiest option and the pension payments fluctuate the most. The time horizon of all three phased withdrawal plans is 20 years. The order in which the three options are presented is randomized to avoid ordering effects. After individuals selected one of the withdrawal plans, they are required to make a second decision: the annuity choice. Participants have to decide whether they prefer to stick with their previously selected phased withdrawal plan or switch to a lifelong annuity.

[Figure 1 about here]

*Choices*

The choices presented in the decision are based on the individuals' own estimated regular retirement income and the "savings income" from own savings. In the survey, we ask participants about their *estimated net retirement income*[9] in categories to approximate the regular income during retirement. This part of the pension income is received, for example, from the statutory pension insurance, civil servant pension, or a pension fund. The second income component is the "savings income", which is derived by transforming the expected *financial assets at retirement* into a payment stream depending on the chosen withdrawal plan or annuity. With this individualized experimental set-up, we improve the commonly used vignette study cases to reflect a more realistic – even though still hypothetical – setting.

The calculations of the "savings income" are based on a Monte Carlo simulation where 10,000 hypothetical return profiles are generated based on historical returns for bonds and equities (for details see Bucher-Koenen et al. 2019).[10] The specific values of the "savings income" can be found in Table A1. If individuals did not answer the questions about the expected retirement income and the estimated wealth at retirement in the survey, they are shown average values during the experiment.[11]

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[9] The exact phrasing of the questions in the survey can be found in Appendix C.
[10] The risk-free interest rate is assumed to be 1%. The details concerning the simulation study by Bucher-Koenen et al. (2019) can be found in Appendix D.
[11] We assume the *average net retirement income* to be 1,300 Euro and the *financial assets at retirement* to equal 50,000 Euro if individuals do not provide personal information or indicate that they have no wealth.

Individuals are asked to choose a decumulation strategy for the "savings income" in the experiment. We present average expected payments and potential payment outcomes in the best and worst 5 out of 100 cases in order to illustrate the potential volatility of the pension payments depending on the different withdrawal plans (see appendix Table A1). To ensure that the participants have a complete overview of their options, they are shown a graph (see Table 1) and a summary table before making their choice. The exact wording of the experimental setup and additional material can be found in Appendix B.

*Treatments*

We implement a 2x2 between-subjects design. We contribute to the framing literature by introducing and analyzing an anchoring as well as a fluctuation frame. In the anchoring frame, we vary the presentation of the regular retirement income and the "savings income". In the control group, the "savings income" (i.e., from the phased withdrawal plan or the lifelong annuity) is shown *separately* from the regular retirement income. Hence, there is a fixed part and a part that can vary in the retirement income. The anchor is low if the two values are shown separately. In the treatment group, the "savings income" and the regular pension income are summed up and shown as the total retirement income. Consequently, the anchor is higher as only *one number* is displayed. Furthermore, the only number displayed now can vary. With the anchoring frame, we want to examine if mental accounting influences the willingness to accept fluctuations in retirement income.

The fluctuation frame focuses on the presentation of the volatility of the different wealth decumulation strategies. In the control group, the absolute values of the fluctuations are shown: "[…] In the best 5 out of 100 cases, the savings income is over **538€**. In the worst 5 out of 100 cases, the payment amount is less than **172€**."[12] In the treatment group, the potential gains and losses compared to the average retirement income are shown explicitly: "[…] In the best 5 out of 100 cases, the savings income is **+215€** above the average. In the worst 5 out of 100 cases, the savings income is **-151€** below the average." With this treatment, we would like to test if loss aversion influences individuals' withdrawal plan choice (Kahneman and Tversky 1979, 1992).

The participants are randomly allocated into the four treatment groups (Table A2). Table 1 shows the two frames graphically and includes the sample sizes.

[Table 1 about here]

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[12] The numbers displayed here are the average examples for the medium-risk phased withdrawal plan (60% stocks/ 40% bonds). In the experiment, the values were adjusted to the individual's financial situation.

### 2.3. Hypotheses

With the anchoring frame in the withdrawal plan choice, we want to test Hypothesis 1:

$H_0$: Participants receiving the anchoring treatment (i.e., total retirement income) are <u>more</u> likely to choose riskier options. Anchoring means that the overall amount is higher and, hence, the relative volatility becomes smaller.

$H_A$: Participants receiving the anchoring treatment (i.e., total retirement income) are <u>less</u> likely to choose riskier options because of mental accounting difficulties. It is more mentally tangible if you see one fixed number, that is "safe", and a volatile one, instead of one larger number that varies.

With the fluctuation frame, we want to test Hypothesis 2:

$H_0$: Participants receiving the fluctuation frame are <u>less</u> likely to choose riskier options because of loss aversion (Kahneman and Tversky 1979, 1992).

Finally, when it comes to the switching behavior between the phased withdrawal plan and the lifelong annuity in the annuity choice, we want to test Hypothesis 3:

$H_0$: Participants are <u>more</u> likely to switch from their withdrawal plan choice to a lifelong annuity if they picked the risk-free withdrawal plan in the withdrawal plan choice. The reason is that the risk-free withdrawal plan reflects a preference for a constant payout stream. The annuity also provides a constant payment, which is guaranteed for life.

### 2.4. Summary statistics

*Sample definition*

Table 2 shows the summary statistics of the participants' demographics and the control variables used in the analyses. A list of all variables with their respective definitions can be found in Appendix C.

The average age of our sample is 54.5 years (median: 55 years). Individuals are allowed to participate if they were older than 30 years. The oldest participant is 91 years old. About 40% of the sample is retired.[13] Men and women are represented in equal shares. On average, the households' current disposable income is between 2,000 and 2,500 Euro. The income distribution is representative of the German population.[14] 96% of the participants expect to receive or already receive retirement income from the first pillar, i.e., statutory pension, civil servant pension, retirement pension for farmers, or professional care (Berufsständische Versorgungswerke). 34% expect to receive or receive retirement

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[13] In the experiment, we adjust the phasing to the retirement status of the participants. For example, retirees are asked "What do you estimate: What were your financial assets approximately at the time of your retirement?" whereas non-retirees are asked "What do you expect your financial assets to be at the time of your retirement?"

[14] The income distribution is comparable to the Panel of Household Finance (PHF) 2017 from the Deutsche Bundesbank. The PHF panel study has been conducted regularly since 2010. In the latest available wave of the study (2017), around 5,000 households with at least one household member over the age of 18 are surveyed in order to approach a comprehensive picture of the "financial structure, income and spending behavior of private households" (Deutsche Bundesbank 2017).

income from company pension claims (2. pillar). Only 7% of retirees receive private retirement income (endowment life insurance or private pension insurance), while 42% of not retired hold such contracts. A detailed overview of all (expected) sources of retirement income are shown in Table A3.

[Table 2 about here]

The average number of children per person is 1.4. The majority of the sample (55%) are married and living together. Concerning the level of education, approximately half of the sample have a secondary high school diploma (German: Realschulabschluss) while 30% have an advanced technical college entrance qualification or a university entrance qualification (German: (Fach-) Abitur).[15] 55% of the participants are tenants and 45% are homeowners.[16]

*Additional variables*

30% of the individuals hold financial assets in the form of shares, equity funds or property funds. This is slightly higher than the average population where only 19% hold stocks or equity funds (own calculations from PHF 2017). We measure financial literacy using standard quiz questions on compound interest, inflation, risk diversification and two questions on debt.[17] On average, individuals can answer 2.5 out of five financial literacy questions correctly. We measure risk tolerance on a scale from 0 "Not willing to take risks at all" to 10 "Very willing to take risks". The mean risk tolerance is 4.1. An important variable for the annuity choice is the contentment with the risk of running out of additional money at the end of one's life. Hence, we ask individuals: *Does it worry you that at the end of the planning horizon [of the phased withdrawal plan], the assets are depleted?* The answers are collected on a scale from 0 "it worries me a lot" to 10 "it doesn't worry me at all". The mean of *contentment with planning horizon* is 5.4. In addition, participants were asked whether they plan to leave a bequest (response option: yes/no). More than half of the sample answered in the affirmative (mean of 0.6).

*Retirement income*

As described in Section 2.2., the values for the retirement income are adjusted to the individual's personal financial situation in order to make the hypothetical scenarios realistically. Hence, the choice setup crucially depends on these values. The regular pension income is retrieved from the participants by directly asking them about their (expected) personal monthly net income after retirement. *Estimated net retirement income* is recorded at predefined intervals ranging from 0-499 Euro, 500-749 Euro,… to more than 4000 Euro. It includes statutory pension, civil servant pension, pension scheme, and company pension scheme. Private supplementary pension schemes are excluded. The estimated net retirement

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[15] According to the education report 2016 (Bildungsbericht 2016, Abb. B5-1), in 2014, 23% of individuals aged 60 to 65 and 45% of the individuals aged 30 to 35 had Abitur. Hence, our sample is representative of the German population with respect to education.

[16] This is representative of the German population in 2018 (Destatis 2021) as the sample was specifically constructed to be this way.

[17] For more details on the Big-Three questions, see Lusardi and Mitchell (2011). For details on the two debt questions, see Lusardi and Tufano (2015).

income is assumed to be constant. Figure 2, Panel A shows the distribution of the estimated net monthly retirement income. About half of the participants (46%) estimate their monthly retirement income to be below 1,250 Euro, 13% estimate their monthly retirement income to be above 2,500 Euro. Individuals with missing information on the expected retirement income (1.2% of the sample) are shown the experiment based on the *average net retirement income* of 1,300 Euro.[18]

[Figure 2 about here]

The additional "savings income" is derived by transforming the *financial assets at retirement* into an annuity. Since the values are based on a simulation study (see Bucher-Koenen et al. 2019 for details), the "savings income" can vary (see Table A1 for the specific values). More than a quarter of the participants (27%) indicate that they do not (expect to) have any financial assets at the time of retirement (Figure 2, Panel B).[19] About 40% indicate financial assets at retirement up to 50,000 Euro. If individuals say that they do not have any wealth or do not provide us with the relevant information, we show them the "savings income" in the experiment based on 50,000 Euro.

For only five participants (0.2% of our sample), we have to assume both components of the total retirement income. For individuals without wealth (see Table A4*:* for descriptives), 51% (38%) indicated an estimated retirement income of less than 1,000 Euro (between 1,000 to 1,999 Euro). Approximately 60% of individuals without wealth are women. There are no large differences by age group or retirement status. However, lower education and unemployment hint towards no wealth at the time of retirement.

We calculate the ratio between "savings income" and the regular retirement income.[20] Figure 2, Panel C reveals that in 30% of the cases, the "savings income" amounts to less than one tenth of the regular retirement income. In 20% of the cases, the "savings income" corresponds to 0.1 to 0.2 of the regular retirement income. For only 6% of the sample, the "savings income" is larger than the regular retirement income (ratio >1). Overall these values seem reasonable as they are approximately in line with values derived from administrative data (See footnote 18, BMAS 2020) where, on average, 1300 Euro from the regular retirement income (without private pensions) and 375 Euro from the private pensions result in a ratio of 0.29 (=375/1300).

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[18] The *average net retirement income* without private supplementary pension schemes is based on the BMAS (2020) old-age security report (Alterssicherungsbericht 2020). After deduction of taxes and social security contributions, senior citizen single people achieve an average monthly net income of 1,667 Euro (BMAS 2020, p. 95). Private pensions including pensions from Riester contracts in the old (new) Länder average 375 Euro (169 Euro) per month for single persons (BMAS 2020, p. 97). Hence, the assumption of 1,300 Euro of average pension income is reasonable.

[19] Additional analyses (not displayed here) show that individuals with no or low level of financial wealth do not expect a large inheritance and do not use housing wealth as a substitute for financial wealth.

[20] As the *estimated net retirement income* is recorded in predefined intervals, we use the average value of each interval for the calculation of the ratios.

### 3. The withdrawal plan choice: Three phased withdrawal plans with varying riskiness

#### 3.1. Descriptives

In the withdrawal plan choice, participants choose between three phased withdrawal plans with varying riskiness. On average, the majority of participants chooses the risk-free option (61%). Interestingly, almost 30% of the participants select the medium-risk option (60% stocks/ 40% bonds) and around 9% pick the risky option with the highest potential fluctuations in "savings income". In total, approximately 40% of the participants accept at least some variation in retirement income. This first main result is notable, since German households are in general reluctant when it comes to investing in the stock market. In 2021, only 2.1 million people in Germany owned stocks, equity funds or equity-based ETFs. This corresponds to around one in six people (17.1%) of the German population aged 14 and over who are invested in the stock market (DAI 2021). It is about half of what Kieren and Weber (2021) find in a similar setting, but with wealthier and more educated participants. The authors show that around 80% of the participants prefer riskier strategies. Our first descriptive result shows that people are in general willing to accept volatility in pension income within a choice set of phased withdrawal plans. In the following, we will consider the role of retirement income, financial assets at retirement, and retirement status.

Moreover, we analyze the withdrawal plan choice based on the retirement income (Figure A1, Panel A). The higher the estimated net retirement income, the higher the share of individuals choosing a riskier withdrawal plan. Individuals with a regular pension income of below 1000 Euro choose the risk-free option in 70% of the cases. They choose the medium-risk withdrawal plan in 22% of the cases and the high-risk withdrawal plan in only 9% of the cases. For the highest retirement income bracket (>= 2,000 Euro), participants are almost equally likely to choose the risk-free (48%) or the medium-risk withdrawal plan (41%). Figure A1, Panel B shows the withdrawal plan choice by expected financial assets at retirement. A similar picture to Panel A emerges. With increasing financial assets at retirement, the willingness to accept volatility in "savings" income grows.

The ratio of the "savings income" and the regular retirement income reveals that the larger the "savings income" compared to the regular retirement income, the more likely people are to pick the risky option (Figure A1, Panel C). If the "savings income" is only one tenth of the regular retirement income or less almost three-quarter (74%) choose the risk-free withdrawal plan and only 21% choose the medium-risk option. If the "savings income" is as large as half the regular retirement income or even larger, then the share of participants choosing a medium-risk or high-risk option increases, even surpassing the risk-free option. This hints towards the fact that less financially constrained individuals are more willing to accept volatility.

Next, we look at the withdrawal plan choice by retirement status (see Figure 4). This is relevant because retirees most likely already made their financial decision how to spend their wealth during retirement. For non-retirees, the decision is hypothetical and rather lies in the (distant) future. Results reveal that,

retired individuals are more likely to choose the risk-free withdrawal plan (67.4%) than those not yet retired (57.8%). Overall, the results show that a substantial fraction of households in Germany would be willing to accept some fluctuations in retirement income for a larger potential average pension. Those with higher expected pensions and those not yet retired are more willing to accept volatile pension payments.

### 3.2. Effects of framing

In order to understand mental budgeting and potential mental accounting struggles in the wealth decumulation decisions better, we introduced an anchoring frame. Figure 3, Panel A shows the effect of anchoring on the withdrawal plan choice. When individuals were shown the "savings income" separately from their regular pension income (Control 1), they were more likely to choose a riskier option. Individuals, who were shown their total retirement income (Treatment 1), were more likely to choose the risk-free portfolio. This is an indication that individuals dislike it if their total retirement income varies and hints towards mental accounting.

To emphasize the potential volatility of "savings income" in the withdrawal plan choices, we introduce a fluctuation frame. When considering the loss framing (Figure 3, Panel B), there are no significant differences for the risk-free and the medium-risk portfolio choices between treatment and control group. However, individuals who saw the potential gains and losses explicitly (Treatment 2) were less likely to choose the riskiest option. This suggest that individuals are on average loss averse and refrain from large volatility in their "savings income".

