CFS Working Paper Series

No. 634

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When saving is not enough – The wealth decumulation decision in retirement*

Pascal Kieren† and Martin Weber‡

This draft: October 16, 2019

Abstract

In this study, we investigate the wealth decumulation decision from the perspective of a retiree who is averse to the prospect of fully annuitizing her accumulated savings. We field a large online survey of hypothetical product choices for phased drawdown offerings and annuities. While the demand for annuities remains low in our sample, we find significant demand for phased withdrawal products with equity-based asset allocations and flexible payout structures. Consistent with the product choice, the most important self-reported considerations for the wealth decumulation decision are low default risk in the products they purchase, the size of the withdrawal rates, and flexibility in the timing of their withdrawal. As determinants of the decision of how much wealth individuals are willing to draw down, we identify consumers' attitudes towards future economic conditions, the extent to which they are protected against longevity risk, and their desire to leave bequests. Policy implications are discussed.

Keywords: *Retirement planning, phased withdrawal accounts, annuity puzzle*

JEL Classification: *D14, G2, H55, J14, J26*

* For valuable comments, we thanks participants of the Experimental Finance 2019 conference, and seminar participants at the University of Mannheim. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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1 Introduction

When conducting a simple Google search on the term 'retirement planning' one finds an overwhelming share of articles which contain recommendations on saving decisions and on how to allocate savings to increase financial wellbeing in retirement. Given this prevailing focus on savings and investment decisions, one could forgive a typical retiree for believing that retirement planning is synonymous with wealth accumulation. Yet, while wealth accumulation is certainly a mandatory condition for successful retirement preparation, it is not a sufficient condition to achieve a targeted steady stream of income during retirement. However, determining how to draw down his wealth is not an easy task for a person contemplating retirement, as one cannot rely on experience.

Rational choice theory predicts that, in the absence of a bequest motive, households will fully convert their savings into a lifetime annuity (Yaari, 1965). Yet, despite the attractiveness of annuities as a way to protect against the risk of outliving one's retirement wealth, relatively few of those facing retirement actually annuitize a significant proportion of their wealth, a discrepancy coined the annuity puzzle.[1]

In this paper, we seek to investigate the wealth decumulation decision from the perspective of a retiree who is averse to the prospect of fully annuitizing his savings. That is, instead of focusing on factors that might explain the annuitization puzzle, we aim to investigate consumers' preferences for alternative wealth decumulation products, so-called phased withdrawals. In the light of recent findings, which question the benefit of full annuitization in the presence of stochastic health shocks (e.g. Reichling & Smetters, 2015; or Peijnenburg, Nijman, & Werker, 2017), such an analysis might not only provide valuable insights for the design of complementary products but also important policy implications.[2]

To study these issues, we field a large online survey in cooperation with a national German newspaper, *Frankfurter Allgemeine Zeitung* (FAZ), in which we elicit preferences for simple drawdown strategies. The strategies differ across two main dimensions, risky vs. risk-free asset allocation and constant vs. dynamic withdrawal rates. We examine 1) what hypothetical products individuals find most appealing, 2) what factors people say are most

[1] Over the past decades, economists have focused on explaining the annuity puzzle under consideration of both behavioral and rational factors. For a review, see Brown (2007) or Benartzi, Previtero, and Thaler (2011).

[2] We do not attempt to claim that phased withdrawals are superior to annuities, as they cannot eliminate longevity risk. Instead, we seek to obtain a more holistic understanding of the wealth decumulation decision by investigating preferences for phased withdrawals. In our view, phased withdrawals should be seen as a complement, rather than a substitute, for those individuals who want to retain control over their wealth and are averse to full-annuitization.

important in their wealth decumulation decision, 3) whether standard utility functions to study consumption decisions adequately capture observed preferences for phased-withdrawals, 4) how the demand for phased withdrawal products compares to the demand for annuities, and 5) how retirement preparation affects individuals willingness to decumulate wealth.

Using a survey to investigate our research question has both advantages and disadvantages. On the positive side, we can use hypothetic choice questions to measure preferences for specific (non-existing) products, which are unobservable in field data. Another advantage is the sample from which we can draw the survey data. While readers of the FAZ are not representative of the general population (they are on average more educated and have higher income), they are highly representative of those most affected by the decision of how much wealth to decumulate. On the negative side, the choices individuals make do not translate to their actual life outcomes. As a consequence, the results may not correspond to the choices people would make in a real-life situation. However, even though the resulting choice behavior might be noisy, it would be surprising if it leads to systematic patterns that are absent in actual behavior.

From our survey, five main findings emerge. First, we find that most participants prefer decumulation strategies with equity-based asset allocation and dynamic withdrawal rates, which adjust to economic conditions. Currently, most retirement products (e.g. lifelong annuities) primarily offer constant income streams, even though there is no economic ex ante reason to do so assuming that major expenses (e.g. going on vacation or health costs) do not occur on a regular basis. Moreover, roughly 81 % of our respondents select drawdown strategies with an equity-based asset allocation, while only 19 % prefer a risk-free allocation, indicating that most individuals recognize the benefit of equity investment with long planning horizons.

Second, the most important considerations for decumulation products that respondents report, is that the products should not default while still offering relatively high returns on the invested assets. These objectives are consistent with the decumulation strategies participants prefer. While a decumulation strategy with equity-based asset allocation and constant withdrawals would generate the same returns as a strategy with dynamic withdrawals, only 28 % of participants would choose such a strategy while 52 % would choose a similar strategy with dynamic withdrawals. Overall, the objectives highlight that while retirees are averse to some risks (i.e. defaulting), they are well willing to invest in the stock market to generate higher average returns.

Third, a time-separable power utility function with bequest motives as frequently employed in life cycle models predicts that a decumulation strategy with equity-based asset

allocation and dynamic withdrawal rates is the utility-maximizing choice for a large number of preference parameter combinations. As the predictions of the utility function are closely in line with participants' actual choice, our results provide further evidence for the suitability of such utility functions to study both consumption savings topics and wealth decumulation topics.

Fourth, we find that only 12 % of all respondents would choose an annuity product to decumulate their wealth while 88 % would rather select a phased withdrawal solution. This result – while surprising – is in line with subjects' preference to achieve higher returns on their accumulated savings while being flexible in the way they decumulate wealth. According to a survey conducted by Beshears et al. (2014), many subjects report that "flexibility in the timing of my spending" is an important factor in their annuitization decision. Yet, while phased withdrawals provide more flexibility in the timing of the spending, they cannot offer protection against longevity risk. In the light of current regulatory efforts, which discuss the benefits and drawbacks of forced annuitization of defined contribution payments, our results suggest that policymakers should consider offering combined solutions. Distributing wealth among annuities and phased withdrawals could help retirees who are averse to full annuitization to insure against longevity risk, while also preserving liquid wealth and making use of the equity premium.

Finally, we find two opposing effects of how retirement preparation affects individuals' willingness to decumulate wealth. First, individuals who successfully prepare for retirement by consulting financial planners or by sticking to saving plans do not show an increased propensity to draw down a greater fraction of their savings, even though they accumulated more wealth on average. Thus, while wealth accumulation is certainly an important ingredient for retirement preparation, it does not automatically guide individuals to also decumulate a greater amount. However, we do find an effect on individuals' attitude towards retirement. To capture the fact that individuals cannot rely on their experience in deciding how much wealth to decumulate, we investigate the impact of optimism, as research has shown that these are the decisions most likely to be influenced by emotional dispositions (Puri & Robinson, 2007). We find that while moderate optimism is positively related to the wealth participants' are willing to decumulate, extreme optimism leads to a strong negative effect. Consistent with the model of Brunnermeier and Parker (2005), it appears that moderately optimistic individuals are more inclined to take small risks to increase their wellbeing, while extreme optimists reduce their spending possibly to protect against longevity, thereby overestimating their income from non-annuitized wealth.

The remainder of the paper is organized as follows. In Section 2 we describe the design of our online survey and outline how we elicit preferences about the properties of retirement

products. We then present our key empirical results on respondents' product choice followed by a utility-analysis of income drawdown offerings and an analysis of the wealth decumulation decision. We conclude with a discussion of possible policy implications and future research questions.

2 Survey design and summary statistics

2.1 Survey design

To investigate the wealth decumulation decision and to derive predictions about the design of phased withdrawal strategies, we conduct an online survey in cooperation with the newspaper *Frankfurter Allgemeine Zeitung* (FAZ). The survey was promoted to cover retirement decisions and planning and was accessible through a link that was posted on their online portal on August 16, 2018. The survey and related material can be found in the Appendix.