[Figure 3 about here]

Interestingly, the frames have different impacts on retirees and non-retired. Figure 4, Panel A shows the results for retirees. Those already in retirement seem not to react to the anchoring frame and only slightly to the fluctuation frame. Retirees receiving the fluctuation frame are more likely to pick a medium risk option and less likely the risk-free option. Panel B shows the descriptive results for the non-retired. Those not yet retired are less likely to choose a riskier option, which includes stocks when they receive the anchoring frame. Moreover, with the loss framing, non-retired are less likely to pick the riskiest option and more likely to pick the risk-less option. Overall, the randomization of the treatments ensures that the treatments are independent of other individual characteristics.[21] Nevertheless, there could be some characteristics explaining the differences in behavior. We will explore this further by using multivariate analyses in the next section.

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[21] Table A2 shows the four different treatment groups by socio-demographic characteristics.

### 3.3. Regression results

*Multinomial probit model*

In order to estimate the effects of the anchoring treatment and fluctuation frame in the withdrawal plan choice, we analyze the average treatment effects (ATE) in a multinomial probit model shown in equation (1):

$$withdrawal\ plan\ choice = \alpha + \beta_1 anchoring + \beta_2 fluctuation\ frame + \gamma X + \varepsilon \qquad (1)$$

The dependent variable *withdrawal plan choice* can take three values. It equals 1 for the risk-free withdrawal plan, 2 for the medium risk portfolio (40% bonds / 60% stocks), and 3 for the high-risk portfolio in the withdrawal plan (100% stocks). *Anchoring* is a dummy equaling 1 if the participants received the anchoring framing, 0 otherwise. *Fluctuation frame* is the dummy equaling 1 if the participant was randomly assigned to the loss framing, 0 otherwise. *X* summarizes the control variables and includes a female dummy, age (in years), risk tolerance score, household income, an experience with stocks dummy, a financial literacy score, and a dummy for homeownership (0 = tenant, 1 = homeowner). Moreover, we include a "no wealth" dummy equaling one if the participant indicates not to have any financial assets at retirement or did not answer this question, 0 otherwise. $\varepsilon$ is the error term.

The regression results are displayed in Table 3. Panel A shows the average treatment effects using the risk-free option as a baseline. Individuals receiving the anchoring framing have an approximately 5 p.p. higher probability to choose the risk-free option compared to the two riskier options (Column 1). An increase in the probability of choosing the risk free option from 61% to 66 % corresponds to an 8% increase in the probability. While the effect of the anchoring framing might be – economically speaking – small, it is statistically significant on the 5% level. The fluctuation frame does not have a statistically significant influence on the choice of the risk-free option. Analogously, Panel B, Column 3 shows the regression results using the medium risk option as a baseline. Individuals receiving the anchoring frame have a 3.3 p.p. lower probability to choose the medium risk option. The effect is statistically significant at the 10% level. Again, the fluctuation frame does not have a statistically significant influence on individuals' behavior. Finally, Panel C, Column 5 shows the regression results using the high-risk option as a baseline. Now, the picture changes. Individuals receiving the fluctuation frame have a 3.7 p.p. lower probability to choose the high-risk option. The effect is statistically significant at the 1% level. The anchoring frame, however, does not have a statistically significant influence.[22]

Summarizing our second main finding: Overall, the anchoring frame results in a small shift from the medium-risk to the risk-free phased withdrawal plan. Hence, when seeing their total retirement income as one number rather than the regular and the "savings income" separately, individuals prefer less volatility in retirement income. The choice for the riskiest option remains unchanged. This result rejects

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[22] The results from an analogous multinomial logit regression are very similar in magnitude and statistical significance.

Hypothesis 1 concerning the effect of anchoring on the withdrawal plan choice. It becomes apparent, that individuals slightly prefer two mental accounts – one "save" and one volatile component in their retirement income – and struggle with mental accounting in the case of one total retirement income budget. The results concerning the fluctuation frame imply that only high potential gains and losses, as is the case in the high-risk withdrawal plan, influence people's decision-making. This result is in line with Hypothesis 2 and the theory of loss-averse individuals (Kahneman and Tversky 1979, 1992).

In Columns 2, 4, and 6, the control variables are included in the models. The most important results from this exercise are the following. Women are more likely to choose the risk-free option (Panel A), and less likely to pick the riskiest option (Panel C) even when controlling for differences in risk aversion. Older and less risk-tolerant participants, as well as those without prior experiences with stocks prefer the risk-free withdrawal plan. Furthermore, individuals with higher financial literacy score, measured by the number of correct answers to the five financial literacy questions, lean towards the medium risk-option and, interestingly, refrain from both the risk-free and high-risk withdrawal plan option. The effect is statistically significant at the 1% level. One might argue that tenants might have more difficulties affording variable "savings income" than homeowners because they have to pay rent regularly. The homeownership dummy, however, is not statistically significant. Moreover, the "no wealth" dummy is statistically significant for the options where the risk-free and the median-risk withdrawal plan serve as a baseline. Recall that 27% of our sample indicate to have no financial assets at retirement. Individuals without own assets at retirement prefer the risk-free option to the median-risk option. There is no significant effect for the riskiest option. Overall, the inclusion of control variables does not change the outcomes of the experiment – both framing coefficient sizes and significance levels remain stable.[23]

*Linear probability model (LPM)*

To be able to interpret the interaction between the anchoring and the loss framing, we apply a LPM. The new outcome variable *withdrawal plan choice stock* is binary. It equals 0 if the participant chooses the risk-free option and, hence, decides against stocks in the withdrawal plan portfolio, 1 if the participant chooses either the medium-risk or the high-risk option which include stocks and, consequently, volatility in retirement income. We estimate equation 2:

$$withdrawal\ plan\ choice\ stock = \alpha + \beta_1 anchoring + \beta_2 fluctuation\ frame + \beta_3 anchoring * loss\ frame + \gamma X + \varepsilon \tag{2}$$

Again, $X$ summarizes the control variables, which are the same as before in equation (1). In addition, the interaction term between gender and risk tolerance is included. $\varepsilon$ is the error term. The regression results are shown in Table A5.

While the framing effects are no longer statistically significant separately, a t-test reveals that there is a mutual treatment effect for participants receiving both the anchoring and the loss framing. Individuals

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[23] As a robustness check we exclude individuals with "no wealth" (N=1,618) and the overall results do not change.

receiving both frames are less likely to choose an option with stocks ($-0.0395 \mp 0.00445 - 0.045 = -0.08$) than those in the control group.

Moreover, our results reveal that the gender gap in the withdrawal plan choice can only partly be explained by differences in risk tolerance. In our setting, the interaction between gender und risk tolerance reveals, that men with high risk tolerance and women with high risk tolerance are behaving statistically different from one another. This is an interesting result and is in contrast to previous literature, for example by Fey et al. (2021) who find that the gender gap in capital market participation is "mainly explained by different risk attitudes and monetary endowment".

*Results by retirement status*

Next, we run the multinomial probit regressions separately for retired and non-retired individuals. This distinction is important because retirees and non-retired are at different stage of their life. Retirees most likely already made their financial decision how to spend they wealth during retirement in real life. For non-retirees, the decision is hypothetical and lies in the (distant) future. We find that the effects of the anchoring frame are predominantly driven by non-retired participants (Table 4). As shown graphically in the previous section, the fluctuation frame has opposing effects on retirees and non-retired. Non-retired opt out of the high-risk option and rather choose the risk-free option. In contrast, retired are less likely to choose the risk-free option and more likely to pick the medium-risk option, opting for some fluctuations in their retirement income. The effects become even more pronounced with age. The closer a person is to retirement, the more likely he or she is to opt from the medium-risk option to the high-risk option. Hence, it seems crucial whether the decision is closely related to the current living situation (as is the case for retirees) or to the future financial situation and includes more uncertainty (as is the case for non-retired).

## 4. Annuity choice: Stay with the withdrawal plan choice or switch to a lifelong annuity?

### 4.1. Descriptive results

In the annuity choice, individuals have to choose between the previously selected phased withdrawal plan and a lifelong annuity. When considering the full sample, approximately 56% of the respondents choose the life-long annuity and 44% of the participants decide to stick with their withdrawal plan choice: 23% stay with the risk-free portfolio, 15% with the medium-risk, and 5% with the high-risk, respectively.[24] This show that even with the possibility to opt-out of the withdrawal plan, a substantial fraction of participants actively decides to stick with their first decision - 20% even accept medium to high volatility in their "savings income". This is an important result given the large role of the German

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[24] In the Swiss context, Bütler and Teppa (2007) find that on average 72% of individuals prefer the annuity (p. 1954). They use administrative data from Swiss employer-based pension plans. Brown et al. (2007) use American survey data and find that, in the consumption frame, 76-77% of the participants prefer the life annuity to a phased withdrawal plan (20- or 35-year period annuity). In contrast, in the investment frame, only 40-48% prefer the life annuity to these two phased withdrawal plans (p. 13).

insurance market for retirement provision. More than half of the respondents (56%) switch from the withdrawal plan to the annuity option and, hence, decide to insure against longevity risk (Figure 5, Panel A). A more differentiated picture emerges, when conditioning on the previous withdrawal plan choice (Figure 5, Panel B).

[Figure 5 about here]

Participants who chose the risk-free portfolio in the first stage of the experiment are more likely to switch to the annuity option. For the medium-risk option, the picture is not so clear any more. 48% of the participants who chose the medium-risk option switch, 52% stay with their withdrawal plan choice. Conditional on having chosen the riskiest option, the reverse pattern emerges: the individuals are more likely to stay with their withdrawal plan choice and thus refrain from switching to the annuity.

In the literature, economic theory and empirical evidence come to different conclusions about whether a lifelong annuity or a phased withdrawal plan is preferable. Classical life-cycle models predict that, under the assumption of no bequest motive, the lifelong annuity option is preferable to a phased withdrawal plan (Yaari 1965). Empirical evidence, however, shows that the demand of retirees for lifelong annuities is substantially lower compared to the demand for phased withdrawal plans (e.g., Brown et al. 2008, Lockwood 2012, Davis et al. 2021, Brown 2007 for a review). These comparisons focus on the insurance of the longevity risk. However, potential gains from investing the remaining wealth in the capital market are not taken into consideration. The comparison of our experiment allows for an analysis of the preferences for withdrawal plans and an annuity explicitly considering the option to invest wealth in the capital markets also during retirement.

Our empirical results contribute to the annuity literature by showing that the type of reinvestment-strategy in the withdrawal plan to which the annuity is compared, crucially influences the decision-making process whether or not to switch to a lifelong annuity. Hence, the choice set available to the individual plays a central role in the investment decision. Especially, in an increasingly complex environment for long-term financial decision-making, this is an important finding.

[Figure 6 about here]

Again, we reran our analysis separately by retirement status (Figure 6). Overall, the likelihood of choosing the annuity is similar among the retired and the non-retired households. The same holds true when conditioning on the risk-free and the medium-risk option. However, when conditioning on the riskiest withdrawal plan choice, non-retired (Panel B) are much less likely to switch to the lifelong annuity option than retirees (Panel A).

### 4.2. Regression results

We estimate the annuity choice using a LPM shown in equation (3).

$$annuity\ choice = \alpha + \beta_1 WP\ choice: medium\ risk + \beta_2 WP\ choice: high\ risk + \beta_3 anchoring + \beta_4 fluctuation\ frame + \gamma X + \varepsilon \tag{3}$$

The dependent variable *annuity choice* is a dummy equaling 1 if the individual switches from her withdrawal plan choice to the lifelong annuity option, 0 if she stays with her withdrawal plan choice. *Withdrawal plan (WP) choice: medium risk* equals 1 if participant previously chose the medium-risk option, 0 otherwise. Analogously, *withdrawal plan (WP) choice: high risk* equals 1 if participant chose the high-risk option, 0 otherwise. Hence, we define the risk-free option as the baseline. Since, the anchoring frame and fluctuation frame continue in the annuity choice, these variables are included in the regression as well. *X* summarizes the control variables as before. In addition, a dummy for the desire to leave a bequest and the variable *contentment with the planning horizon* are included to account for special features of a lifelong annuity compared to a phased withdrawal plan choice.

Table 5, Panel A shows the results for the LPM for the full sample.[25] Compared to individuals who chose the risk-free portfolio in the withdrawal plan choice, individuals who accepted some volatility in retirement income are much less likely to switch to the lifelong annuity. When adding controls, the size of the coefficient is halved from -0.134 to -0.0601 but is still statistically significant at the 5% level. The effect is even stronger for individuals who chose the riskiest option. They are approximately 11 p.p. less likely to switch to the annuity than those who picked the risk-free option first (Column 2).

The positive coefficient of the anchoring frame implies that those seeing their total retirement income as one number are more likely to switch to the annuity option. The effect of the fluctuation frame is not statistically significant.

These findings indicate that Hypothesis 3 – concerning the switching behavior from the previously selected risk-free withdrawal plan to a lifelong annuity – cannot be rejected. Our third main finding can be summarized as follows: Individuals who already prefer a constant payout stream in the withdrawal plan choice also prefer a life-long annuity, because it ensures a constant payment for life. Consequently, the examination of withdrawal plan options with alternative investment strategies is very important.

Moreover, prior experiences with stocks has a large and statistically significant impact on the annuity decision. Individuals who own stocks, equity funds or property funds are more likely to stay with their withdrawal plan choice, so are participants with higher financial literacy and those who are content with the planning horizon of a phased withdrawal plan. The desire to leave a bequest and homeownership do not have a statistically significant impact.

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[25] Alternatively, we estimate a probit model and the average treatment effects (ATE, not shown here). The estimation coefficients from ATE and LPM are in the same order of magnitude. Hence, the LPM can be used as an approximation for the ATEs.

*Results by retirement status*

Again, it is interesting to analyze whether the decision was made from a future (as is the case for non-retired) or from a current perspective (as is the case for retirees). The regression results are shown in Table 5, Panel B and C. Both non-retired (Panel B) and retired individuals (Panel C) are less likely to switch to the lifelong annuity when they picked a medium-risk option in the withdrawal plan choice compared to the risk-free option.

## 5. Conclusion

Wealth decumulation decisions during retirement are important as people's life expectancy continues to increase.[26] Especially in times of low interest rates and high inflation, the decision between a phased withdrawal plan (potentially with investments in the capital market) and a risk-free lifelong annuity yield very different financial outcomes. To understand this decision process better, we conduct a large online experiment in Germany. First, individuals choose between three phased withdrawal plans with varying riskiness resulting in different fluctuations in retirement income. Second, they decide whether to stick with their withdrawal plan choice or switch to a lifelong annuity. To emphasize potential volatility in retirement income, we implement an anchoring and a fluctuation frame in a 2x2 between-subjects design. The main findings from the experiment are threefold.

First, we find that 40% of the participants choose a phased withdrawal plan with either medium risk (60% stocks/ 40% bonds) or high risk (100% stocks). This result is astonishing as only 17% of the German population aged 14 and over currently own stocks, equity funds or equity-based ETFs (DAI 2021). Hence, to answer our first research question, individuals are willing to accept fluctuations in retirement income in phased withdrawal plans. We find that especially individuals with high risk tolerance, high financial literacy, and prior experience with stocks are willing to accept volatile "savings income". Second, the anchoring and the fluctuation frame only have a small impact on the decision-making process. Third, the choice to switch to a lifelong annuity crucially depends on the withdrawal plan choice, i.e. participants who chose a medium- or high-risk option first are much less likely to switch compared to those picking the risk-free option. Moreover, the more content people are with the planning horizon of the phased withdrawal plan, the less likely they are to choose the annuity.