Overall, 3598 participants with an age ranging from 18 to 93 completed the survey. Participants answered hypothetical questions about different retirement products, their willingness to decumulate wealth in retirement, and rate how the payout structure of a hypothetical income drawdown offering should look like. Moreover, they answered questions about demographics and household characteristics, risk preferences, financial literacy, and numeracy.

Preferences regarding the payout structure of phased withdrawal products were elicited in two different ways in a within-subject design, which will be described subsequently. In both elicitation strategies, *product-based* and *self-reported*, we ask respondents to rate the importance of four characteristics related to the shape of the stream of payouts. The first characteristic resembles participants' attitude about the size of the payouts. The second characteristic is what we refer to as the variance in the payout stream. Many currently offered retirement products (e.g. most annuities) feature constant payout streams, which allow consumers to plan ahead with a given budget. Yet, from an economic perspective, there is no ex ante reason to primarily offer constant payouts, as fluctuating payouts can dynamically adjust to economic conditions. That is, in states of high returns, consumers can either increase consumption or increase savings (e.g. by capping the maximal withdrawal amount) to shift more consumption to states with adverse market conditions to keep the marginal utility of consumption constant. The third characteristic we assess is the uncertainty in the payout stream. As phased withdrawals can invest in equities, they are necessarily subject to capital market

risks, which – depending on the payout policy – can lead to default risk. In our context, we use the term default risk to refer to the probability of depleting the capital stock before the end of the planning horizon. Finally, we also assess to what extent participants view wealth that is not consumed before they die as an inefficient way of allocating resources or as an opportunity to benefit future generations. In other words, the last characteristic resembles bequest motives.

Product-based elicitation

In the product-based elicitation, we seek to measure the importance of the payout characteristics by presenting participants with three different options to draw down their retirement savings. As the characteristics are not mutually exclusive, we construct strategies that differ across two dimensions, constant vs. dynamic withdrawal amounts and risky vs. risk-free asset allocation. We label the resulting drawdown strategies as (1) *constant consumption – risk-free*, (2) *constant consumption – risky*, and (3) *dynamic consumption – risky*.[3] In order to avoid too much complexity in the decumulation strategies and to ensure that the characteristics are still clearly differentiable for participants, we use simple heuristics to construct the strategies. The first strategy which features constant yearly withdrawals and risk-free asset allocation can be implemented by a simple reverse annuity calculation with a fixed horizon.[4] For the risk-free asset allocation, we use the historical inflation-adjusted average of 1-year German government bonds, which amounts to roughly 1.22 % for the past 30 years (German Federal Bank, 2018). As such, the yearly withdrawal amount is constant and only depends on participants' planning horizon and their accumulated wealth. The second strategy combines a constant yearly withdrawal amount with a risky investment strategy. A simple way to implement these features is to withdraw each year a fixed percentage of the original retirement wealth (adjusted for inflation) and to invest the remaining funds in a well-diversified portfolio.[5] To ensure comparability across different planning horizons, we selected the fixed percentage such that the default probability remains constant at 10 % (i.e. a higher withdrawal amount for shorter horizons). Due to the nature of constant withdrawals paired with stochastic investment returns, the strategy can neither guarantee that drawdowns continue until the end of the planning horizon (i.e. it can default), nor that all wealth will be used in the decumulation process. The third

[3] Note that while constructing strategies which differ across two dimensions (2x2) would result in four different strategies, we only use three of them as the combination fluctuating withdrawals and risk-free asset allocation would not make sense in a hypothetical choice scenario.

[4] The present value of an annuity that pays a yearly amount y conditional on an expected return r, a planning horizon of T years, and an initial portfolio value V is calculated using the following formula: $y = V \cdot \frac{(1+r)^T \cdot r}{(1+r)^T - 1}$.

[5] Besides its simplicity, a similar decumulation strategy was originally developed by Bengen (1994) and Cooley et al. (1998).

strategy features variable withdrawals paired with a risky investment strategy and can be implemented in a similar fashion as the first strategy using a reverse annuity calculation. In particular, once return expectations are stochastic (due to the risky investment strategy), the withdrawal amount for each year is no longer constant and instead a function of remaining years of the planning horizon and the expected rate of return. As such, this strategy cannot default in a strict sense (as the withdrawal amount adjusts for each year of the planning horizon) and presents a relatively high average consumption that comes at the cost of uncertainty about the actual withdrawal amount.

To allow participants to compare risk and benefit characteristics of each strategy conditional on survival, we conduct Monte Carlo simulations. To do so, we assume that a representative 65-year old retiree desires to decumulate his wealth over a period of a minimum of 20 years and a maximum of 30 years (i.e. to the age of 95). The risky investment strategy assumes that retirees hold their non-annuitized assets in a 60 % stock, 40 % bond portfolio, as typically offered by balanced funds (e.g. Gomes et al., 2008). The equity component in our study is represented by the MSCI World Index, while the bond component is represented by monthly U.S. treasury bills. The plan assets are rebalanced annually within a buy-and-hold approach and returns are adjusted for inflation. Portfolios are constructed for the period between February 1970 to February 2018. Return data for the MSCI component was obtained from Datastream, while the risk-free rate was downloaded from the union of the CRSP/Compustat database.

To simulate outcomes, we employ a bootstrapping algorithm, which randomly draws (with replacement) 360 return observations (twelve months over 30 years) from our portfolio data to generate one scenario with 30 years of data. This process is then repeated 10,000-times to obtain a sufficient number of scenarios.

[INSERT FIGURE 1 ABOUT HERE]

Figure 1 depicts the order in which questions on the phased withdrawal choice are presented. The exact wording of the strategies is reported in the Appendix. Before participants observe the withdrawal strategies, they answer general demographic questions including a forecast of their wealth level at retirement (assessed by five categories or an exact number) and the time over which they would want to decumulate their assets (choice between 20, 25, or 30 years). Afterward, participants can choose one of the three decumulation strategies, adjusted for personal wealth levels and planning horizon. Each withdrawal strategy is described by four

key financial variables (average consumption, default probability, consumption fluctuation, and consumption in the worst 5 % of the cases) and a brief overview of advantages and disadvantages. In a consecutive question, participants decide whether they prefer a decumulation strategy or a life-long annuity. The annuity is presented in a similar fashion compared to the withdrawal strategies. The annuity values are calculated assuming a real interest rate of 1.22 % (as for the risk-free decumulation strategy) and using the latest life tables for Germany. Moreover, due to adverse selection in the annuity market, we made a downward adjustment to the expected present discounted value of the fair annuity following Mitchell et al. (1999). This downward adjustment amounts to 15 % and 10 % of the fair value for male and female participants, respectively. Finally, after subjects decided which product best suits their preferences, they are asked to answer a question about how much of their overall wealth they would be willing to decumulate over the course of their retirement.

Self-reported elicitation

In the self-reported elicitation strategy, we directly ask subjects to assess the importance of the four payout characteristics on a seven-point Likert scale. The exact wording is reported in Table 1. Participants have to answer these questions after they choose their preferred decumulation strategy. This is to ensure that subjects have a more profound understanding of what the statements mean.

In addition, we also ask participants to provide an estimate of their life expectancy and health status (adopted from the Survey of Consumer Finances and Mirowsky, 1999), to indicate which tools they use to prepare for retirement and whether they have tried to figure out how much their household would need to save for retirement. Self-reported life expectancy and health status should be amongst the most important factors influencing the annuitization decision, while the latter factors are important determinants for successful retirement planning (Lusardi & Mitchell, 2011).

Controls

We elicit a financial literacy score based on participants' answers to six questions, of which three are pure knowledge questions and another three are related to financial numeracy. We select one of the basic questions from Lusardi and Mitchell (2007), two advanced questions from van Rooij et al. (2011), one question from Schreiber and Weber (2016), one question from Lusardi and Tufano (2009), and one question from Ensthaler et al. (2018). The exact wording of the questions can be found in the Appendix. Following the suggestion of Behrman et al.

(2012) and Fernandes et al. (2014), we also collect information on parents' and siblings' highest level of education and assess a scale of need for cognition (Epstein et al., 1996) as instruments for financial literacy not caused by financial behaviors.

To control for risk and loss aversion, we ask participants to rate their risk and loss attitude on a seven-point Likert scale. Earlier studies on risk-taking find that self-reported risk attitude is a good predictor of actual risk-taking (e.g. Nosic and Weber, 2010; van Rooij et al., 2011). Moreover, we also assess participants' trust in financial markets on a seven-point Likert scale as a proxy of participants' general willingness to invest in financial products.