Our findings contribute to the political debate on effective pension provision. The policy debate ranges mostly about funded retirement plans in the accumulation phase but disregards a discussion about investments during retirement. In times of increasing relevance of funded individual retirement plans, optimal plan design and choice settings also need to address individuals' preferences to invest in capital markets during the decumulation phase and their willingness to accept resulting fluctuations in retirement income.

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[26] While 65-year old women in 2003/05 were expected to live on average another 19.9 years, 65-year old women in 2018/20 are expected to live on average another 21.1 years. Men's expected remaining life expectancy at the age of 65 increased from 16.5 to 17.9 years over the same period (Destatis 2022).

## 6. References

Albrecht, P. and Maurer, R. (2002). Self Annuitization, Consumption Shortfall in Retirement and Asset Allocation: The Annuity Benchmark. *Journal Of Pensions Economics & Finance*, 1(3), pp. 269–288.

Alonso-García, J., Bateman, H., Bonekamp, J., van Soest, A., and Stevens, R. (2022). Saving preferences after retirement. *Journal of Economic Behavior & Organization*, 198, pp. 409–433.

Bateman, H., Eckert, C., Iskhakov, F., Louviere, J., Satchell, S., and Thorp, S. (2017), Default and naive diversification heuristics in annuity choice. *Australian Journal of Management*, 42(1), pp. 32–57.

Behrman, J. R., Mitchell, O. S., Soo, C. K., and Bravo, D. (2012). The Effects of Financial Education and Financial Literacy - How Financial Literacy Affects Household Wealth Accumulation. *American Economic Review: Papers & Proceeding*, 102(3), pp. 300–304.

Bildungsbericht (2016). Bildung in Deutschland 2016. W. Bertelsmann Verlag, Bielefeld. ISBN 978-3-7639-5742-2.

Binswanger, J. and Carman, K. G. (2012). How real people make long-term decisions: The case of retirement preparation. *Journal of Economic Behavior & Organization*, 81, pp. 39–60.

BMAS (2020). Ergänzender Bericht der Bundesregierung zum Rentenversicherungsbericht 2020 gemäß § 154 Abs. 2 SGB VI (Alterssicherungsbericht 2020).

Bockweg, C., Ponds, E., Steenbeek, O., and Vonken, J. (2018). Framing and the annuitization decision – Experimental evidence from a Dutch pension fund. *Journal of Pension Economics & Finance*, 17(3), pp. 385–417.

Brown, J. R. (2007). Rational and Behavioral Perspectives on the Role of Annuities in Retirement Planning. NBER Working Paper No. 13537.

Brown, J. R. (2009). "Understanding the Role of Annuities in Retirement Planning." In Annamaria Lusardi, ed., Overcoming the Savings Slump: How to Increase the Effectiveness of Financial Education and Saving Programs. University of Chicago Press. pp. 178–206.

Brown, J. R., Kapteyn, A., Luttmer, E. F. P., Mitchell, O. S., and Samek, A. (2021). Behavioral Impediments to Valuing Annuities: Complexity and Choice Bracketing. *Review of Economics and Statistics,* 103(3), pp. 533–546.

Brown, J. R., Kling, J. R., Mullainathan, S., and Wrobel, M. V. (2008). Why Don't People Insure Late-Life Consumption? A Framing Explanation of the Under-Annuitization Puzzle. NBER Working Paper Series, Working Paper 13748.

Brown, J. R., Kling, J. R., Mullainathan, S., and Wrobel, M. V. (2008). Why Don't People Insure Late-Life Consumption? A Framing Explanation of the Under-Annuitization Puzzle. *The American Economic Review: Papers and Proceedings,* 98(2), pp. 304–309.

Bucher-Koenen, T., Riedler, J., and Weber, M. (2019). Kapitalanlage eines staatlich organisierten Altersvorsorgefonds. Gutachten für den Verbraucherzentrale Bundesverband (vzbv), pp. 1–49.

Bütler, M. and Teppa F. (2007). The choice between an annuity and a lump sum: Results from Swiss pension funds. *Journal of Public Economics,* 91, pp. 1944–1966.

Butt, A., Donald, M., S., Foster, F. D., Thorp, S., and Warren, G. J. (2018). One size fits all? Tailoring retirement plan defaults, *Journal of Economic Behavior & Organization*, 145, pp. 546–566.

Davis, H., Hasler, A., and Lusardi, A. (2021). Examining the barriers to annuity ownership for older Americans. Retirement Income Institute Original Research-#003-2021.

Deutsches Aktieninstitut (DAI) (2021). Deutschland und die Aktie - Weiter auf hohem Niveau. Aktionärszahlen des Deutschen Aktieninstituts 2021.

https://www.dai.de/fileadmin/user_upload/220119_Aktionaerszahlen_2021_Deutsches_Aktieni nstitut.pdf

Deutsche Bundesbank (2017). Die Studie zur wirtschaftlichen Lage privater Haushalte (PHF), pp. 1-74.

Eberhardt, W., Brüggen, E., Post, T., and Hoet, C. (2020). Engagement behavior and financial well-being: The effect of message framing in online pension communication. *International Journal of Research in Marketing*, 38(2), pp. 448–471.

Fey, J.-C., Lerbs, O., Schmidt, C., and Weber, M. (2021). Risk attitude and capital market participation: is there a gender gap in Germany? SSRN Working Paper.

Gesamtverband der Deutschen Versicherungswirtschaft e. V. (GDV) (2022). Eine Information der deutschen Lebensversicherer: Die deutsche Lebensversicherung in Zahlen 2022.

Goldin, T., Homonoff, T., Patterson, R., and Skimmyhorn, W. (2020). How much to save? Decision costs and retirement plan participation. *Journal of Public Economics*, 191, 104247, pp. 1–10.

Hurwitz, A. and Sade, O. (2020). An investigation of time preferences, life expectancy, and annuity versus lump sum choices: Can smoking harm long-term saving decisions? *Journal of Economic Behavior & Organization*, 180, pp. 812–825.

Kahneman, D. and Tversky, A. (1979). Prospect Theory: An Analysis of Decision under Risk. *Econometrica*, 47(2), pp. 263–292.

Kahneman, D. and Tversky, A. (1992). Advances in Prospect Theory: Cumulative Representation of Uncertainty. *Journal of Risk and Uncertainty*, 5, pp. 297–323.

Kieren, P. and Weber, M. (2021). When saving is not enough –wealth decumulation decision in retirement. *Journal of Pension Economics and Finance*, pp. 1–28.

Lockwood, L. (2012). Bequest motives and the annuity puzzle. *Review of Economic Dynamics*, 15, pp. 226–243.

Lusardi, A. and Mitchell, O. S. (2011): Financial Literacy and Planning: Implications for Retirement Wellbeing. In: Olivia S. Mitchell and Annamaria Lusardi (Hrsg.), Financial Literacy: Implications for Retirement Security and the Financial Marketplace. Oxford: Oxford University Press, 17–49.

Lusardi, A. and Tufano, P. (2015). Debt literacy, financial experiences, and overindebtedness. *Journal of Pension Economics and Finance*, 14(4), pp. 332–368.

Saez, E. (2009). Details Matter: The Impact of Presentation and Information on the Take-up of Financial Incentives for Retirement Saving. *American Economic Journal: Economic Policy,* 1(1), pp. 204–228.

Samek, A., Kapteyn, A., and Gray, A. (2019). Using vignettes to improve understanding of social security and annuities. NBER Working Paper Series, Working Paper 26176.

Statistisches Bundesamt (Destatis) (2021). Datenreport 2021 - Kapitel 7: Wohnen. https://www.destatis.de/DE/Service/Statistik-Campus/Datenreport/Downloads/datenreport-2021-kap-7.pdf?__blob=publicationFile

Statistisches Bundesamt (Destatis) (2022). Welche Lebenserwartung haben Personen eines bestimmten Alters? Source: https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bevoelkerung/_FAQ/lebenserwartung-personen.html, last accessed 26.02.2022.

Thaler, R. (1985). Mental accounting and consumer choice. *Marketing Science*, 4(3), pp. 199–214.

Yaari, M. E. (1965). Uncertain Lifetime, Life Insurance, and the Theory of the Consumer. *The Review of Economic Studies*. 32(2), pp. 137–150.

## 7. Figures

**Figure 1**

Figure 1 displays the order in which the questions from the survey, the withdrawal plan choices, and the annuity choice were presented.

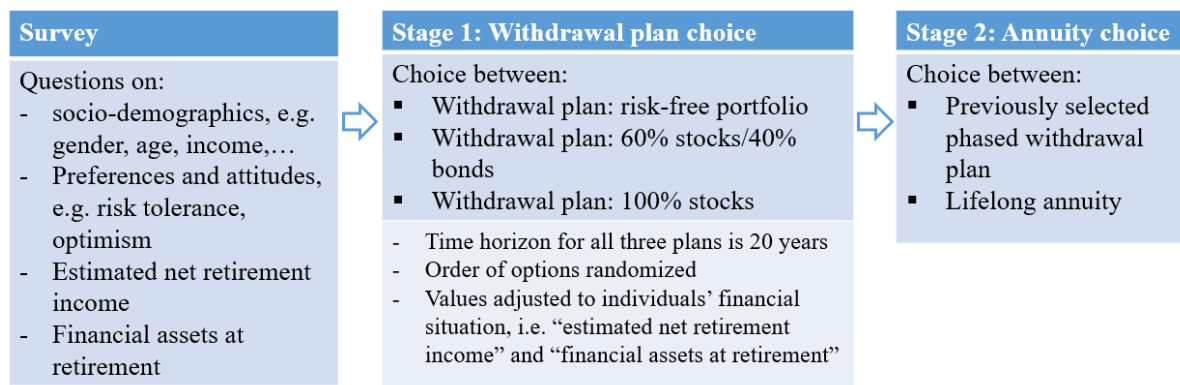| **Survey** | **Stage 1: Withdrawal plan choice** | **Stage 2: Annuity choice** |
|---|---|---|
| Questions on: <br>- socio-demographics, e.g. gender, age, income,… <br>- Preferences and attitudes, e.g. risk tolerance, optimism <br>- Estimated net retirement income <br>- Financial assets at retirement | Choice between: <br>▪ Withdrawal plan: risk-free portfolio <br>▪ Withdrawal plan: 60% stocks/40% bonds <br>▪ Withdrawal plan: 100% stocks <br><br>- Time horizon for all three plans is 20 years <br>- Order of options randomized <br>- Values adjusted to individuals' financial situation, i.e. "estimated net retirement income" and "financial assets at retirement" | Choice between: <br>▪ Previously selected phased withdrawal plan <br>▪ Lifelong annuity |

**Figure 2: Retirement income**

**Panel A:** Estimated net monthly retirement income (N=2,518)
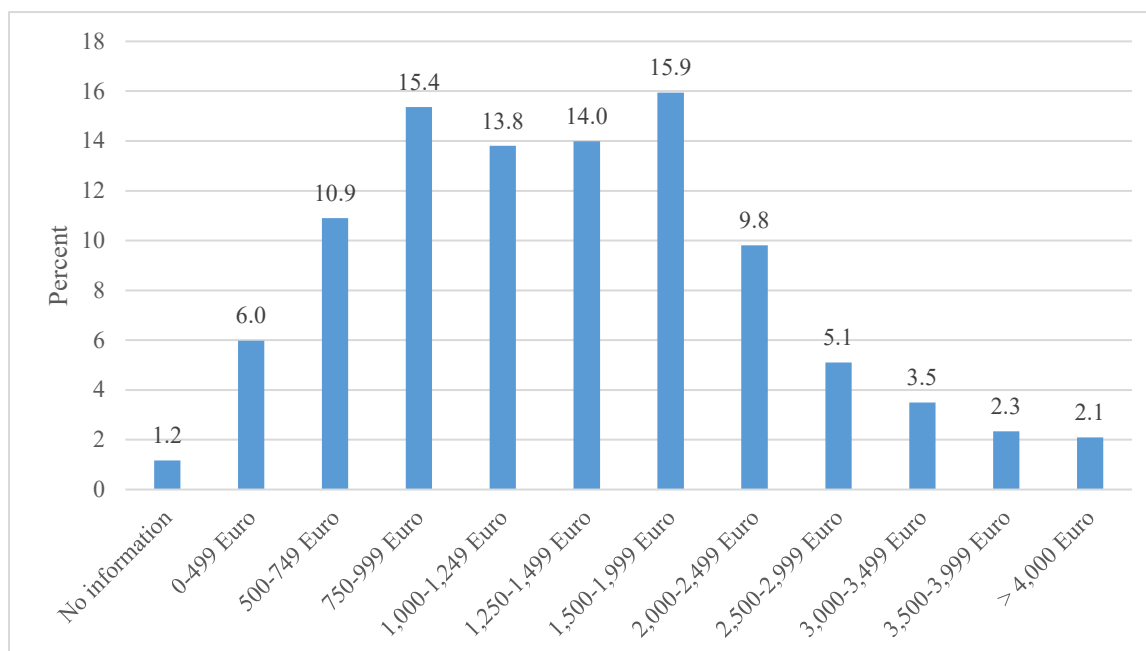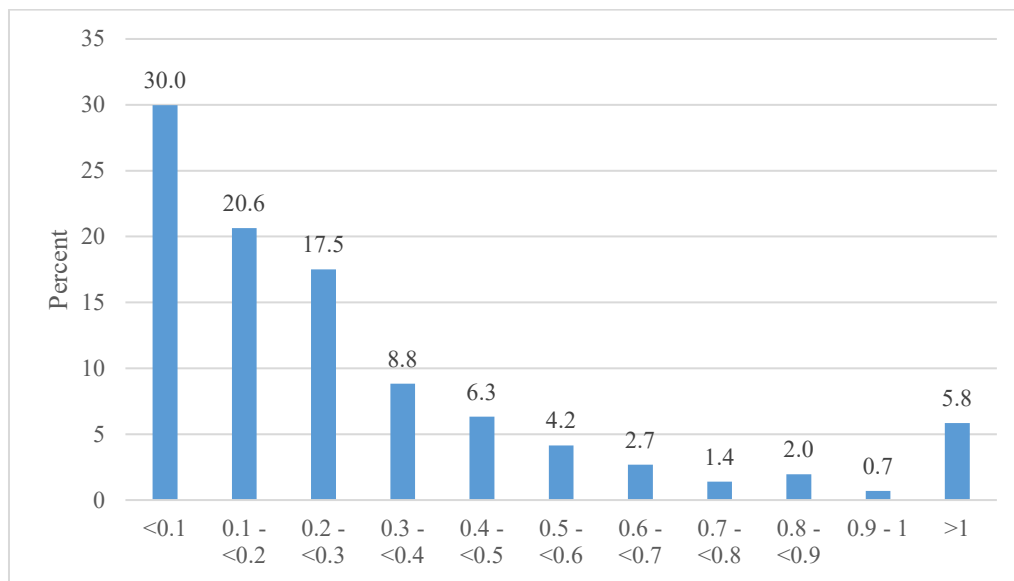


Note: Data is weighted.[27]

**Panel B:** Expected financial assets at retirement (N=2,518)
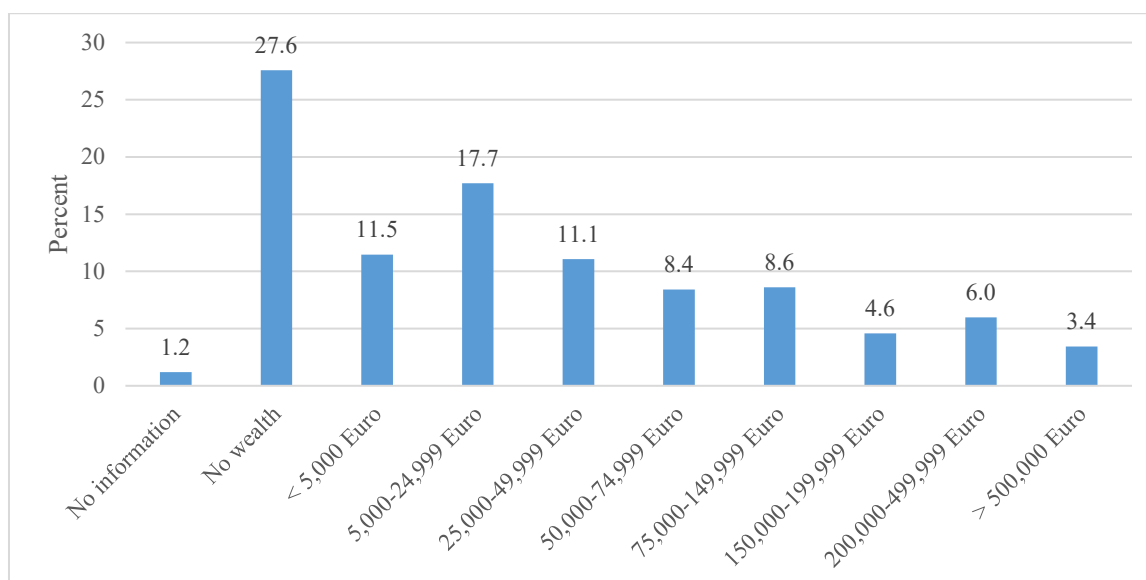


Note: Data is weighted.

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[27] Data weighted for representativeness of German-speaking population aged 30 and above living in private households.

**Panel C:** Ratio of "savings income" to regular retirement income



Note: Data is weighted.

**Figure 3: Withdrawal plan choice by treatments**

**Panel A:** Withdrawal plan choice by anchoring frame (Treatment 1)
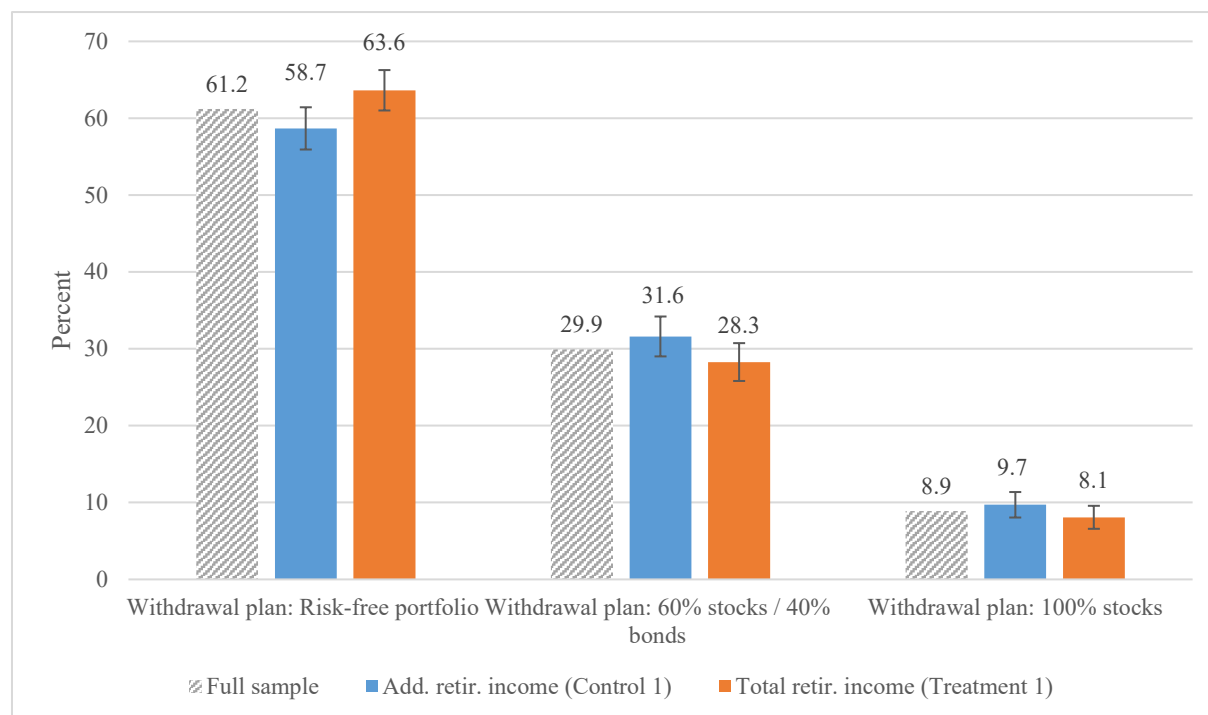


**Panel B:** Withdrawal plan choice by fluctuation frame (Treatment 2)
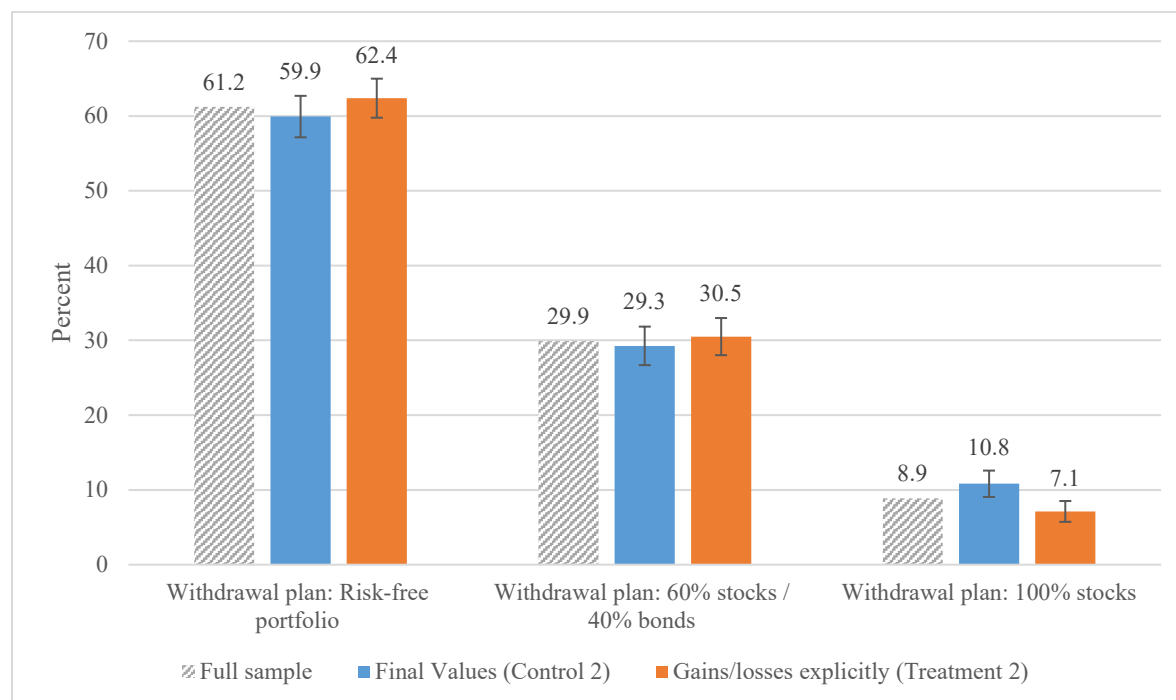


Figure 3 shows the withdrawal plan choice between three phased withdrawal plans by treatment. In the anchoring frame, participants are shown the "savings income" and the regular retirement income i) separately (control) or ii) summed up (Panel A). In the fluctuation frame, participants are shown the potential volatility i) in final values (control) or ii) as gains and losses explicitly (Panel B). Data is weighted.

**Figure 4: Withdrawal plan choice by retirement status**

**Panel A:** Retired



Retired: Withdrawal plan choice by anchoring frame (Treatment 1)



Retired: Withdrawal plan choice by loss frame (Treatment 2)

Note: Data is weighted.

**Panel B:** Non-retired

Non-retired: Withdrawal plan choice by anchoring frame (Treatment 1)



Non-retired: Withdrawal plan choice by loss frame (Treatment 2)



Note: Data is weighted.

**Figure 5: Annuity choice**

**Panel A:** Annuity choice – final decisions
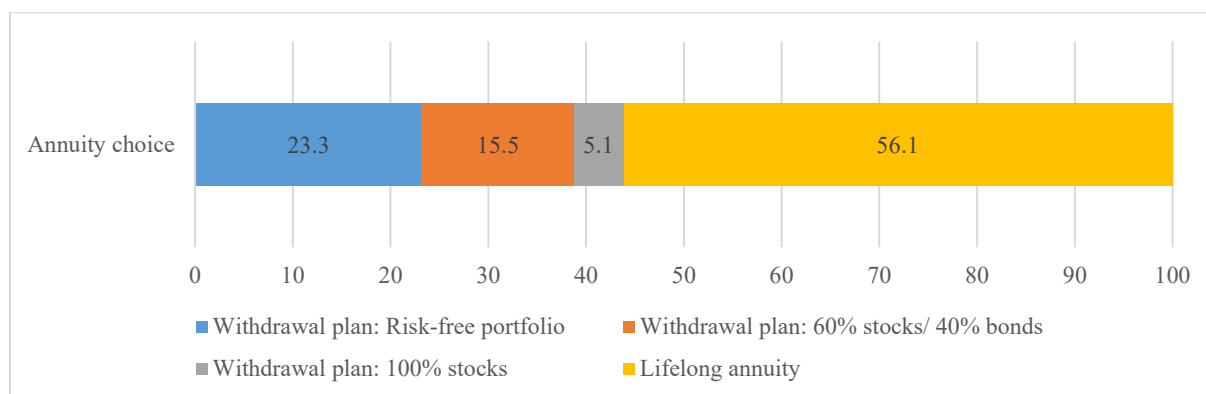


Note: Data is weighted.

**Panel B:** Annuity choice given the withdrawal plan choice
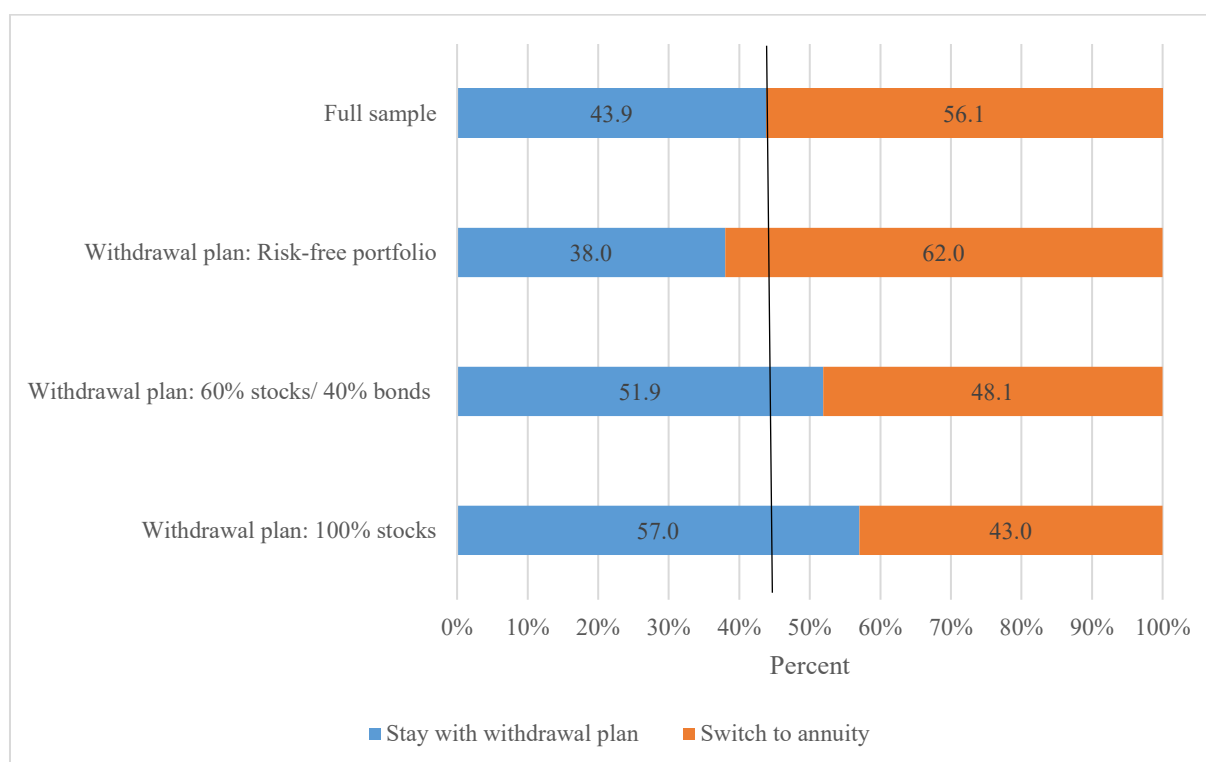


Note: Data is weighted.

**Figure 6: Annuity choice by retirement status**
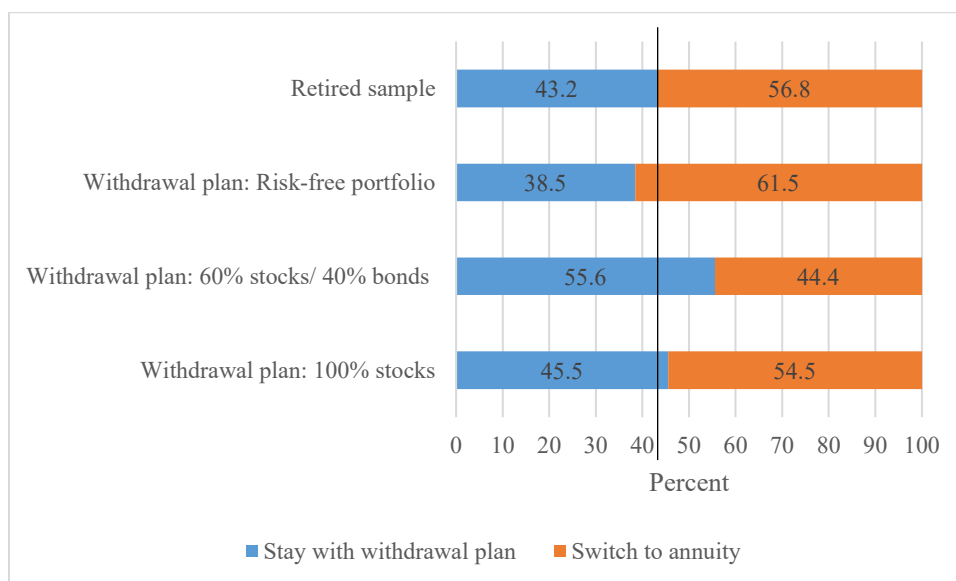
**Panel A:** Retired



Note: Data is weighted.