2.2 Summary statistics

Table 1 presents summary statistics. The third withdrawal strategy which featured dynamic withdrawal amounts and a risky investment strategy was favored by more than half of the participants (53 %). Only a small fraction of participants preferred a life-long annuity over a phased withdrawal plan (12 %), in line with the literature on the annuitization puzzle. Participants are on average willing to decumulate roughly 65 % of their overall liquid wealth over the course of their retirement. Similar to the withdrawal plan choice, we observe that safety in the form of a low default risk paired with the desire for relatively high withdrawal rates are the most prominent decumulation features with 5.33 and 4.67 out of 7, respectively.

[INSERT TABLE 1 ABOUT HERE]

The average age in our sample is 52.12 years (median 54). While this is higher compared to similar surveys of our kind (e.g. Merkle et al., 2016; or Mueller & Weber, 2014), it is well suited to study questions on retirement. Men are overrepresented in our study (85 %), which reflects the fact that the majority of FAZ readers are male. Participants report a relatively high after-tax income of about 5440 € (compared to the German average of about 3300 € as reported by the German Federal Statistical Office), Social Security benefits of roughly 3556 € (retired participants only), and accumulated wealth of roughly 455,357 €. They are well educated with about 78 % having obtained a university degree. Roughly 63 % are married, and participants have on average 1.15 children. Average life expectancy amounts to 86.49 years and 85.70 years for female and male participants, respectively. While these estimates are slightly higher than the average life expectancy implied life tables for the respective cohort, they might reflect the fact that we have an on average wealthier and more educated sample.

Participants correctly answer on average 1.77 of the knowledge questions and roughly 1.67 of the numeracy questions out of 3. Given the level of complexity of the questions, participants do quite good. Need for cognition score is on average 26.22 out of 35. Asking participants for their risk and loss aversion leads to an average of 3.77 and 4.16, respectively.

Overall, one should emphasize that our sample is most likely not representative of the general German population. However, it is highly representative to study wealth decumulation preferences for individuals who have the choice to decumulate a significant proportion of their accumulated savings.

3 Results

3.1 Preferences on the product structure of phased withdrawals

In analyzing the design of potential income drawdown offerings, we proceed in two steps. First, we investigate which products participants find most appealing and the factors people say are most important in their product choice. Additionally, we present findings on the demographic correlates of the product choice. In a second step, we derive normative predictions regarding which of the presented withdrawal strategies are utility-maximizing under a standard time-separable power utility function frequently used to study consumption-saving decisions. We then compare predictions with participants' actual choices to assess whether preferences are adequately captured by such a function.

3.1.1 Product choice and important factors

Figure 2 displays both the withdrawal strategies that participants prefer and the characteristics they deem important on an aggregate level (Panel A) and across age (Panel B).

[INSERT FIGURE 2 ABOUT HERE]

From Figure 2, it becomes evident that the majority of participants prefer a withdrawal strategy with risky asset allocation and dynamic withdrawal rates. Given that the current standard in most retirement products (e.g. most annuities) is still constant payoff streams, this finding is – while surprising – also reassuring. Effectively, it indicates that many investors seem to value the flexibility that phased withdrawal products are able to offer, which is absent in most standard annuity products. Regarding the strategies with constant withdrawals, we observe

two opposing effects across different age groups. While the strategy with risk-free asset allocation is mostly preferred by participants who are close to retirement, it is hardly chosen by younger participants. Conversely, the strategy with constant withdrawals and risky asset allocation is popular among younger participants while it loses in popularity among those close to retirement. Regarding the assessed withdrawal characteristics, we find that safety in the form of decumulation strategies, which cannot default, gradually becomes the most desired characteristic as individuals approach retirement followed by the desire for a high average consumption. However, quite the reverse appears to hold for bequest motives. While younger participants list bequest motives among the most important characteristics, they are hardly relevant for those close to retirement and become more important again as participants approach later stages of their retirement. Finally, a constant consumption stream in retirement is deemed rather unimportant by most participants, which is not only consistent with the dynamic withdrawal strategies participants choose but also further evidence for the demand for flexible decumulation options.

Besides the descriptive analysis, we also examine how cognitive abilities and demographic characteristics relate to the plan choice using multinomial logistic regressions. The dependent variable is *strategy* that takes on three values, which capture participants' preferred withdrawal strategy. The independent variables are knowledge, numeracy, the log of wealth and various demographics. Results are reported in Table 2.

[INSERT TABLE 2 ABOUT HERE]

We can draw several conclusions from Table 2. First, it appears that the more financially savvy individuals are, the more likely they are to select an equity-based withdrawal strategy (i.e. strategy 2 or 3). Relatedly, the more trust individuals have in financial markets and the more educated they are (i.e. having at least a university degree), the more likely they are to select either the second or the third strategy. Yet, we also observe differences within the strategies, which invest in equities. That is, more statistically numerate individuals show a higher propensity to choose withdrawal strategies with dynamic withdrawal rates, both relative to the risk-free alternative and relative to the risky strategy with constant withdrawal rates. Taken together, these results imply that while financial education is positively related to a return-oriented investment behavior in retirement, it cannot predict whether investors prefer dynamic or constant payoff streams. Those individuals, however, who show – ceteris paribus – also a deeper understanding of financial mathematics and compound interest, are significantly

more likely to choose dynamic payoff streams. Regarding the impact of demographics and household characteristics, we find a positive relationship between participants' accumulated wealth and their willingness to invest in equity products, with no significant difference between dynamic and constant withdrawal rates. These results are in line with previous studies, as wealthier individuals usually have a higher exposure to financial markets, which makes them on average more comfortable in assessing the properties and benefits of equity investments with long planning horizons.

3.1.2 Normative predictions on the design of decumulation strategies

To derive normative predictions, we start by assuming that an exemplary agent enters retirement at the age 65[6] ($t = 1$) with an accumulated initial wealth $W_0 > 0$. To decumulate his wealth, the retiree has access to the three different withdrawal strategies described previously, which ultimately define the amount C_t he is able to consume at the beginning of each period. Moreover, we assume that the retiree survives every year with a positive probability $p_{t,g} > 0$ ($g \in \{male, female\}$) until the last year of the planning horizon is reached. If the retiree either dies before the final period or does not consume all of his wealth before the plan ends, we assume that the remaining wealth will be transferred to an heir, yielding a (dis-)utility in the form of a bequest B. Note that this analysis only captures a fixed period of years and neglects the period after the planning horizon. While simplifying, the assumption is not unjustified as non-insurance products cannot offer longevity protection. As such, retirees face both capital markets risk and longevity risk.

We assume that retirees' preferences are described by a time-separable power utility function proposed by Cocco, Gomes, and Maenhout (2005):

$$U_0(C,B) = \sum_{t=1}^{T} \delta^{t-1} \left(\prod_{j=0}^{t-2} p_j \right) \left\{ p_{t-1} \frac{C_t^{1-\gamma}}{1-\gamma} + b(1-p_{t-1}) \frac{B_t^{1-\gamma}}{1-\gamma} \right\}$$

where $\delta < 1$ is the discount factor and $\gamma > 0$ is the coefficient of relative risk aversion. The parameter b controls the intensity of the bequest motive. While positive values of b translate to retirees' desire to benefit future generations, negative values of b correspond to a view that bequests are an inefficient resource allocation. For simplicity, we assume that the

[6] The average retirement age in Germany is around 65. However, our results do not depend on this assumption.

utility function applied to the bequest is identical to the utility function of the retiree's own consumption.

We begin our analysis by restricting our attention to preference parameter tuples (γ, b) for which $\gamma \in [1, 10]$, and $b \in [-0.5,2]$. We focus on values of γ that are below 10, as this is the upper bound for risk aversion considered reasonable by Mehra and Prescott (1985), and restrict the intensity of the bequest motive to not exceed the benefit of own consumption by a factor of two. We then discretize each of the two intervals (γ, b) into a set of 40 and 25 equally spaced points and study parameter tuples where each parameter takes a value that corresponds to one of the discrete points. As we repeat the analysis for four different planning horizons $T \in \{20,25,30,35\}$, we study $40 \cdot 25 \cdot 4 = 4{,}000$ different scenarios for each simulated consumption path.