**Panel B:** Non-retired
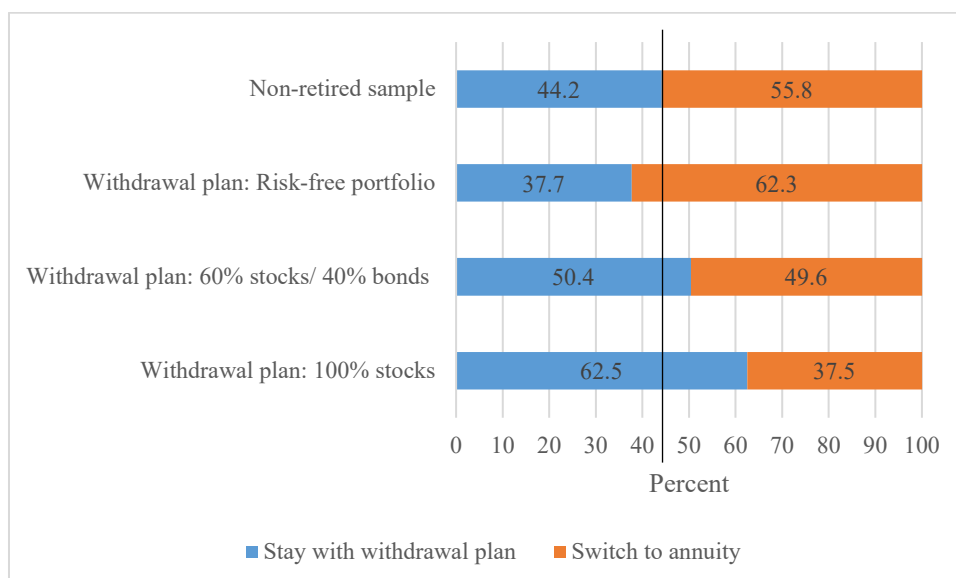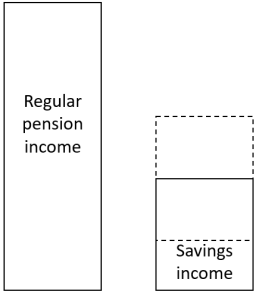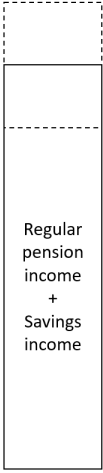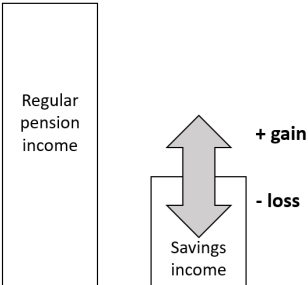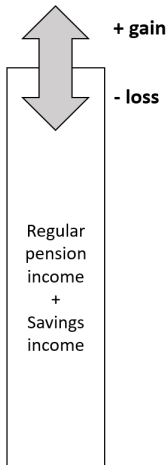


Note: Data is weighted.

# 8. Tables

## Table 1: Experimental Design
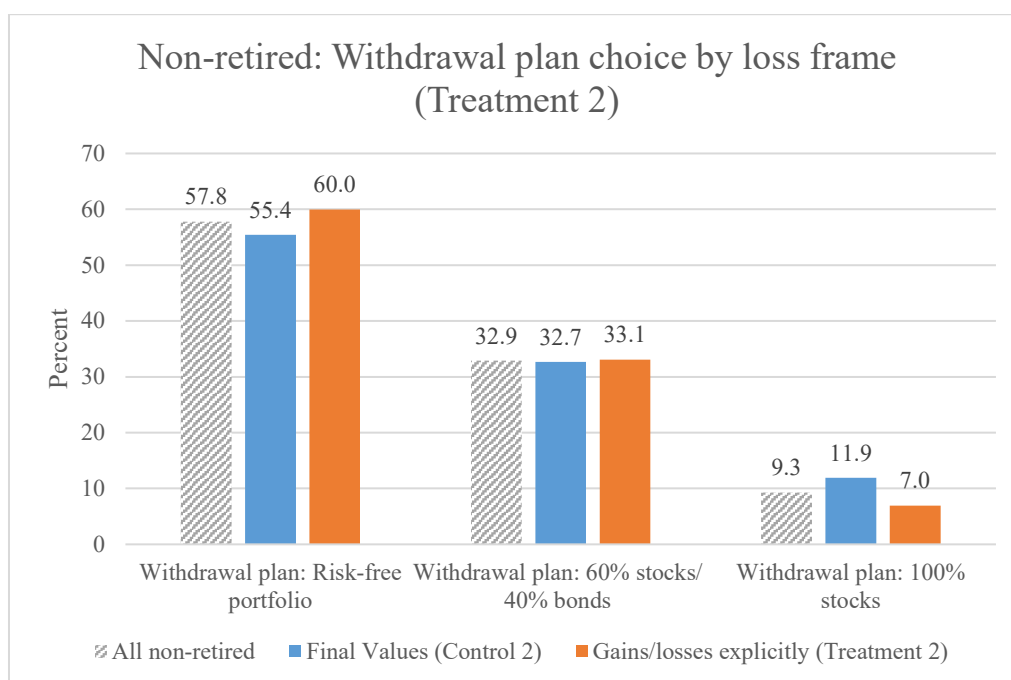
Table 1 presents the 2x2 between-subjects experimental design and the respective numbers of observations for the four treatment groups.

| | | Anchoring frame (Treatment 1) | |
|---|---|---|---|
| | | Control group 1: "Savings income" shown **separately** from regular pension income | Treatment group 1: **Total** retirement income (regular pension income + "savings income") |
| **Fluctuation frame (Treatment 2)** | Control group 2: Only **final values** shown | Group 1: N= 592 | Group 2: N=606 |
| | Treatment group 2: Potential **gains and losses** shown explicitly | Group 3: N=640 | Group 4: N=680 |

Note: Data is weighted.

**Table 2: Summary statistics**

| Variable | N | Mean | Median | Std. Dev. |
|---|---|---|---|---|
| ***Demographics*** | | | | |
| Age in years[28] | 2,512 | 54.5 | 55 | 14 |
| Retired | 2,512 | 0.4 | 0 | 0.5 |
| Female | 2,507 | 0.5 | 1 | 0.5 |
| Household monthly disposable income* | 2,165 | 7.5 | 7 | 3.2 |
|     Less than 1500 Euro | 537 | 21.33% | | |
|     1500 to less than 2500 Euro | 573 | 22.76% | | |
|     2500 to less than 3500 Euro | 497 | 19.76% | | |
|     3500 Euro and more | 910 | 36.15% | | |
| Number of children | 2,507 | 1.4 | 1 | 1.3 |
| Marital status | 2,517 | | | |
|     Single without a partner | 403 | 16.02% | | |
|     Single with a partner | 288 | 11.43% | | |
|     Married and living together | 1,388 | 55.14% | | |
|     Divorced / separated / widow | 358 | 14.24% | | |
|     Divorced / separated / widowed with a partner in HH | 80 | 3.17% | | |
| Education level | 2,518 | | | |
|     Junior high school (Hauptschulabschluss) | 517 | 20.52% | | |
|     Secondary high school (Realschulabschluss) | 1,239 | 49.22% | | |
|     Advanced technical college entrance qualification (Fachhochschulreife) | 183 | 7.27% | | |
|     University entrance qualification (Abitur) | 579 | 22.99% | | |
| Homeownership (dummy) | 2512 | 0.45 | 0 | 0.5 |
| ***Controls*** | | | | |
| Stocks, equity funds, property funds (0/1) | 2493 | 0.3 | 0 | 0.5 |
| Financial literacy score (0-5) | 1,895 | 2.5 | 2 | 1.5 |
| Risk tolerance (0-10) | 2,512 | 4.1 | 4 | 2.5 |
| Contentment with planning horizon (0-10) | 2,512 | 5.4 | 3 | 5 |
| Plan to leave bequest (0/1) | 2,509 | 0.6 | 1 | 0.5 |

This table presents the summary statistics of our experimental sample. Statistics are split into two categories: demographics and controls. Reported are the sample size N, mean, median, and standard deviation when applicable.

* Originally, the household monthly disposable income is defined on a 16 item scale (1 = "< 500€", 2 = "500€ - 749€", 3 = "750€ - 999€", …, 15 = "10,000€ - 14,999€", 16 = "> 15,000€". For the regressions, we use the original variable.

Source: Authors' calculations. Note: Data is weighted.

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[28] The minimum age in the sample is 30 years, the maximum age is 91 years.

**Table 3: Withdrawal plan choice – ATE Multinomial probit**

| | Panel A: Baseline: Risk-free option | | Panel B: Baseline: 60% stock/ 40% bonds option | | Panel C: Baseline:100% stocks option | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| VARIABLES | ATE | ATE | ATE | ATE | ATE | ATE |
| Anchoring frame (Treatment 1) | 0.0494** | 0.0580*** | -0.0335* | -0.0386** | -0.0159 | -0.0194 |
| | (0.0194) | (0.0193) | (0.0183) | (0.0187) | (0.0113) | (0.0120) |
| Fluctuation frame (Treatment 2) | 0.0242 | 0.0145 | 0.0127 | 0.00982 | -0.0368*** | -0.0244** |
| | (0.0194) | (0.0194) | (0.0182) | (0.0187) | (0.0114) | (0.0120) |
| Female | | 0.0343* | | -0.00766 | | -0.0267** |
| | | (0.0202) | | (0.0197) | | (0.0126) |
| Age (in yrs) | | 0.00334*** | | -0.00322*** | | -0.000114 |
| | | (0.000708) | | (0.000690) | | (0.000435) |
| Risk tolerance (0-10) | | -0.0340*** | | 0.0230*** | | 0.0110*** |
| | | (0.00395) | | (0.00392) | | (0.00257) |
| HH income | | 0.000511 | | 0.00259 | | -0.00310 |
| | | (0.00358) | | (0.00344) | | (0.00218) |
| Stocks, equity funds, property funds (dummy) | | -0.236*** | | 0.154*** | | 0.0818*** |
| | | (0.0218) | | (0.0216) | | (0.0143) |
| Financial literacy score (0-5) | | -0.0122* | | 0.0256*** | | -0.0133*** |
| | | (0.00719) | | (0.00693) | | (0.00440) |
| FinLit experiment | | -0.0335 | | 0.0293 | | 0.00420 |
| | | (0.0226) | | (0.0217) | | (0.0141) |
| Homeownership (dummy) | | 0.0270 | | -0.0107 | | -0.0163 |
| | | (0.0213) | | (0.0206) | | (0.0133) |
| No wealth dummy | | 0.0467* | | -0.0434* | | -0.00334 |
| | | (0.0250) | | (0.0249) | | (0.0161) |
| Observations | 2,512 | 2,143 | 2,512 | 2,143 | 2,512 | 2,143 |

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note: In our survey, several experiments were conducted. We include a dummy for being part of a financial literacy experiment.

Source: Authors' calculations. The average effects are calculated as the average of the marginal effects.

**Table 4: Withdrawal plan choice by retirement status**

| Baseline: | Panel A: Non-retired | | | Panel B: Retired | | |
|---|---|---|---|---|---|---|
| | Risk-free option | 60% stock/ 40% bonds option | 100% stocks option | Risk-free option | 60% stock/ 40% bonds option | 100% stocks option |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| VARIABLES | ATE | ATE | ATE | ATE | ATE | ATE |
| Anchoring frame (Treatment 1) | 0.0805*** | -0.0433* | -0.0372** | 0.0122 | -0.0206 | 0.00841 |
| | (0.0243) | (0.0240) | (0.0152) | (0.0318) | (0.0296) | (0.0192) |
| Fluctuation frame (Treatment 2) | 0.0513** | -0.00881 | -0.0425*** | -0.0507 | 0.0558* | -0.00502 |
| | (0.0242) | (0.0239) | (0.0151) | (0.0321) | (0.0298) | (0.0196) |
| Female | 0.0584** | -0.0141 | -0.0443*** | -0.00226 | -0.000582 | 0.00284 |
| | (0.0253) | (0.0252) | (0.0162) | (0.0334) | (0.0313) | (0.0201) |
| Age (in yrs) | 0.00494*** | -0.00406*** | -0.000887 | 0.00165 | -0.00417** | 0.00252* |
| | (0.00123) | (0.00122) | (0.000772) | (0.00197) | (0.00181) | (0.00130) |
| Risk tolerance (0-10) | -0.0331*** | 0.0230*** | 0.0101*** | -0.0331*** | 0.0227*** | 0.0104*** |
| | (0.00506) | (0.00510) | (0.00328) | (0.00629) | (0.00600) | (0.00399) |
| HH income | -0.000770 | 0.00512 | -0.00435* | 0.00325 | -0.00246 | -0.000787 |
| | (0.00425) | (0.00417) | (0.00260) | (0.00696) | (0.00650) | (0.00415) |
| Stocks, equity funds, property funds (dummy) | -0.224*** | 0.137*** | 0.0864*** | -0.253*** | 0.195*** | 0.0579** |
| | (0.0275) | (0.0277) | (0.0179) | (0.0363) | (0.0344) | (0.0232) |
| Financial literacy score (0-5) | -0.0142 | 0.0243*** | -0.0101* | -0.0115 | 0.0344*** | -0.0229*** |
| | (0.00896) | (0.00888) | (0.00551) | (0.0123) | (0.0112) | (0.00747) |
| FinLit experiment | -0.0347 | 0.0476* | -0.0129 | -0.0183 | -0.0242 | 0.0425* |
| | (0.0283) | (0.0276) | (0.0181) | (0.0377) | (0.0350) | (0.0224) |
| Homeownership (dummy) | 0.0484* | -0.0121 | -0.0363** | -0.0152 | -0.0233 | 0.0386* |
| | (0.0266) | (0.0261) | (0.0168) | (0.0357) | (0.0335) | (0.0222) |
| No wealth dummy | 0.0327 | -0.0225 | -0.0102 | 0.0576 | -0.0712** | 0.0136 |
| | (0.0334) | (0.0339) | (0.0219) | (0.0375) | (0.0357) | (0.0232) |
| | | | | | | |
| Observations | 1,401 | 1,401 | 1,401 | 742 | 742 | 742 |

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

**Table 5: Annuity choice**

*Dependent variable: Prefers annuity to previous withdrawal plan choice*

| VARIABLES | Panel A: Full Sample | | Panel B: Non-retired | | Panel C: Retired | |
|---|---|---|---|---|---|---|
| | (1) OLS | (2) OLS | (3) OLS | (4) OLS | (5) OLS | (6) OLS |
| Baseline = Withdrawal plan: Risk-free portfolio | | | | | | |
| Withdrawal plan: 60% stocks/ 40% bonds | -0.134*** | -0.0601** | -0.119*** | -0.0445 | -0.167*** | -0.0866* |
| | (0.0254) | (0.0287) | (0.0310) | (0.0345) | (0.0448) | (0.0512) |
| Withdrawal plan: 100% stocks | -0.181*** | -0.116*** | -0.229*** | -0.164*** | -0.0728 | 0.00814 |
| | (0.0413) | (0.0441) | (0.0509) | (0.0535) | (0.0688) | (0.0757) |
| Anchoring frame (Treatment 1) | 0.109*** | 0.122*** | 0.119*** | 0.136*** | 0.0879** | 0.0774* |
| | (0.0227) | (0.0240) | (0.0286) | (0.0294) | (0.0379) | (0.0410) |
| Fluctuation frame (Treatment 2) | 0.0189 | 0.0109 | 0.0294 | 0.0303 | -0.00224 | -0.0296 |
| | (0.0227) | (0.0239) | (0.0284) | (0.0293) | (0.0377) | (0.0407) |
| Female | | 0.0415 | | 0.0689** | | -0.0157 |
| | | (0.0254) | | (0.0318) | | (0.0419) |
| Age (in yrs) | | 0.0000944 | | 0.000350 | | 0.00323 |
| | | (0.000903) | | (0.00151) | | (0.00254) |
| Risk tolerance (0-10) | | -0.00382 | | -0.00549 | | -0.00342 |
| | | (0.00514) | | (0.00635) | | (0.00880) |
| HH income | | -0.00417 | | -0.00462 | | -0.00498 |
| | | (0.00441) | | (0.00513) | | (0.00851) |
| Stocks, equity funds, property funds (dummy) | | -0.137*** | | -0.121*** | | -0.160*** |
| | | (0.0303) | | (0.0362) | | (0.0538) |
| Financial literacy score (0-5) | | -0.0242*** | | -0.0284** | | -0.0206 |
| | | (0.00930) | | (0.0114) | | (0.0156) |
| FinLit experiment | | 0.0157 | | -0.0452 | | 0.138*** |
| | | (0.0277) | | (0.0341) | | (0.0468) |
| Homeownership (dummy) | | 0.0249 | | 0.0335 | | -0.00222 |
| | | (0.0280) | | (0.0333) | | (0.0519) |
| Contentment with planning horizon (0-10) | | -0.0182*** | | -0.0166*** | | -0.0209*** |
| | | (0.00404) | | (0.00506) | | (0.00656) |
| Bequest motive | | 0.0138 | | 0.00507 | | 0.0223 |
| | | (0.0286) | | (0.0342) | | (0.0527) |
| Constant | 0.552*** | 0.684*** | 0.539*** | 0.724*** | 0.575*** | 0.430** |
| | (0.0225) | (0.0826) | (0.0297) | (0.106) | (0.0345) | (0.200) |
| Observations | 2,512 | 2,141 | 1,595 | 1,400 | 917 | 741 |
| R-squared | 0.035 | 0.084 | 0.043 | 0.104 | 0.029 | 0.083 |

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Note: In our survey, several experiments were conducted. We include a dummy for being part of a financial literacy experiment.

## Appendix A: Additional figures and tables

**Figure A1:** Withdrawal plan choice by income sources

**Panel A:** Withdrawal plan choice by estimated net monthly retirement income
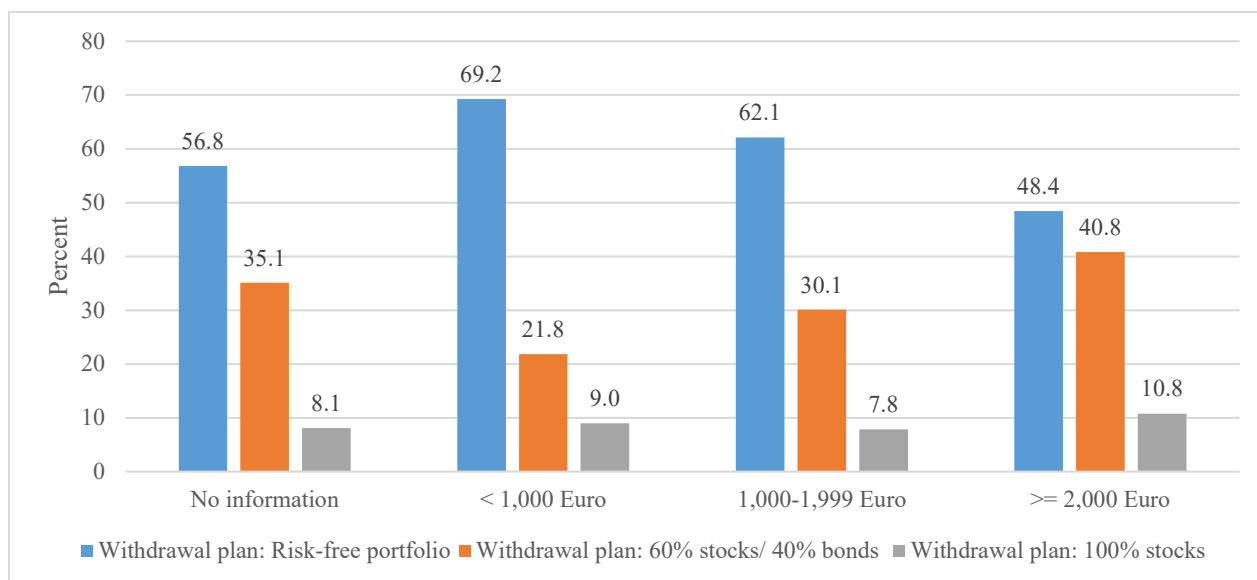


Note: Data is weighted.

**Panel B:** Withdrawal plan choice by expected financial assets at retirement



Note: Data is weighted.

**Panel C:** Withdrawal plan choice by ratio of "savings income" to regular retirement income



Note: Data is weighted.

**Table A1: "Savings income" derived from financial assets at retirement**

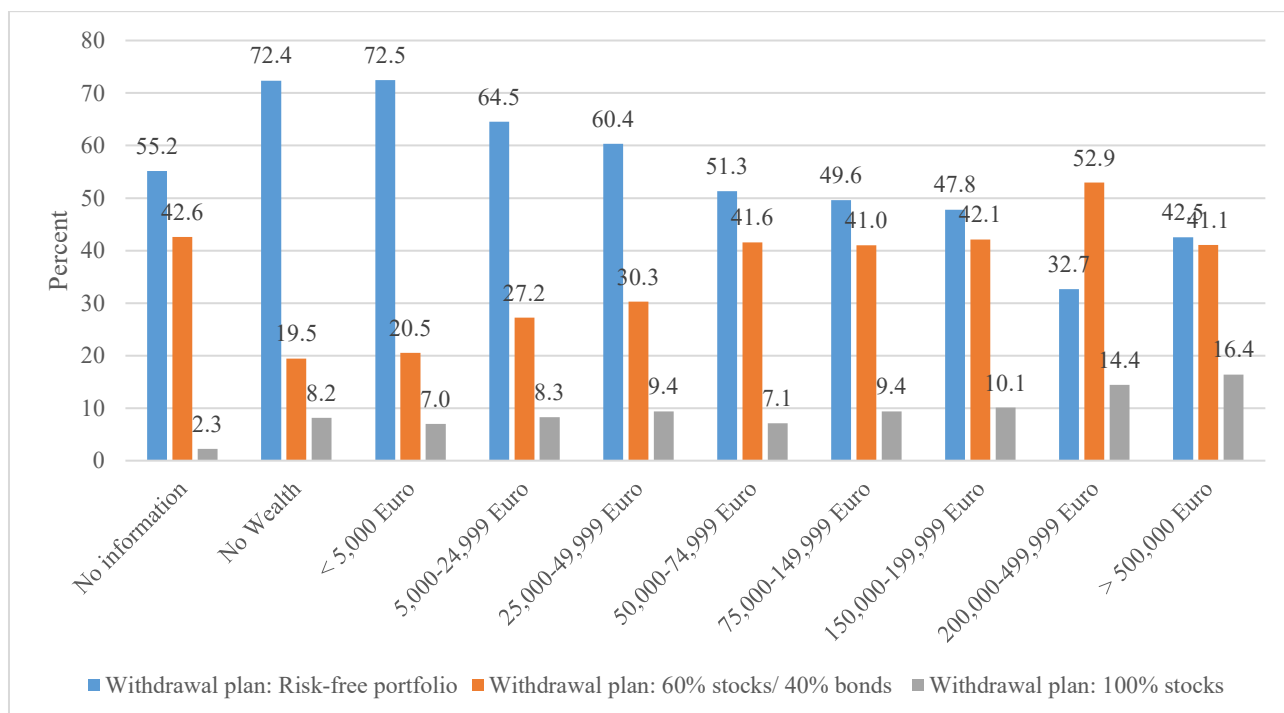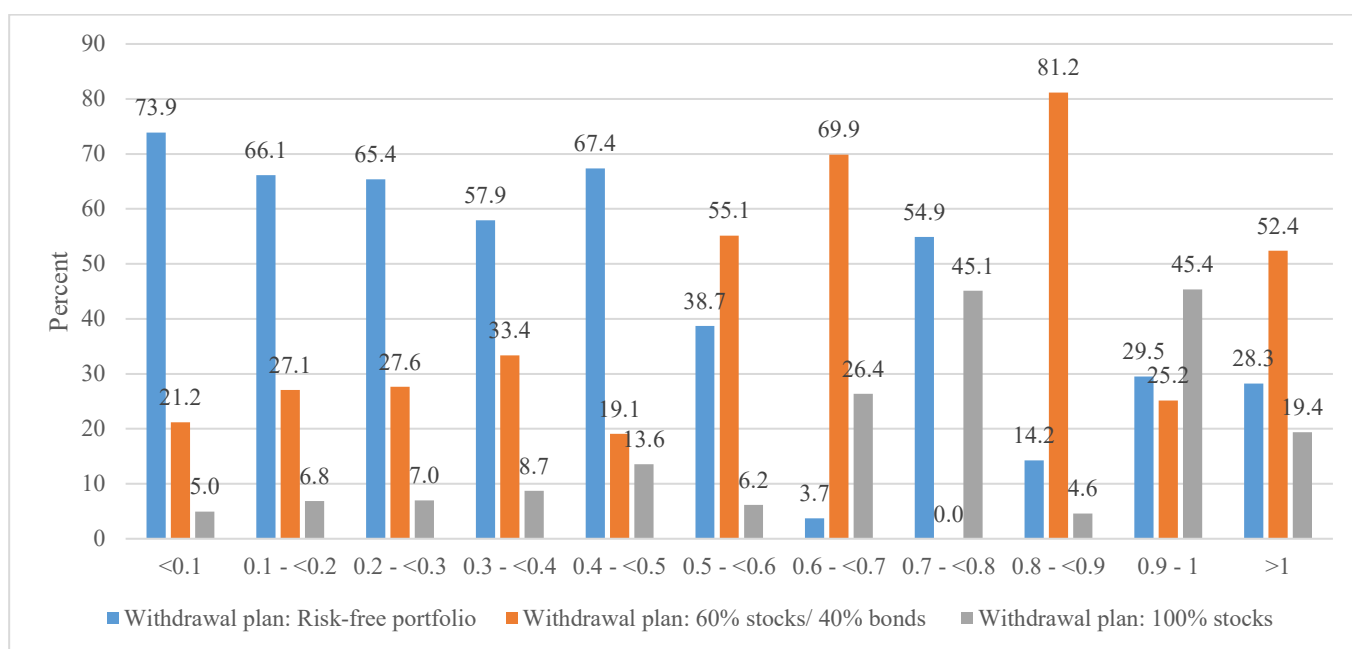| Financial assets at retirement | No wealth or no answer | Less than 5,000 Euro | 5T – 25T Euro | 25T – 50T Euro | 50T – 75T Euro | 75T – 150T Euro | 150T – 200T Euro | 200T – 500T Euro | More than 500,000 Euro |
|---|---|---|---|---|---|---|---|---|---|
| Aver. of each cat. used for simulations | 50000 | 5000 | 15000 | 37500 | 62500 | 112500 | 175000 | 350000 | 500000 |
| **Savings income - Average value** | | | | | | | | | |
| Withdrawal plan: Risk-free portfolio | 229 | 23 | 69 | 172 | 287 | 516 | 803 | 1606 | 2294 |
| Withdrawal plan: 60% stocks/ 40% bonds | 324 | 32 | 97 | 243 | 404 | 728 | 1132 | 2265 | 3236 |
| Withdrawal plan: 100% stocks | 377 | 38 | 113 | 283 | 472 | 849 | 1320 | 2641 | 3772 |
| Lifelong annuity | 185 | 18 | 55 | 139 | 231 | 416 | 647 | 1293 | 1847 |
| **Savings income in the worst 5 out of 100 cases - final values** | | | | | | | | | |
| Withdrawal plan: Risk-free portfolio | 229 | 23 | 69 | 172 | 287 | 516 | 803 | 1606 | 2294 |
| Withdrawal plan: 60% stocks/ 40% bonds | 172 | 17 | 52 | 129 | 215 | 387 | 603 | 1205 | 1722 |
| Withdrawal plan: 100% stocks | 123 | 12 | 37 | 93 | 154 | 278 | 432 | 864 | 1234 |
| Lifelong annuity | 185 | 18 | 55 | 139 | 231 | 416 | 647 | 1293 | 1847 |
| **Savings income in the best 5 out of 100 cases - final values** | | | | | | | | | |
| Withdrawal plan: Risk-free portfolio | 229 | 23 | 69 | 172 | 287 | 516 | 803 | 1606 | 2294 |
| Withdrawal plan: 60% stocks/ 40% bonds | 538 | 54 | 161 | 404 | 673 | 1211 | 1884 | 3768 | 5383 |
| Withdrawal plan: 100% stocks | 769 | 77 | 231 | 576 | 961 | 1729 | 2690 | 5380 | 7686 |
| Lifelong annuity | 185 | 18 | 55 | 139 | 231 | 416 | 647 | 1293 | 1847 |
| **Savings income in the worst 5 out of 100 cases - losses** | | | | | | | | | |
| Withdrawal plan: Risk-free portfolio | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Withdrawal plan: 60% stocks/ 40% bonds | -151 | -15 | -45 | -114 | -189 | -341 | -530 | -1060 | -1514 |
| Withdrawal plan: 100% stocks | -254 | -25 | -76 | -190 | -317 | -571 | -888 | -1777 | -2538 |
| Lifelong annuity | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Savings income in the best 5 out of 100 cases - gains** | | | | | | | | | |
| Withdrawal plan: Risk-free portfolio | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Withdrawal plan: 60% stocks/ 40% bonds | 215 | 21 | 64 | 161 | 268 | 483 | 752 | 1503 | 2147 |
| Withdrawal plan: 100% stocks | 391 | 39 | 117 | 294 | 489 | 881 | 1370 | 2740 | 3914 |
| Lifelong annuity | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Source: Simulations based on Bucher-Koenen et al. (2019). Values shown in Euro. T = thousand.

**Table A2: Randomization**

OLS Group Comparison

| VARIABLES | (1) Group 1 | (2) Group 2 | (3) Group 3 | (4) Group 4 |
|---|---|---|---|---|
| Female | -0.00389 | 0.00273 | -0.0139 | 0.0151 |
|  | (0.0176) | (0.0177) | (0.0178) | (0.0182) |
| Age (in years) | 0.000483 | -0.000872 | 0.00131** | -0.000920 |
|  | (0.000625) | (0.000630) | (0.000633) | (0.000649) |
| Risk tolerance (0-10) | -0.00154 | 0.000977 | 7.21e-05 | 0.000495 |
|  | (0.00354) | (0.00356) | (0.00358) | (0.00367) |
| Household monthly disposable income *Baseline: less than 1500 Euro* |  |  |  |  |
| 1500 to less than 2500 Euro | -0.00167 | -0.00588 | -0.00797 | 0.0155 |
|  | (0.0257) | (0.0258) | (0.0260) | (0.0267) |
| 2500 to less than 3500 Euro | -0.0304 | 0.0232 | -0.0157 | 0.0229 |
|  | (0.0269) | (0.0271) | (0.0272) | (0.0279) |
| 3500 Euro and more | -0.0279 | 0.0258 | 0.0131 | -0.0110 |
|  | (0.0241) | (0.0243) | (0.0244) | (0.0250) |
| Education level *Baseline: Junior high school (Hauptschulabschluss)* |  |  |  |  |
| Secondary high school (Realschulabschluss) | 0.00958 | -0.00288 | -0.0209 | 0.0142 |
|  | (0.0236) | (0.0238) | (0.0239) | (0.0245) |
| Advanced technical college entrance qualification (Fachhochschulreife) | 0.00358 | -0.0678* | 0.0208 | 0.0434 |
|  | (0.0357) | (0.0360) | (0.0362) | (0.0371) |
| University entrance qualification (Abitur) | -0.0108 | -0.0165 | -0.0156 | 0.0429 |
|  | (0.0269) | (0.0271) | (0.0272) | (0.0279) |
| East | -0.0165 | 0.0277 | -0.0366 | 0.0253 |
|  | (0.0228) | (0.0230) | (0.0231) | (0.0237) |
| Constant | 0.238*** | 0.281*** | 0.202*** | 0.280*** |
|  | (0.0482) | (0.0486) | (0.0488) | (0.0501) |
|  |  |  |  |  |
| Observations | 2,507 | 2,507 | 2,507 | 2,507 |
| R-squared | 0.002 | 0.004 | 0.005 | 0.004 |

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note: Data is weighted.