[INSERT FIGURE 3 ABOUT HERE]

Figure 3 presents our first result from which we can draw several predictions for the later analysis. First, we see that the withdrawal strategy with risky asset allocation and dynamic consumption is the utility-maximizing choice for the majority of more realistic preference parameter combinations. Considering all combinations, this strategy is optimal in 2,533 out of the 4,000 parameter tuples. In particular, for medium positive values of the intensity of the bequest motive ($0 \leq b \leq 0.5$), we find the third strategy is the utility-maximizing choice for all levels of relative risk aversion. Yet, as risk aversion increases, the floor between the third and the other two strategies is decreasing. This finding is not surprising. As relative risk aversion increases, the benefit of an additional unit of consumption is strictly decreasing. As such, the high average consumption of the third strategy becomes relatively less important.

Observation 1: A withdrawal strategy with risky asset allocation and fluctuating consumption is the utility-maximizing choice for most realistic parameter tuples. Its optimality is decreasing in the parameter of relative risk aversion and decreasing the further the intensity of the bequest motive is away from zero.

Second, we find that a withdrawal strategy with risk-free asset allocation and constant withdrawals is never optimal as long as $b \geq 0$. As risk aversion increases and the bequest intensity decreases, this strategy becomes gradually the optimal choice until it is optimal for any $b < 0$. In other words, as long as a retired investor with preferences as described here is at least indifferent to the prospect of leaving a bequest, he would never choose to decumulate his

wealth using a completely risk-free asset allocation. For those investors, however, who are both highly risk-averse (and as such do not value high consumption) and who view bequests as an "inefficient" way of allocating their retirement resources, such an allocation would be the utility-maximizing choice.

Observation 2: A withdrawal strategy with risk-free asset allocation is never the optimal choice unless investors are both highly risk-averse and averse to the prospect of leaving bequests.

The remaining withdrawal strategy features a risky asset allocation paired with constant withdrawal amounts. In contrast to the risk-free strategy, we observe that as the intensity of the bequest motive increases, this strategy becomes the utility-maximizing choice for both low and high parameters of relative risk aversion. For medium values of relative risk aversion however, the strategy with dynamic withdrawal amounts remains the utility-maximizing choice. The intuition for this finding is as follows. Both strategies follow the same asset allocation, and as such, generate the same returns over the respective time horizon. As the consumption of the constant withdrawal strategy is on average lower compared to the consumption of the dynamic strategy, more overall wealth is generated. As bequests rise in importance, so does overall wealth, which explains the positive relation with the intensity of the bequest motive. The relation with the parameter of relative risk aversion is a little more subtle. For low levels of risk aversion, more consumption (or wealth) is always better due to the low concavity of the utility function. As average wealth is much higher than average consumption, the lower consumption of Strategy 2 is outweighed by the high average bequeathable wealth and as such, Strategy 2 is the optimal choice. For intermediate values of risk aversion however, the more balanced relation between consumption and wealth of Strategy 3 eventually becomes superior. Yet, for high levels of risk aversion, this relation shifts once again. Now, the utility function has a fairly high concavity and as such, even great differences in consumption and wealth translate to only marginal increases in utility. At this point, the difference in consumption between both strategies is no longer enough to offset the difference in wealth at later stages of the planning horizon. In particular, while the wealth profile of Strategy 3 is decreasing, it is increasing for Strategy 2. As a consequence, Strategy 2 becomes optimal once again, given a relatively high intensity of the bequest motive.

Observation 3: A withdrawal strategy with risky asset allocation and constant withdrawals is the utility-maximizing choice for investors with strong bequest motives who show either a relatively low level of risk aversion or a relatively high level of risk aversion.

Finally, we can also compare the utility of the withdrawal strategies across different time horizons. Most notably, we find that while Strategy (3) becomes the utility-maximizing choice for an even greater range of preference parameters, Strategy (2) vanishes nearly entirely for very long planning horizons (T = 35). Only for very low values of relative risk aversion and a high intensity of bequests, Strategy (2) is still utility-maximizing. This is partially related to how the second strategy was constructed for different time horizons. To make the strategy comparable, we adjusted the withdrawal amounts under the constraint that the probability of default remains constant across all horizons. As such, average yearly consumption declines for longer planning horizons while average wealth levels increase. For higher parameters of risk aversion, the increase in wealth is, however, not enough to outweigh the drop in consumption compared to other strategies.

Observation 4: Withdrawal strategies whose withdrawal rates adjust to market conditions are increasingly optimal the longer individuals' planning horizons are compared to strategies who do not adjust withdrawals.

3.1.3 Predicted and actual choice

To test how well a time-separable power-utility function with bequest motives describes participants' actual choice behavior, we construct three dummy variables that indicate which of the three withdrawal strategies a participant prefers, which will be the dependent variables for our analyses. To match participants' choices with actual predictions, we discretize their self-reported risk-aversion (1 – 7) and their self-reported bequest motive (1 – 7) into seven equally spaced points to fit the described intervals used for the utility simulations, i.e. $\gamma \in [1,10]$ and $b \in [-0.5,2]$. Since self-reported risk-aversion and bequest intentions are only noisy measures of the true parameter values, we also consider alternative limits for both intervals. To assign each participant a "best-choice"-prediction, we match the simulated utility-maximizing choices with our survey data based on the two described intervals and based on participants' chosen planning horizon. As a result, each participant is matched with a unique utility-maximizing choice that corresponds to her parameter triple (γ, b, T), which will serve as the main independent variable. Table 3 reports the marginal effects of five sets of probit regressions with participants' chosen decumulation strategy as dependent variable. Each specification represents a different interval over which parameters were linearized while the last specification represents a placebo-test, where participants were matched with random recommendations.

[INSERT TABLE 3 ABOUT HERE]

Across all specifications, we reliably find that a time-separable power utility function with bequest motives successfully predicts preferences for the first and the third withdrawal strategy. For the risk-free strategy (Strategy 1), we find that when the utility functions predict the first strategy to be the optimal choice for a given participant, participants are on average between 11 % and 19 % more likely to also select this strategy. Similarly, for the strategy with dynamic withdrawal rates (Strategy 3), we find that participants are on average between 10 % and 15 % more likely to also select the strategy if the utility function would predict it to be the optimal choice. Yet, despite these consistent results, the employed utility function appears to struggle in predicting preferences for the strategy with constant withdrawal rates (Strategy 2), as reported in Column (2). While the coefficients are not only economically small, they are also not statistically different from zero. One potential driver for this inconsistency is the implied relation with risk aversion. While our model predicts a positive relation of risk aversion for planning horizons until T = 30, our results suggest the reverse. As such, it appears that the more risk-averse participants are, the less likely they are to select a decumulation strategy with risky asset allocation and constant withdrawals. This is not entirely unexpected. Due to the nature of how the second strategy is constructed (constant withdrawals paired with stochastic returns), it cannot guarantee that wealth levels are always sufficient to sustain the withdrawal rate. While this strategy only defaults in about 1.2 % of the time five years before the planning horizon, this risk increases to roughly 10 % until the final year. Considering that most participants are highly averse to the prospect of defaulting before the planning horizon (most important self-reported characteristic across all age groups), this fear appears to be reflected in participants' self-reported risk aversion.

3.2 The wealth decumulation decision

Next, we analyze which factors affect individuals' preference of how much of their retirement wealth they would be willing to decumulate. In analyzing this decision, we differentiate two sets of variables related to participants' retirement preparedness. In assessing retirement preparedness, we distinguish factors which are related so successful wealth accumulation (i.e. their "financial" preparedness) and factors which capture participants' attitude towards retirement (i.e. their "emotional" preparedness).

3.2.1 Financial preparedness and the wealth decumulation decision

To identify factors related to successful wealth accumulation, we follow Lusardi and Mitchell (2007, 2011). The authors find that both financial literacy and planning are strong predictors for financial wellbeing in retirement. In particular, it appears that those individuals who successfully develop and stick to a saving plan not only accumulate more wealth but also make better investment decisions. Additionally, the authors find that these individuals are also more likely to follow sound financial advice and less likely to follow investment recommendations from friends and family members. As such, we include a dummy variable that equals 1 if participants report sticking to a saving plan for their retirement, a measure of financial literacy, and dummy variables that indicate the source of financial advice participants use for their retirement planning.[7] Results of 4 OLS regressions with dissave as dependent variable are reported in Table 4.