**Table A3: Summary statistics: (Expected) retirement income**

*Which source of retirement income do you or do you expect to receive?*

| | Full sample | | Retired | | Non-retired | |
|---|---|---|---|---|---|---|
| | n | % | n | % | n | % |
| Statutory pension | 2295 | 91.15 | 791 | 88.61 | 1504 | 92.54 |
| Occupational pension | 877 | 34.81 | 272 | 30.47 | 605 | 37.19 |
| Civil servant pension | 154 | 6.11 | 71 | 7.93 | 83 | 5.12 |
| Retirement pension for farmers | 7 | 0.27 | 3 | 0.31 | 4 | 0.24 |
| Professional care* | 38 | 1.5 | 5 | 0.55 | 33 | 2.02 |
| Endowment life insurance | 301 | 11.94 | 27 | 2.97 | 274 | 16.87 |
| Private pension insurance | 608 | 24.16 | 43 | 4.79 | 566 | 34.8 |
| Income from financial assets | 317 | 12.58 | 62 | 6.98 | 255 | 15.66 |
| Rent income | 280 | 11.11 | 69 | 7.76 | 210 | 12.95 |
| Other | 81 | 3.22 | 51 | 5.76 | 30 | 1.83 |
| Accumulation by pillar: | n | % | n | % | n | % |
| 1. Pillar | 2430 | 96.51 | 847 | 94.87 | 1583 | 97.41 |
| 2. Pillar | 877 | 34.81 | 272 | 30.47 | 605 | 37.19 |
| 3. Pillar | 758 | 30.09 | 66 | 7.42 | 691 | 42.53 |
| Total | 2518 | 100 | 893 | 100 | 1626 | 100 |

Note: Data is weighted. Multiple answers are possible.1. Pillar includes statutory pension, civil servant pension, retirement pension for farmers, and professional care. 2. Pillar includes company pension, 3. Pillar includes endowment life insurance and private pension insurance.

* Professional provision for chambered freelancers such as physicians, pharmacists, or lawyers.

**Table A4: No financial assets at retirement**

| | No wealth | |
|---|---|---|
| | n | % |
| Estimated net retirement income | | |
| No information | 15 | 2.15 |
| 0-499 Euro | 85 | 12.18 |
| 500-749 Euro | 130 | 18.67 |
| 750-999 Euro | 145 | 20.92 |
| 1,000-1,249 Euro | 105 | 15.06 |
| 1,250-1,499 Euro | 89 | 12.84 |
| 1,500-1,999 Euro | 75 | 10.77 |
| 2,000-2,499 Euro | 26 | 3.75 |
| 2,500-2,999 Euro | 15 | 2.14 |
| 3,000-3,499 Euro | 4 | 0.64 |
| 3,500-3,999 Euro | 6 | 0.81 |
| > 4,000 Euro | 1 | 0.08 |
| Total | 694 | 100 |
| Gender (Female = 1) | | |
| Male | 284 | 40.97 |
| Female | 409 | 59.03 |
| Total | 692 | 100 |
| Age groups | | |
| 30 to 39 years | 98 | 14.15 |
| 40 to 49 years | 109 | 15.66 |
| 50 to 59 years | 180 | 25.94 |
| 60 to 69 years | 135 | 19.46 |
| 70 to 79 years | 162 | 23.31 |
| 80 years + | 10 | 1.47 |
| Retired | | |
| No | 374 | 53.93 |
| Yes | 320 | 46.07 |
| Education level | | |
| Junior high school (Hauptschulabschluss) | 228 | 32.78 |
| Secondary high school (Realschulabschluss) | 355 | 51.1 |
| Advanced technical college entrance qualification (Fachhochschulreife) | 32 | 4.55 |
| University entrance qualification (Abitur) | 80 | 11.57 |
| Employment status | | |
| Full-time employment (>= 35h/week) | 172 | 24.79 |
| Part-time employment (15 to <35h /week) | 91 | 13.1 |
| Marginally employed (<15h /week) | 56 | 8.06 |
| Occasionally employed | 29 | 4.16 |
| Not employed | 346 | 49.89 |
| Total | 694 | 100 |

Note: Data is weighted.

**Table A5: Withdrawal plan choice - LPM**

*Dependent Variable "withdrawal plan choice stock" = 0 if option without stocks (risk-free), 1 if option with stocks (medium-risk and high-risk)*

| VARIABLES | (1) | (2) |
|---|---|---|
| Anchoring frame (Treatment 1) | -0.0331 | -0.0395 |
| | (0.0323) | (0.0322) |
| Fluctuation frame (Treatment 2) | -0.00825 | 0.00445 |
| | (0.0330) | (0.0322) |
| Anchoring * fluctuation frame | -0.0312 | -0.0345 |
| | (0.0451) | (0.0455) |
| Female | | -0.0175 |
| | | (0.0332) |
| Risk tolerance (Median dummy) | | 0.163*** |
| | | (0.0347) |
| Female * risk tolerance | | -0.0653 |
| | | (0.0470) |
| Age (in yrs) | | -0.00369*** |
| | | (0.000832) |
| HH income | | 0.000189 |
| | | (0.00437) |
| Stocks, equity funds, property funds (dummy) | | 0.273*** |
| | | (0.0289) |
| Financial literacy score (0-5) | | 0.0132 |
| | | (0.00889) |
| FinLit experiment | | 0.0333 |
| | | (0.0267) |
| Homeownership (dummy) | | -0.0321 |
| | | (0.0240) |
| No wealth dummy | | -0.0493* |
| | | (0.0287) |
| Constant | 0.418*** | 0.451*** |
| | (0.0232) | (0.0785) |
| | | |
| Observations | 2,512 | 2,143 |
| R-squared | 0.003 | 0.145 |

Robust standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$

*Interaction of the two treatments significantly different from zero?*
1.AZ_treatment1 + 1.AZ_treatment2 + 1.AZ_treatment1#1.AZ_treatment2 = 0
   F( 1, 2130) =   4.92
       Prob > F =   0.0267
*Difference between men with high tolerance and women with high risk tolerance statistically different from one another?*
test _b[1.median_risk] = _b[1.median_risk] + _b[1.gender_dummy] +
_b[1.gender_dummy#1.median_risk]
 equivalent to:  - 1.gender_dummy - 1.gender_dummy#1.median_risk = 0
   F( 1, 2130) =   6.07
       Prob > F =   0.0138

**Appendix B: The experiment**

**Part A: Survey design – Introduction (Stage 1: Withdrawal plan choice)**

This part of our survey is about retirement planning. We will introduce you to various ways in which you can convert part of your saved assets into a payment stream at the start of your retirement.

It is about how you "dissave" your assets during retirement. By "dissaving", we mean the following situation:

*Suppose you retire at the age of 67 and have saved up financial assets over the course of your professional life. These assets increase your regular retirement income, which you receive from the statutory pension insurance, civil servants' pension or from a pension fund. In order to achieve a desired standard of living, you have to think about how you can best distribute the wealth you have saved over your retirement period, i.e., "dissave" it.*

In the following experiment, we are talking about your "savings income".

There are important decisions to be made when "dissaving":

- How much would you like to spend on everyday expenses, travel and the like on a monthly basis?
- How should the remaining assets be invested?

The various options are explained in detail below.

We calculate with an expected (net) retirement income of 1,300€ and financial assets at the start of retirement of 50,000€.[29]

[The values are based on information that you have given us beforehand in the questionnaire.]

You can choose between three different **phased withdrawal plans**. A phased withdrawal plan means that the assets are withdrawn in equal or flexible amounts over a specified time horizon. Here, all withdrawal plans run for a period of 20 years. If you retire at the age of 67, for example, you will be able to draw on your financial assets until you are 87 years old before they are used up. Your saved assets, which are used for the calculations, will therefore be completely used up after 20 years, and it will then be 0€.

With a phased withdrawal plan, the assets can either be invested at a fixed interest rate and fixed monthly amounts withdrawn (**risk-free investment**). Or you can invest your existing assets in the **capital market**. Then the assets are subject to the capital market risk and the savings income can fluctuate.

The term *capital market risk* means that investing assets in the capital market is associated with risk. Profits can be achieved depending on the development of the capital market, but losses can also arise in the event of poor development.

1. A **risk-free investment** has the advantage that you receive a constant monthly savings income. However, the monthly amounts will be lower due to the risk-free investment, as no (high) profits are achieved.
2. When **investing in the capital market**, the average return is higher over a longer period of time, but the return and thus the monthly savings income may fluctuate.

The possible fluctuations become visible in the graph. These relationships will become clear in the following based on the calculations with the numbers you provided.

**Part B: Survey design – Graphical illustration see Table 1**

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[29] This is the average scenario if participants did not answer the questions on *estimated net retirement income* and *financial assets at retirement*.

**Part C: Survey design – Presentation of options (Stage 1: Withdrawal plan choice)**

*In the following, we will introduce you to three variants of a phased withdrawal plan and are interested in which one you prefer.[30]*

*Withdrawal plan: risk-free portfolio*

| | | **Anchoring frame (Treatment 1)** | |
|---|---|---|---|
| | | Control group 1: "Savings income" shown **separately** from regular pension income | Treatment group 1: **Total** retirement income (regular pension income + "savings income") |
| **Fluctuation frame (Treatment 2)** | Control group 2: Only **final values** shown | Your wealth is invested **risk-free**, you achieve a **constant** savings income of **229€** in addition to your regular pension income of **1,300€**. | Your wealth is invested **risk-free**. Together with your regular pension income, you have a total income of **1,529€** at your disposal. |
| | Treatment group 2: Potential **gains and losses** shown explicitly | Your wealth is invested **risk-free**, you achieve a **constant** savings income of **299€** in addition to your regular pension income of **1,300€**.<br><br>There are no fluctuations. | Your wealth is invested **risk-free**. Together with your regular pension income, you have a total income of **1,529€** at your disposal.<br><br>There are no fluctuations. |

*Withdrawal plan: 60% stocks/ 40% bonds*

| | | **Anchoring frame (Treatment 1)** | |
|---|---|---|---|
| | | Control group 1: "Savings income" shown **separately** from regular pension income | Treatment group 1: **Total** retirement income (regular pension income + "savings income") |
| **Fluctuation frame** | Control group 2: Only **final values** shown | Your wealth is invested **in the capital market. 60% are invested in stocks and 40% in bonds.** Your withdrawal **fluctuating** amounts depending on the development of the capital market. **On average**, you have an amount of **324€** available in addition to your regular pension income of **1,300€.**<br><br>In the best 5 out of 100 cases, the savings income is over **538€**. In the worst 5 out of 100 cases, the payment amount is less than **172€**. | Your wealth is invested **in the capital market. 60% are invested in stocks and 40% in bonds.** Your withdrawal **fluctuating** amounts depending on the development of the capital market. **On average**, you have a total income of **1,624€** at your disposal.<br><br>In the best 5 out of 100 cases, the total income is over **1,838€**. In the worst 5 cases out of 100, the total income is less than **1,472€**. |
| | Treatment group 2: Potential **gains and losses** shown explicitly | Your wealth is invested **in the capital market. 60% are invested in stocks and 40% in bonds.** Your withdrawal **fluctuating** amounts depending on the development of the capital market. **On average**, you have an amount of **324€** available in addition to your regular pension income of **1,300€.**<br><br>In the best 5 out of 100 cases, the savings income is **+215€** above the average. In the worst 5 out of 100 cases, the savings income is **-151€** below the average. | Your wealth is invested **in the capital market. 60% are invested in stocks and 40% in bonds.** Your withdrawal **fluctuating** amounts depending on the development of the capital market. **On average**, you have a total income of **1,624€** at your disposal.<br><br>In the best 5 out of 100 cases, the savings income is **+215€** above the average. In the worst 5 out of 100 cases, the savings income is **-151€** below the average. |

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[30] The order of the options is randomized. The values are rounded to whole numbers.

*Withdrawal plan: 100% stocks*

| | | Anchoring frame (Treatment 1) | |
|---|---|---|---|
| | | Control group 1: "Savings income" shown **separately** from regular pension income | Treatment group 1: **Total** retirement income (regular pension income + "savings income") |
| **Fluctuation frame (Treatment 2)** | Control group 2: Only **final values** shown | Your wealth is invested **in the capital market. 100% are invested in stocks.** Your withdrawal **fluctuating** amounts depending on the development of the capital market. **On average**, you have an amount of **377€** available in addition to your regular pension income of **1,300€.**<br><br>In the best 5 out of 100 cases, the savings income is over **769€**. In the worst 5 out of 100 cases, the payment amount is less than **123€.** | Your wealth is invested **in the capital market. 100% are invested in stocks.** Your withdrawal **fluctuating** amounts depending on the development of the capital market. **On average**, you have a total income of **1,677€** at your disposal.<br><br>In the best 5 out of 100 cases, the total income is over **2,069€**. In the worst 5 cases out of 100, the total income is less than **1,423€.** |
| | Treatment group 2: Potential **gains and losses** shown explicitly | Your wealth is invested **in the capital market. 100% are invested in stocks.** Your withdrawal **fluctuating** amounts depending on the development of the capital market. **On average**, you have an amount of **377€** available in addition to your regular pension income of **1,300€.**<br><br>In the best 5 out of 100 cases, the savings income is **+391€** above the average. In the worst 5 out of 100 cases, the savings income is **-254€** below the average. | Your wealth is invested **in the capital market. 100% are invested in stocks.** Your withdrawal **fluctuating** amounts depending on the development of the capital market. **On average**, you have a total income of **1,677€** at your disposal.<br><br>In the best 5 out of 100 cases, the savings income is **+391€** above the average. In the worst 5 out of 100 cases, the savings income is **-254€** below the average. |

**Part D: Example of screenshot, here group 2 (total retirement income and final values)**



Note: Values shown for expected retirement income of 1,250 – 1,500 € and expected wealth of 50,000 – 75,000 €.