[INSERT TABLE 4 ABOUT HERE]

Based on the results of Table 4, we can draw several conclusions. First, those participants who report sticking to a saving plan to save for retirement show a weak tendency to decumulate a greater fraction of their accumulated savings, even after control for actual wealth. However, the effect is both economically small and statistically only marginally significant. Looking at other indicators of successful wealth accumulation, this relation even appears to vanish entirely. While financial literacy is a highly significant and positive predictor of wealth accumulation (both in our sample and in previous studies; see for example Behrman et al., 2012), it does not appear to be related to wealth decumulation. Similar results can be found by looking at the source of financial advice participants take. While we observe a weak negative effect for those people who take advice from their family and a weak positive effect for those who use spreadsheets and similar planning tools, none of the effects is statistically significant at the 10 %-level. One potential reason for this seemingly non-existent relationship might be that wealth decumulation – in contrast to saving and investment decisions – is still a relatively new and unexplored topic for the broad population and even for most financial institutions besides insurance companies. As such, there is relatively little guidance for consumers about how (if at all) wealth should be decumulated.

[7] To ensure the suitability of our proxies for successful wealth accumulation, we test the implications of Lusardi and Mitchell (2007, 2011) in the Appendix. Consistent with their study, our results leave no doubt that financial literacy and the ability to develop and stick to a saving plan are important determinants for effective retirement preparation.

3.2.1 Emotional preparedness and the wealth decumulation decision

To capture participants' attitudes towards retirement (i.e. their "emotional" preparedness), we include both a measure of optimism and the planning horizon over which they would want to decumulate their wealth. With our measure of optimism, we seek to capture the fact that consumers cannot rely on their experience when evaluating how much of their wealth they would be willing to decumulate. According to Puri and Robinson (2007) these are the decisions which are most affected by attitudes and emotional dispositions as there is no available data on which to base an opinion. Following Puri and Robinson (2007), optimism was measured as the difference between participants' self-reported life expectancy and that implied by statistical tables, adjusted for gender. To differentiate moderate optimism from extreme optimism, we take the right-most 5 % of optimists to be extreme optimists.[8] Including participants' planning horizon allows us to control for participants' outlook on their retirement, which is not caused by optimism (i.e. information about their health status, general longevity in their family, or aversion to the prospect of outliving their retirement resources). Yet, longer planning horizons are likely to have diverse implications for individuals who prefer phased withdrawals over annuities or vice versa. For individuals who prefer phased withdrawals, longer planning horizons should be associated with a decreased willingness to decumulate greater amounts, as there is no protection against longevity risk. Conversely, for those preferring annuities, one should expect that longer planning horizons increase the willingness to decumulate greater amounts, as predicted by Yaari (1965) or Davidoff et al. (2005). Following this approach, we include both our regular measure of optimism, a dummy variable for extreme optimists, participants' planning horizon, a dummy for preferring annuities over phased withdrawals and an interaction between the last two. Results are reported in Table 5.

[INSERT TABLE 5 ABOUT HERE]

We find that the tendency to plan for a longer retirement is negatively related to the wealth decumulation decision for participants preferring phased withdrawals while having a positive impact for those preferring annuities. This result is consistent with normative predictions. In the absence of a significant proportion of annuitized wealth, households must decide which fraction of their savings they decumulate and how much they keep as precautionary savings. The longer they expect to live (or the more averse they are to the prospect

[8] In our study, extreme optimists overestimate their life expectancy by roughly 20 to 30 years, similar to the 20 years reported by Puri and Robinson (2007).

of outliving their resources) the more precautionary savings they should build. Conversely, participants interested in annuities have no incentive to keep large precautionary savings in response to longer planning horizons. In particular, the longer one expects to live, the higher are the benefits from livelong pension payments and the more beneficial it becomes to drawdown a greater fraction of one's savings (while keeping smaller precautionary savings as protection against adverse health shocks).

Regarding the impact of optimism, we find that moderate optimism is positively related to the wealth decumulation decision. This finding is in line with the view that optimism is generally correlated with positive beliefs about future economic conditions, as postulated by Puri and Robinson (2007). As such, more optimistic individuals appear to be attracted by the prospect of a higher consumption during retirement without worrying too much about the state of their precautionary savings. Given the magnitude of the coefficient, moderate optimism might well enhance general wellbeing among retirees. In our sample, more optimistic individuals are willing to decumulate roughly 4 % more of their savings compared to rather pessimistic individuals (as defined by being one standard deviation away from the mean). While this difference is hardly decisive for living retirement in luxury or in poverty, it might benefit those retirees who systematically overestimate their life expectancy (Heimer, Myrseth, & Schoenle, 2019). Yet, similar to earlier findings on optimism, we also report strikingly different results for individuals who are overly optimistic. In particular, instead of moderately increasing their consumption, extreme optimists decumulate between 2 % and 5 % less than the average participant. The implications of this finding might hint at an inherent misunderstanding of how to protect against longevity risk. Given that extremely optimistic individuals overestimate their life expectancy by roughly 20 to 30 years, a 2 % to 5 % increase in precautionary savings is barely relevant to sustain the financial needs of a retiree until the age of 105. Instead, those individuals would benefit most by annuitizing an even greater fraction of their accumulated savings.

Taken together, our results on optimism are largely consistent with findings from Brunnermeier and Parker (2005). In their model, forward-looking agents who believe that better outcomes are more likely, are more inclined to take ex post optimal actions that others might find too costly ex ante. Overly optimistic agents, however, neglect the benefit of those actions and instead perceive future income as too certain. Similarly, our findings imply that moderately optimistic individuals decumulate a greater fraction of their wealth to either increase their wellbeing over a shorter horizon (through phased withdrawals or immediate consumption) or over a longer horizon (through annuities). Extreme optimists – however – decumulate a smaller

fraction of their wealth possibly to protect against longevity risk and as such neglect the uncertainty in their life expectancy and overestimate their income from non-annuitized wealth.

4 Conclusion

The goal of this study has been to obtain a more holistic understanding of the wealth decumulation decision from the perspective of an individual who is averse to fully annuitizing her accumulated savings in retirement. Such an individual faces the following decision problem. Out of her non-annuitized wealth, she must decide how much to allocate to a savings account (i.e. as a protection against unexpected costs) and how much (if anything) to decumulate over the course of her retirement. As an alternative way to decumulate savings, we investigate preferences for phased withdrawal products by fielding a large online survey.

Our results have several implications for the design and the demand for complementary products. In our sample, annuity demand is still relatively low, as only 12 % of respondents would prefer a lifelong annuity to decumulate savings, while 88 % would prefer some form of phased withdrawal. Offering a wider array of phased withdrawal solutions would help retirees to decumulate more of their savings, without being forced to fully convert their wealth. As flexibility in the timing of spending is among the most important factors of the annuitization decision (Beshears et al, 2014), offering combined solutions of phased withdrawals and partial annuitization could help to increase overall retirement welfare while protecting retirees against longevity risk. Yet, finding the optimal mix of phased withdrawals and annuitization remains a significant challenge.

Regarding the concrete design of phased withdrawal products, our results suggest that even in retirement most people are willing to invest in equities to sustain higher withdrawal rates. Additionally, the majority of respondents would choose a product with dynamic withdrawal rates. Given the current standard of constant payout policies (e.g. as offered by most annuity contracts), our findings highlight once more the importance and the demand for more flexible retirement solutions. Whereas similar proposals exist in the variable annuity market (e.g. penalty-free early withdrawals, or flexible payout streams), annuities face much higher hurdles to implement such suggestions due to adverse selection, which eventually increases product complexity for consumers.

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Figure 1

Figure 1 displays the order in which the questions regarding demographics, the withdrawal plan choice, and the annuity choice were presented. Both decumulation strategies and annuities were adjusted for previously reported demographics, including gender, wealth, and planning horizon.

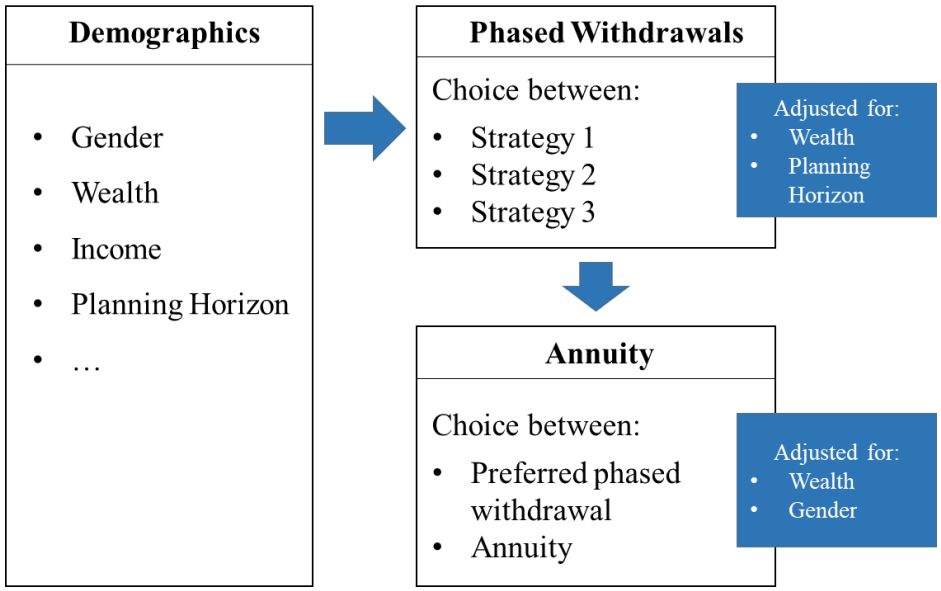

Figure 2

This figure displays participants' preferred withdrawal strategies and their rating of various decumulation attributes. Panel A displays the strategies and attributes for the whole sample, while Panel B displays the predictive margins with 95% confidence intervals from logit regressions on the plan choice or the respective characteristic for age.

Panel A:

Panel B:

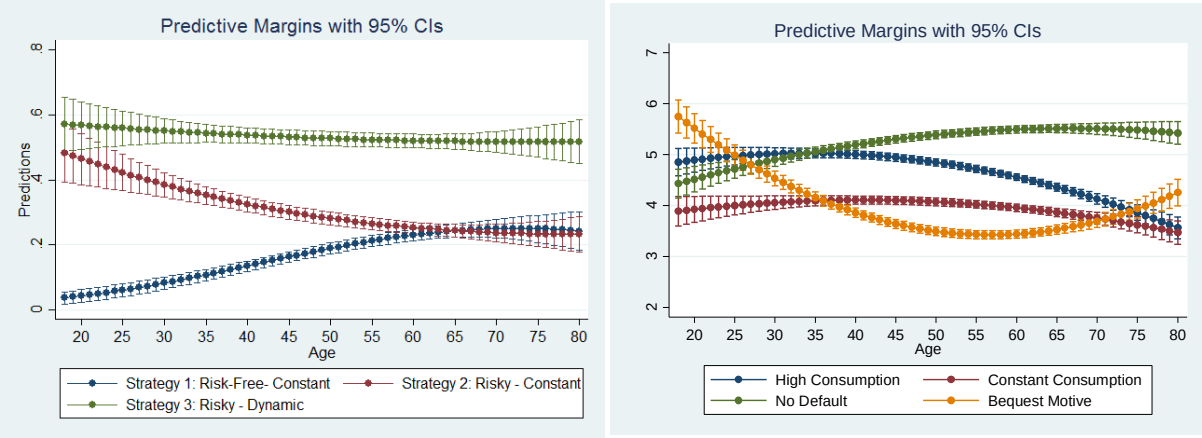

Figure 3

These figures display the utility-maximizing withdrawal plan for the given preference parameter tuple, as indicated by the colored dots. The y-axis captures the intensity of the bequest motive for parameter values $b \in [-0.5,2]$. The x-axis depicts the parameter of relative risk aversion for values $\gamma \in [1,10]$. Each figure displays one planning horizon for $T = \{20,25,30,35\}$.

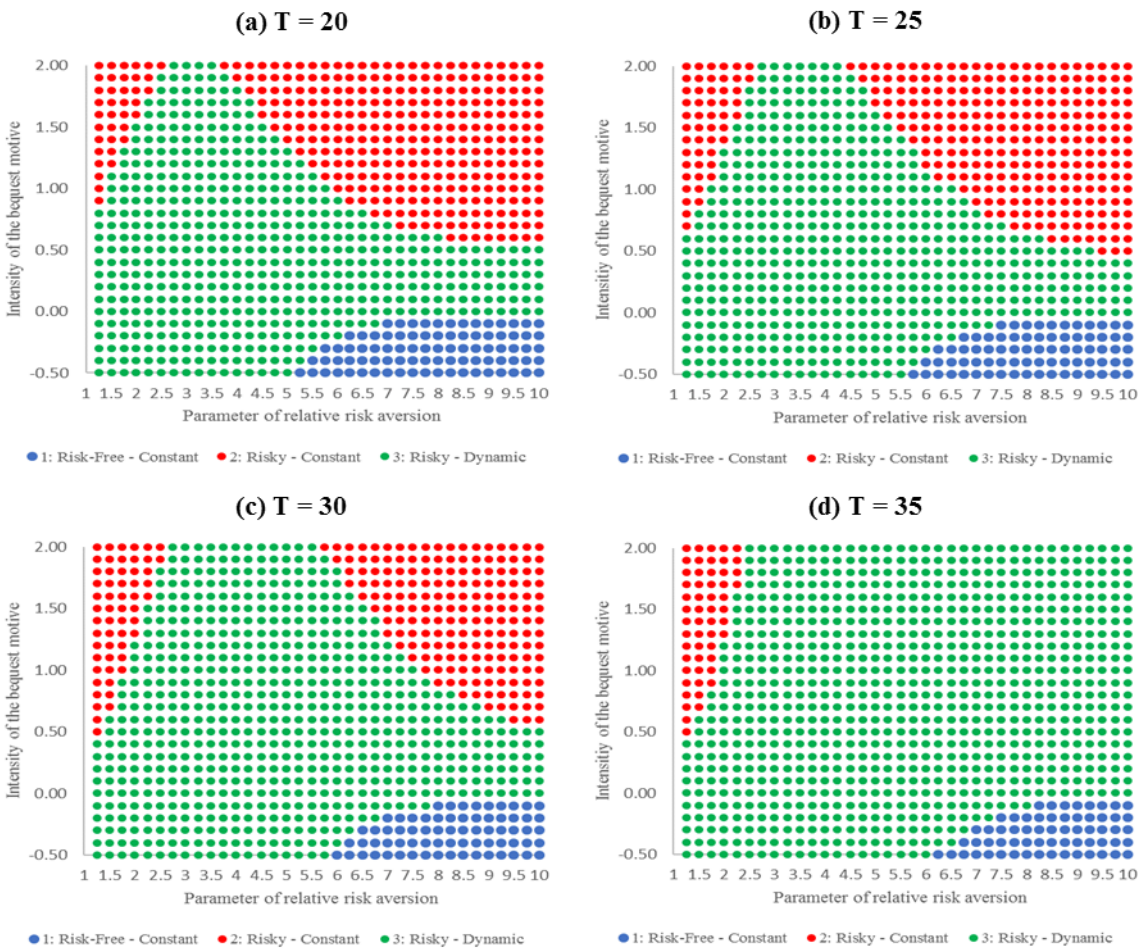

Table 1

This table presents summary statistics of our survey. Included are all 3598 participants. Statistics are split across four categories: demographics, choices related to the wealth decumulation decision through products and self-reported, and controls.

Variable	Mean	Median	Std. dev.
Demographics			
Age	52.12	54	13.6
Female (0/1)	0.15		0.36
Income (after taxes)	5441	6000	2011
Social Security (only retired participants)	3556	4500	1580
Liquid Wealth	455,357	375,000	924,041
Number of children	1.15	1	1.21
University degree (0/1)	0.78		0.41
Married (0/1)	0.63		0.48
Withdrawal Strategies			
Planning horizon	24.86	25	3.98
Strategy 1 (0/1)	0.19		0.39
Strategy 2 (0/1)	0.29		0.45
Strategy 3 (0/1)	0.53		0.5
Annuity (0/1)	0.12		0.32
Dissave	0.65		0.26
Self-reported			
“How important are high withdrawal rates for you?” (1-7)	4.67		1.63
“How important are constant withdrawal amounts for you?” (1-7)	3.98		1.74
“How important are withdrawals which cannot default for you?” (1-7)	5.33		1.69
“How important are bequests for you?” (1-7)	3.75		2.06
Health (1-5)	4.17		0.7
Life expectancy	85.82	85	6.73
Saving plan (0/1)	0.62		0.49
Controls			
Knowledge score (0-3)	1.77	2	0.73
Numeracy score (0-3)	1.67	2	0.66
Need for cognition	26.22	27	4.77
Risk aversion (1-7)	3.77		1.54
Loss aversion (1-7)	4.16		1.63

Table 2

This table reports results of three multinominal logit regressions with varying baseline values. Dependent variable is *Strategy*, a categorial variable, which denotes participants' preferred withdrawal strategy (1 – 3). Main independent variables are cognitive abilities, trust in financial markets (self-reported; 1 – 7), the log of wealth, and demographics. Age is captured by clustering participants in four age groups, with the medium category (between 36 and 49) as baseline. Reported are coefficients and robust standard errors. ***, **, and * indicate significance at the 1%, 5% and 10%-level, respectively.