**Part E: Survey design – Table with option overview (Stage 1: Withdrawal plan choice)**

| | Withdrawal plan: risk-free portfolio | Withdrawal plan: 60% stocks/ 40% bonds | Withdrawal plan: 100% stocks |
|---|---|---|---|
| **Form of payment** | Withdrawal plan | Withdrawal plan | Withdrawal plan |
| **Time horizon** | 20 years | 20 years | 20 years |
| **Investment form** | Risk-free portfolio | 60% stocks 40% bonds | 100% stocks |
| **Capital market risk** | No | Yes | Yes |
| **GROUP 1** | | | |
| **Average savings income** | 229€ | 324€ | 377€ |
| **Savings income in the best 5 out of 100 cases** | 229€ | 538€ | 769€ |
| **Savings income in the worst 5 out of 100 cases** | 229€ | 172€ | 123€ |
| **GROUP 2** | | | |
| **Average total income** | 1,529€ | 1,624€ | 1,677€ |
| **Average total income in the best 5 out of 100 cases** | 1,529€ | 1,838€ | 2,069€ |
| **Average total income in the worst 5 out of 100 cases** | 1,529€ | 1,427€ | 1,423€ |
| **GROUP 3** | | | |
| **Average savings income** | 299€ | 324€ | 377€ |
| **Fluctuation of the savings income in the best 5 out of 100 cases** | +0€ | +215€ | +391€ |
| **Fluctuation of the savings income in the worst 5 out of 100 cases** | -0€ | -151€ | -254€ |
| **GROUP 4** | | | |
| **Average total income** | 1,529€ | 1,624€ | 1,677€ |
| **Fluctuation of the total income in the best 5 out of 100 cases** | +0€ | +215€ | +391€ |
| **Fluctuation of the total income in the worst 5 out of 100 cases** | -0€ | -151€ | -254€ |

**Part F: Survey design – Introduction (Stage 2: Annuity choice)**

With the **withdrawal plans** just considered, the financial assets are consumed over a period of 20 years. However, a person does not know exactly how long he or she will live. This phenomenon is called *longevity risk*. A person could die sooner or later than they expected. If a person dies before the end of the contract, the heirs will receive the remaining capital from the withdrawal plan. If a person lives longer than the planned time horizon, i.e., if they are older than 87 years, the savings income ceases thereafter.

[Question: Are you concerned that at the end of the planning horizon your assets will be used up? Scale from 1 – 10]

As an alternative to a withdrawal plan with a fixed planning horizon, you can exchange your saved assets for a **lifelong pension**. That means you get secure monthly payments until you die. The pension payments are constant until the end of life. There is no inheritance.

**Part G: Survey design – Presentation of options (Stage 2: Annuity choice)**

*Lifelong annuity*

| | | **Anchoring frame (Treatment 1)** | |
|---|---|---|---|
| | | Control group 1: "Savings income" shown **separately** from regular pension income | Treatment group 1: **Total** retirement income (regular pension income + "savings income") |
| **Fluctuation frame (Treatment 2)** | Control group 2: Only **final values** shown | If you opt for a **lifelong annuity**, you will receive a **constant** monthly payment of **185€** until the **end of your life** in addition to your regular retirement income of **1,300€**. | If you opt for a **lifelong annuity**, you will receive a **constant** monthly payment until the **end of your life**. Together with your regular retirement income, you have a total income of **1,485€** at your disposal. |
| | Treatment group 2: Potential **gains and losses** shown explicitly | If you opt for a **lifelong annuity**, you will receive a **constant** monthly payment of **185€** until the **end of your life** in addition to your regular retirement income of **1,300€**. There are no fluctuations. | If you opt for a **lifelong annuity**, you will receive a **constant** monthly payment until the **end of your life**. Together with your regular retirement income, you have a total income of **1,485€** at your disposal. There are no fluctuations. |

**Part H: Survey design – Table with option overview (Stage 2: Annuity choice)**

*Note that only the previously chosen withdrawal plan is shown and the lifelong annuity.*

| | Withdrawal plan: risk-free portfolio | Withdrawal plan: 60% stocks/ 40% bonds | Withdrawal plan: 100% stocks | Lifelong annuity |
|---|---|---|---|---|
| **Form of payment** | Withdrawal plan | Withdrawal plan | Withdrawal plan | Lifelong annuity |
| **Time horizon** | 20 years | 20 years | 20 years | Lifelong |
| **Investment form** | Risk-free portfolio | 60% stocks 40% bonds | 100% stocks | Determined by the insurer |
| **Capital market risk** | No | Yes | Yes | No |
| **Longevity risk** | Yes | Yes | Yes | No |
| **GROUP 1** | | | | |
| **Average savings income** | 229€ | 324€ | 377€ | 185€ |
| **Savings income in the best 5 out of 100 cases** | 229€ | 538€ | 769€ | 185€ |
| **Savings income in the worst 5 out of 100 cases** | 229€ | 172€ | 123€ | 185€ |
| **GROUP 2** | | | | |
| **Average total income** | 1,529€ | 1,624€ | 1,677€ | 1,485€ |
| **Average total income in the best 5 out of 100 cases** | 1,529€ | 1,838€ | 2,069€ | 1,485€ |
| **Average total income in the worst 5 out of 100 cases** | 1,529€ | 1,427€ | 1,423€ | 1,485€ |
| **GROUP 3** | | | | |
| **Average savings income** | 299€ | 324€ | 377€ | 185€ |
| **Fluctuation of the savings income in the best 5 out of 100 cases** | +0€ | +215€ | +391€ | +0€ |
| **Fluctuation of the savings income in the worst 5 out of 100 cases** | -0€ | -151€ | -254€ | +0€ |
| **GROUP 4** | | | | |
| **Average total income** | 1,529€ | 1,624€ | 1,677€ | 1,485€ |
| **Fluctuation of the total income in the best 5 out of 100 cases** | +0€ | +215€ | +391€ | +0€ |
| **Fluctuation of the total income in the worst 5 out of 100 cases** | -0€ | -151€ | -254€ | -0€ |

**Appendix C: List of variables**

| Variable name | Original question | Definition |
|---|---|---|
| Age (in yrs) | Age derived from "Year of birth" | Ages between 30 – 91 years |
| Annuity choice | | 0 = Stay with withdrawal plan<br>1 = Switch to annuity option |
| Bequest motive | Are you planning to leave a bequest? | 0 = No<br>1 = Yes |
| Contentment with planning horizon | Are you concerned that at the end of the planning horizon your assets will be used up? | Scale of 0 to 10<br>0 = It worries me a lot<br>10 = It doesn't worry me at all |
| Education level | What is your highest general school leaving certificate? | 1 = Junior high school (Hauptschulabschluss)<br>2 = Secondary high school (Realschulabschluss)<br>3 = Advanced technical college entrance qualification (Fachhochschulreife)<br>4 = University entrance qualification (Abitur) |
| Employment status | Are you currently employed in any way? Which item on this list suits your situation best? | 1 = Full-time employment with weekly working hours of 35 hours or more<br>2 = Part-time employment with weekly working hours of 15 to less than 35 hours<br>3 = Marginally employed with a weekly working time of less than 15 hours<br>4 = Occasionally employed<br>5 = Not employed in any way |
| Estimated net retirement income | *For participants not yet retired:* What do you think how high will your personal monthly net income (from statutory pension / civil servant pension / pension fund and occupational pension, i.e., the regular income without your private supplementary pension) be after retirement?<br>Note: This information does Not include private pension schemes<br><br>*For retirees:* How high is your personal monthly net income (from statutory pension / civil service pension / pension fund and company pension, i.e., the regular income without your private supplementary pension)? | 1 = 0 to less than 500 Euro<br>2 = 500 to less than 750 Euro<br>3 = 750 to less than 1,000 Euro<br>4 = 1,000 to less than 1,250 Euro<br>5 = 1,250 to less than 1,500 Euro<br>6 = 1,500 to less than 2,000 Euro<br>7 = 2,000 to less than 2,500 Euro<br>8 = 2,500 to less than 3,000 Euro<br>9 = 3,000 to less than 3,500 Euro<br>10 = 3,500 to less than 4,000 Euro<br>11 = 4,000 Euro and more |
| Estimated net retirement income (dummy) | | 0 = No Information<br>1 = < 1,000 Euro<br>2 = 1,000 – 1,999 Euro<br>3 = > 2,000 Euro |
| Financial assets at retirement | For retirees: What do you estimate, how high were your financial assets at the time of your retirement?<br><br>For participants not yet retired: What do you expect, how high will your financial assets be by the time you retire? | 0 = No information<br>1 = No financial wealth<br>2 = Less than 5,000 Euro<br>3 = 5,000 to less than 25,000 Euro<br>4 = 25,000 to less than 50,000 Euro<br>5 = 50,000 to less than 75,000 Euro<br>6 = 75,000 to less than 150,000 Euro<br>7 = 150,000 to less than 200,000 Euro<br>8 = 200,000 to less than 500,000 Euro<br>9 = 500,000 Euro and more |

| Variable name | Original question | Definition |
|---|---|---|
| Financial literacy score (0-5) | Sum of five financial literacy questions | 0 - 5 number of correct answers |
| Financial literacy experiment | Was interviewed person part of the financial literacy experiment? | 0 = Variant A (incl. Do Not know / No details)<br>1 = Variant B (without know / No + inquiry) |
| Financial literacy question 1 (Risk) | Suppose you have a deposit of 100€ in your savings account. The interest rate is 2% per year and you keep it on this account for 5 years. What do you think: How much money will be on your savings account after 5 years? | 1 = More than 110 Euro<br>2 = Exactly 110 Euro<br>3 = Less than 110 Euro<br>4 = Don't know (only of Variant A)<br>5 = No information (only of Variant A) |
| Financial literacy question 2 (Inflation) | Suppose the interest on your savings account is 1% per year and the inflation rate is 2% per year. What do you think: Will you be able to buy more, less or the same amount of goods with the deposited money after one year? | 1 = More<br>2 = Just as much<br>3 = Less than today<br>4 = Don't know (only of Variant A)<br>5 = No information (only of Variant A) |
| Financial literacy question 3 (Risk diversification) | Is the following statement right or wrong: "Investing in shares of a single company bears fewer risks than investing in a fund?" | 1 = Agree<br>2 = Do not agree<br>3 = Don't know (only of Variant A)<br>4 = No information (only of Variant A) |
| Financial literacy question 4 (Interest on loans) | Suppose you take out a loan of 1000 Euro from the bank at an interest rate of 20% per year. If you don't pay off that loan and interest, how long will it take for the amount you owe the bank to double? | 1 = Less than 2 years<br>2 = 2 to less than 5 years<br>3 = 5 to less than 10 years<br>4 = 10 years or more<br>5 = Don't know (only of Variant A)<br>6 = No information (only of Variant A) |
| Financial literacy question 5 (Debt repayment) | Suppose you have taken out a loan of 3000 Euro from the bank. You pay the minimum contribution of 30 Euro per month to the bank. The annual interest is 12% (or 1% per month). How many years does it take to pay off this loan? | 1 = Less than 5 years<br>2 = Between 5 and 10 years<br>3 = Between 10 and 15 years<br>4 = Never, the debt remains.<br>5 = Don't know (only of Variant A)<br>6 = No information (only of Variant A) |
| Female | Are you… | 0 = Male<br>1 = Female |
| Homeownership (dummy | Do you live as a tenant or in home ownership? | 0 = Tenant<br>1 = Homeowner |
| Household monthly disposable income | How much do you estimate is the MONTHLY disposable net income of your household, i.e., the money that is available to the entire household after deduction of taxes and social security contributions to cover expenses?<br>Please take into account the types of income listed in your answer.<br><br>Wage<br>Salary<br>Income from self-employment<br>Annuity or pensions<br>Public Aid Income<br>Rental income<br>Lease income<br>Housing benefit<br>Child benefit<br>Other Income | 1 = Less than 500 Euro<br>2 = 500 to less than 750 Euro<br>3 = 750 to less than 1,000 Euro<br>4 = 1,000 to less than 1,250 Euro<br>5 = 1,250 to less than 1,500 Euro<br>6 = 1,500 to less than 2,000 Euro<br>7 = 2,000 to less than 2,500 Euro<br>8 = 2,500 to less than 3,000 Euro<br>9 = 3,000 to less than 3,500 Euro<br>10 = 3,500 to less than 4,000 Euro<br>11 = 4,000 to less than 4,500 Euro<br>12 = 4,500 to less than 5,000 Euro<br>13 = 5,000 to less than 7,500 Euro<br>14 = 7,500 to less than 10,000 Euro<br>15 = 10,000 to less than 15,000 Euro<br>16 = 15,000 Euro and more |

| Variable name | Original question | Definition |
|---|---|---|
| Marital Status | What is your marital status? | 1 = Single without a partner in the household<br>2 = Single with a partner in the household<br>3 = married and living together<br>4 = Divorced / separated / widowed without a partner in the house<br>5 = Divorced / separated / widowed with a partner in the house |
| Number of children | How many children or stepchildren do you have (regardless of whether they live in the household or how old they are)? | Numeric values |
| No wealth dummy | Derived from variable "Financial assets at retirement" | 0 = Positive financial assets at retirement<br>1 = No financial assets at retirement |
| Retired | Are you retired, or in early retirement, or are you receiving a limited incapacity benefits? | 0 = No<br>1 = Yes |
| Retirement income | Which of the listed types of retirement income do you receive?<br>Which of the listed types of retirement income are you expecting to receive in old age?<br><br>□ Pension from the statutory pension insurance<br>□ Occupational pension, supplementary pension in the private sector / supplementary pension in the public sector<br>□ civil servant pension<br>□ old-age pension for farmers<br>□ Professional care for collective freelancers such as doctors, pharmacists, lawyers<br>□ Endowment life insurance<br>□ Private pension insurance (also Riester and Rürup pensions)<br>□ income from financial assets<br>□ Income from renting and leasing<br>□ Other retirement income, namely:_____<br>□ *For retired:* None of the above, I do not have my own retirement income.<br>□ *For non-retired*: None of the above, I will not have my own retirement income later. | 0 = No<br>1 = Yes |
| Risk tolerance | How do you assess yourself personally: How willing are you to take risks in general? | Scale of 0 to 10<br>0 = Not willing to take risks at all<br>10 = Very willing to take risks |
| Stocks, equity funds, property funds (dummy) | Did you (i.e. your household) own any of the following types of assets in December 2019? | 0 = No<br>1 = Yes |
| Anchoring frame (Treatment 1) | | 0 = "Savings income"<br>1 = Total retirement income |
| Fluctuation frame (Treatment 2) | | 0 = Final Values<br>1 = Gains/losses explicitly |
| Withdrawal plan choice | | 1 = Withdrawal plan: Risk-free portfolio<br>2 = Withdrawal plan: 60% stocks/ 40% bonds<br>3 = Withdrawal plan: 100% stocks |
| Withdrawal plan choice dummy | | 0 = Risk-free portfolio withour stocks<br>1 = Risky portfolio (with stocks) |

**Appendix D: The simulation study**

In the experiment, participants' total retirement income consists of two parts. First, a regular pension income that provides the participants with a constant retirement income. We directly use the *estimated net retirement income* to approximate the regular income during retirement. Second, the "savings income" that provides participants with additional and potentially flexible retirement income.

This second part of the total retirement income is based on the variable *financial assets at retirement*. The individualized numbers on the "savings income" are based on a simulation study from Bucher-Koenen et al. (2019). In contrast to Bucher-Koenen et al. (2019), we are given the assets at the beginning of the pension (*financial assets at retirement*). Only the decumulation phase is simulated. We assume that the financial assets at retirement are decumulated over a time span on 20 years.

Using a Monte Carlo simulation, 10,000 hypothetical return profiles are generated based on historical returns for bonds and stocks. The underlying return time series for the equity portfolio is based on the MSCI World Index (from 1970 to 1988) and the MSCI All Country World Index (from 1988 to 2019). For the bond portfolio, Bucher-Koenen et al. (2019) use a REX index from Deutsche Börse, which tracks the yield curve of German government bonds with a remaining term of five years.

The future real risk-free interest rate is assumed to be 1% (p. 6).

The specific values of the "savings income" can be found in Table A1.

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IMPRINT