	(1)		(2)		(3)	
	Baseline: Strategy 1		**Baseline: Strategy 2**		**Baseline: Strategy 3**	
Strategy 1						
Knowledge			-0.211***	-0.0776	-0.266***	-0.0698
Numeracy			-0.0219	-0.083	-0.256***	-0.0751
Trust			-0.381***	-0.0379	-0.382***	-0.0347
Log(wealth)			-0.360***	-0.071	-0.273***	-0.06
18<Age<35			-0.992***	-0.21	-0.624***	-0.2
50<Age<65	-		0.328**	-0.14	0.271**	-0.127
Age>65			0.443**	-0.177	0.298*	-0.158
Female			0.277*	-0.151	0.0469	-0.131
Married			0.115	-0.121	0.108	-0.11
University			-0.338***	-0.123	-0.352***	-0.109
Kids			-0.235***	-0.0473	-0.106**	-0.0447
Strategy 2						
Knowledge	0.211***	-0.0776			-0.0542	-0.0572
Numeracy	0.0219	-0.083			-0.234***	-0.0639
Trust	0.381***	-0.0379			-0.000879	-0.0269
Log(wealth)	0.360***	-0.071			0.0866	-0.054
18<Age<35	0.992***	-0.21			0.368***	-0.126
50<Age<65	-0.328**	-0.14	-		-0.0561	-0.102
Age>65	-0.443**	-0.177			-0.145	-0.136
Female	-0.277*	-0.151			-0.230*	-0.122
Married	-0.115	-0.121			-0.00701	-0.0901
University	0.338***	-0.123			-0.014	-0.0998
Kids	0.235***	-0.0473			0.129***	-0.0356
Strategy 3						
Knowledge	0.266***	-0.0698	0.0542	-0.0572		
Numeracy	0.256***	-0.0751	0.234***	-0.0639		
Trust	0.382***	-0.0347	0.000879	-0.0269		
Log(wealth)	0.273***	-0.06	-0.0866	-0.054		
18<Age<35	0.624***	-0.2	-0.368***	-0.126		
50<Age<65	-0.271**	-0.127	0.0561	-0.102	-	
Age>65	-0.298*	-0.158	0.145	-0.136		
Female	-0.0469	-0.131	0.230*	-0.122		
Married	-0.108	-0.11	0.00701	-0.0901		
University	0.352***	-0.109	0.014	-0.0998		
Kids	0.106**	-0.0447	-0.129***	-0.0356		
N	3573		3573		3573	
R^2	0.062		0.062		0.062	

Table 3

This table reports the marginal effects of probit regressions. Dependent variables are indicator variables of participants' chosen withdrawal strategies. The main independent variables are indicator variables that denote whether our utility specification would recommend a participant to choose a specific strategy, based on self-reported risk-aversion, bequest intensity and planning horizon. Self-reported risk-aversion and bequest are linearized into a set of seven equally spaced points on the intervals denoted in the four specifications. Our full set of controls is included in every regression. Reported are coefficients and t-statistics. ***, **, and * indicate significance at the 1%, 5% and 10%-level, respectively.

	(1)	**(2)**	**(3)**
	Strategy 1	**Strategy 2**	**Strategy 3**
	Specification 1: $b \in [-0.5,2]$ & $\gamma \in [1,10]$		
CRRA Strategy 1	0.1181***		
	(6.38)		
CRRA Strategy 2		0.0175	
		(1.02)	
CRRA Strategy 3			0.1081***
			(6.36)
	Specification 2: $b \in [-0.5,1]$ & $\gamma \in [1,7]$		
CRRA Strategy 1	0.1958***		
	(9.75)		
CRRA Strategy 2		0.0968**	
		(2.22)	
CRRA Strategy 3			0.1478***
			(5.32)
	Specification 3: $b \in [-0.5,2]$ & $\gamma \in [1,7]$		
CRRA Strategy 1	0.1933***		
	(8.18)		
CRRA Strategy 2		0.0308	
		(1.60)	
CRRA Strategy 3			0-1276***
			(6.61)
	Specification 4: $b \in [-0.5,1]$ & $\gamma \in [1,10]$		
CRRA Strategy 1	0.1137***		
	(7.32)		
CRRA Strategy 2		0.038	
		(1.52)	
CRRA Strategy 3			0.0953***
			(5.02)
	Specification 5: Placebo-test with random allocation		
CRRA Strategy 1	0.0077		
	(0.57)		
CRRA Strategy 2		0.0188	
		(1.18)	
CRRA Strategy 3			-0.0175
			(-1.00)
N	3.553	3.553	3.553

Table 4

This table reports results of four OLS regressions. Dependent variable is *Dissave*, which can take values between 0% and 100%. Main independent variables are *Saving Plan* (1 = participant follows a saving plan for retirement), *Financial Literacy*, and five dummy variables that indicate whether a participant follows financial advice of family members, work colleagues, planning tools, the media, or from financial planners. Reported are coefficients and t-statistics (in parentheses). All standard errors are robust. ***, **, and * indicate significance at the 1%, 5% and 10%-level, respectively. We control for socio-demographic variables and household composition whenever indicated.

	(1)	(2)	(3)	(4)
	Dissave	Dissave	Dissave	Dissave
Saving Plan	1.811**			1.572*
	-1.96			-1.66
Financial Literacy		0.286		0.0932
		-0.67		-0.21
Advice_Family			-1.063	-0.908
			(-1.08)	(-0.91)
Advice_Work			-0.246	-0.218
			(-0.17)	(-0.15)
Advice_Tool			0.81	0.48
			-0.89	-0.52
Advice_Media			0.752	0.612
			-0.72	-0.58
Advice_Advisor			-0.703	-0.781
			(-0.73)	(-0.80)
Controls?	Yes	Yes	Yes	Yes
N	3.508	3.508	3.508	3.508
R^2	0.063	0.063	0.064	0.064

Table 5

This table reports results of four OLS regressions. Dependent variable is *Dissave*, a categorial variable, which can take values between 0% and 100%. Main independent variables are optimism and extreme_optimism, which were constructed following Puri and Robinson (2006). Reported are coefficients and t-statistics (in parentheses). All standard errors are robust. ***, **, and * indicate significance at the 1%, 5% and 10%-level, respectively. We control for socio-demographic variables and household composition whenever indicated.

	(1)	(2)	(3)	(4)
	Dissave	Dissave	Dissave	Dissave
Optimism	0.284***	0.168**	0.281***	0.274***
	-3.2	-2.09	-3.17	-3.08
Extreme Optimism	-10.22***	-10.25***	-10.20***	-10.06***
	(-3.79)	(-3.83)	(-3.79)	(-3.76)
Horizon	-0.561***		-0.566***	-0.686***
	(-4.42)		(-4.45)	(-5.26)
Annuity		0.702	1.023	-26.66***
		-0.49	-0.71	(-2.81)
Horizon x Annuity				1.098***
				-2.94
Controls?	Yes	Yes	Yes	Yes
N	3.508	3.508	3.508	3.508
R^2	0.063	0.063	0.064	0.064

Appendix:

Part A: Survey instructions and screenshots

Welcome Instructions

Dear participant,

on the following pages, you will find a survey of the **University of Mannheim in cooperation with FAZ.NET**. The survey covers topics on retirement planning. In particular, it deals with the question of how to convert our savings into a steady stream of income once we enter retirement, in order to increase our standard of living.

Please note that the survey takes some time (approx. 15 minutes). Also, note that you might encounter questions that require some time to answer (just as your retirement planning!). In return, we will present you different ways on how to convert your savings into a steady stream of income. Should you be interested in further results, we will gladly send you a summary of the main results after the completion of the study via email.

In addition, we are giving away ten Behavioral Finance volumes on the subject "Entsparen im Alter – Portfolioentnahmestrategien in der Rentenphase" by Prof. Dr. Dr. h.c. Martin Weber from the University of Mannheim. **All data collected here is anonymous and exclusively used for research purposes**.

We are looking forward to your participation!

Financial Literacy Questions

1. Do you think the following statement is true or false?
   "Buying a single company's stock usually provides a safer return than a stock mutual fund".
   i. The statement is true
   ii. *The statement is false*
   iii. Do not know / Refuse to answer
2. If the interest rate falls, what should happen to bond prices?
   i. *Rise*
   ii. Stay the same
   iii. Fall
   iv. None of the above
   v. Do not know / Refuse to answer
3. Consider a call-option with a stock as underlying. Please judge the following statement: "The price of the call-option should increase if the volatility of the underlying stock increases."
   i. *The statement is true*
   ii. The Statement is false
   iii. The statement can't be judged with the information given
   iv. Do not know / Refuse to answer
4. Suppose you have 100 € in a savings account and the interest rate is 4% per year and you never withdraw money or interest payments. After 10 years, how much would you have in this account in total?
   i. *More than 140€*
   ii. Exactly 140€
   iii. Less than 140€
   iv. Do not know / Refuse to answer
5. Suppose you owe 3,000€ on your credit card. You pay a minimum payment of 30€ each month. At an annual percentage rate of 12% (or 1% per month), how many years would it take to eliminate your credit card debt if you made no additional new charges?
   i. Less than 5 years
   ii. Between 5 and 10 years
   iii. Between 10 and 15 years
   iv. *Never*
   v. Do not know / Refuse to answer
6. A very volatile asset either increases in value by 70% or decreases in value by 60% in every period, each growth rate realizing with a change of one half. If the investor buys the asset she must hold it for 12 periods. With an initial value of 10,000 what would the asset likely be worth at the end of period 12?
   i. *Up to 6,400*
   ii. Between 6,400 and 12,800
   iii. Between 12,800 and 19,200
   iv. Between 19,200 and 25,600
   v. Above 25,600
   vi. Do not know / Refuse to answer

Description and display of the phased withdrawal strategies

Below you will find 3 potential strategies for you, which are based on the following information you provided:

- **Saved assets at retirement: about 500.000 €** [Angabe: über 500.000 €]
- **Planning horizon (as from retirement): 25 years**

The strageties are used to distribute your wealth over the course of your retirement and they differ with regard to the way **your wealth is invested** (riskfree vs. risky) and the way **your wealth is consumed annually** (constant vs. fluctuating consumption).

Please examine the strategies thoroughly and decide which one you would choose **at the beginning of your retirement**.

(Note: By clicking on the information boxes, you will receive more information or explanations regarding the terms.)

Strategy 1: Constant withdrawals- risk-free allocation

Advantages	Disadvantages
✓ Constant withdrawals	× Relatively low withdrawal amounts due to riskfree investment

Annual withdrawals over 25 years	23.050 €
Withdrawal fluctuation	± 0 %
Withdrawal in worst 5% of the cases	23.050 €
Default risk	0 %
Average possible bequest	0 €

Strategy 2: Constant Consumption - risky

Advantages	Disadvantages
✓ Constant Consumption ✓ Higher consumption due to risky investment	× Default risk due to constant consumption

Annual consumption over 25 years	27.500 €
Consumption fluctuations	± 0 %
Consumption in worst 5% of the cases	0 € (Default)
Default risk	10 %
Average possible bequest	1.110.300 €

Strategy 3: Fluctuating Consumption - risky

Advantages	Disadvantages
✓ Highest average consumption ✓ No default risk	× Relatively high consumption fluctuations

Annual Consumption over 25 years	37.250 €
Consumption fluctuations	± 33 %
Consumption in worst 5% of the cases	18.230 €
Default risk	0 %
Average possible bequest	0 €

Description and display of the lifelong annuity

As an alternative to a **drawdown strategy** with given planning horizon, you could exchange your saved wealth for an **immediate annuity**.

In the case of an immediate annuity an insurance provider guarantees **save pension payments every year for the rest of your life** in return for a lump-sum payment.

For your wealth of 500.000 € a potential offer might look the following:

Option 4: Lifelong immediate annuity

Advantages	Disadvantages
✓ Constant payments	× No control over accumulated wealth
✓ Pension payments guaranteed until the day of death	× No financial bequest possible

Annutal pension payments	27.979 €
Fluctuatings in pension payments	± 0 %
Payments in worst 5% of the cases	27.979 €
Default risk	0 %
Average possible bequest	0 €

20. Suppose you had to decide between a decumulation strategy and a lifelong annuity. Which would you prefer?

- ◯ I would prefer a decumulation strategy
- ◯ I would prefer a lifelong annuity

Self-reported importance of various retirement characteristics

Please rate the following statements on a scale from 1 (not very important) to 7 (very important)

1. "How important are high withdrawal rates for you?"
2. "How important is it for you that the withdrawal amount remains constant over time?"
3. "How important is it for you that the withdrawals you receive cannot default?"
4. "How important are bequests for you?"

Which factors not previously mentioned affect your choice?

Would you say your current health status is…

(i) Very good; (ii) Good; (iii) Medium; (iv) Rather bad; (v) Very Bad

If you think about it, to what age do you expect to live?

Please tell us about the ways you tried to figure out how much your household would need for retirement.

i. Did you talk to family and relatives?
ii. Did you talk to co-workers or friends?
iii. Did you use calculators or worksheets that are computer or Internet-based?
iv. Did you consult a financial planner or advisor or an accountant?
v. Did you follow advice received from the media?

Have you ever tried to figure out how much your household would need to save for retirement?

Do you work in the financial industry or do you have an education in a financial domain?

Part B: Construction of the phased withdrawal strategies

Strategy 1: Risk-Free – Constant

The withdrawal amount C_t in every period t is defined using the following formula:

$$C_t = \frac{(1 + r_f)^{H-1} \cdot r_f}{(1 + r_f)^H - 1} \cdot W_0,$$

where r_f is the real risk-free rate of return, *H* is the planning horizon in years, and W_0 is the initial wealth that an agent wants to decumulate.

Strategy 2: Risky – Constant

Strategy 2 was constructed such that the real withdrawal amount is a fixed percentage of the initial wealth level. The percentage was chosen in a way such that the default probability remains constant at 10 % (determined with simulations). In other words, as long as there is enough wealth, the real withdrawal amount remains constant every year. If there is not enough wealth, the remaining wealth is withdrawn and the strategy ends prematurely (i.e. it defaults in our terminology).

$$C_t = w \cdot W_0 \mid W_t > C_t, else$$

$$C_t = W_t$$

Given the underlying asset allocation, the resulting withdrawal rates are as follows:

Planning Horizon	Withdrawal Rate
20 Years	6.27 %
25 Years	5.50 %
30 Years	5.13 %

Strategy 3: Risky – Dynamic

The real withdrawal amount C_t in every period t is defined using the following formula:

$$C_t = \frac{(1 + E[r])^{H-t} \cdot E[r]}{(1 + E[r])^{H+1-t} - 1} \cdot W_t,$$

where $E[r]$ is the real expected return of the underlying investment strategy, H is the planning horizon, and W_0 is the initial wealth that the agent wants to decumulate. Whenever the expected return in any given period does not equal the realized return, the consumption does not equal to the consumption in the previous period. In other words, the resulting consumption pattern fluctuates and directly depends on the realized return and the number of periods that are left (denoted with $H - t$).

Part C: Additional Analyses

Table I

This table reports results of four OLS regressions. Dependent variable in specification (1) and (2) is *Saving plan*, a dummy variable, which equals 1 if participants report to stick to a saving plan in preparing for retirement. Dependent variable in specification (2) is the log of wealth. Reported are coefficients and t-statistics (in parentheses). All standard errors are robust. ***, **, and * indicate significance at the 1%, 5% and 10%-level, respectively. We have 3578 observations due to missing answers. We control for socio-demographic variables and household composition whenever indicated.

	(1) Saving Plan	(2) Saving Plan	(3) Wealth (log)	(4) Wealth (log)
Fin. Literacy	0.0538***	0.0389***	0.186***	0.145***
	(7.51)	(5.12)	(14.76)	(11.36)
Advice_Family	-0.0682***	-0.0791***	-0.114***	-0.108***
	(3.73)	(4.34)	(3.69)	(3.48)
Advice_Work	-0.0148	-0.0308	-0.150***	-0.157***
	(0.58)	(1.19)	(3.69)	(3.96)
Advice_Tool	0.207***	0.179***	0.0916***	0.0762***
	(13.04)	(11.15)	(3.34)	(2.83)
Advice_Expert	0.0519***	0.0507***	0.0752**	0.0779**
	(2.95)	(2.91)	(2.39)	(2.53)
Advice_Media	0.0712***	0.0650***	0.0624**	0.0495
	(3.85)	(3.54)	(1.97)	(1.60)
Saving Plan			0.144***	0.127***
			(4.91)	(4.39)
Controls?	No	Yes	No	Yes
N	3.578	3.578	3.578	3.578
R^2	0.08	0.11	0.1	0.15

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