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Framing and Pension Annuities

Experimental Evidence from a Dutch Pension Fund

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Framing and Pension Annuities

Experimental Evidence from a Dutch Pension Fund

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Abstract

Recently a debate in the Netherlands has emerged on an increasing demand for individualized pension solutions and the implementation of partial lump sum cash outs in second pillar pension plans. This thesis is a first assessment of how Dutch plan members will react to such new optionalities. In a survey-based experiment, about 3000 members of a Dutch occupational pension plan were asked to allocate their real projected pension accrual between a life annuity and a partial lump sum. In the experiment most respondents made use of this new optionality. In a second step, the driving variables of annuity and lump sum demand are analyzed. Departing from standard economic theory as well as human biases in decision taking, the predominantly behavioral nature of the decision to annuitize is revealed. Particularly strong evidence for the framing hypothesis in annuity demand is presented. Dutch plan members are found to filter the underlying decision through a “consumption frame” rather than an investment frame. Individual decisions appear to be steerable when actively framing plan members. Next to framing, default setting is assessed as a tool to actively steer individual decision taking. The third step of analysis refines insights from the framing hypothesis: Robust evidence is found for the reaction to active framing being subject to individual characteristics, highlighting the impact of heterogeneity on framing effects. The thesis concludes, that while plan members welcome the partial lump sum option, pension professionals must be aware of the impact they have on overall outcome through information architecture. Framing and default setting are found to be powerful “nudges”, capable of predictively steering annuity demand.

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1 Introduction

Over the past decades there has been a subsequent shift away from traditional defined benefit (DB) pension plans towards more individualistic pension solutions in the form of defined contribution (DC) plans. While in the U.S. these tendencies towards less collective solutions gained momentum with the introduction of 401k plans in late 1970's a similar trend took hold of the Dutch pension system only with the onset of the dotcom crisis and the 2008 global financial crisis, when funding ratios and asset returns plunged.

In the aftermath of the crises Dutch pension plans adopted so-called "hybrid DC" and "collective DC" designs. (Ponds & Van Riel, 2007) In these schemes, social trust among stakeholders and collective risk sharing are immanent characteristics as they are for traditional DB plans. But as average salary based pension rights are indexed conditional on funding ratios, considerable amounts of investment risk were passed on to the plan members. (Kemna, Ponds, & Steenbeek, 2011).

Together with the transfer of risk and increased individual responsibility for one's pension income, plan members increasingly demand ways to individualize their retirement income. (Van Els, Van den End, & Van Rooij, 2004) In Chapter 6.1 it will be shown how active choice in retirement income increased significantly over the past years, putting pressure on pension professionals and social planners. In that sense there are two forces in Dutch society pushing for a more individualistic pension system: The supply side which feels the need to pass on investment risk to plan members due to adverse financial market conditions. And the demand side which wants to deviate from dictated one-size-fits all solutions.

Recently, the introduction of partial lump sum payments has emerged as one of the "hot topics" in that context. With the Dutch pension federation supporting the idea (Dagblad, 2015), partial lump sum payments have arrived at policy makers agendas, posing several questions to pension professionals:

- 1.) To what extent will Dutch plan members make use of partial lump sum payouts?
- 2.) Which plan members will typically have a strong preference for such lump sums?
- 3.) Can professionals steer the plan member's choice into predictable directions?
- 4.) If so, to what degree should pension professionals take action?

Before jumping to conclusions it is important to understand the basic, economic rationale behind the decision to annuitize. Standard economic theory suggests, that a utility maximizing individual with uncertain lifetime would prefer to convert her entire wealth into an actuarially fair annuity. (Yaari, 1965) This prediction, however, could not be further away from what is being observed in empirical research, leaving economists puzzled about actual agents' behavior. Many efforts have been made to find the solving variables for the so called annuitization-puzzle (Modigliani, 1986). Most prominently bequest motives (Davidoff, Brown, & Diamond, 2003) and market imperfections such as default risk (Jang, Keun Koo, & Park, 2013) or adverse selection into longevity insurance were added to the explanatory model. Other researchers have chosen a more applied approach by matching annuity demand to observable individual characteristics. Explained variation of annuity pickup, however, stays quite low. (Cappelletti, Guazzarotti, & Tommasino, 2013; Chalmers & Reuter, 2012).

With standard theory failing to give a satisfying explanation of annuitization behavior, more promising explanations may come from behavioral economists, who stress that decisions in the pension domain are subject to a number of behavioral biases. Based on prospect theory (Kahneman & Tversky, 1979) and mental accounting (R. Thaler, 1985) it has been shown how annuities are systematically undervalued by retirees (Hu & Scott, 2007) and how especially individuals of lower cognitive ability tend to make mistakes in valuing annuities. (Jeffrey R Brown et al., 2015) One popular explanation in this context has been the framing hypothesis (Jeffrey R Brown, Kling, Mullainathan, & Wrobel, 2008): The key to the undervaluation of annuities is, that retirees are stuck in an “investment frame” in which the annuity is perceived as a risky gamble on their lifetime rather than a collective longevity insurance scheme. Therefore, a lump sum will appear as the safer and hence preferable “investment”. If however, retirees are in a “consumption frame” where they are aware of the longevity insurance and the safe consumption path provided by annuities, the smooth consumption path of the annuity is preferred. This phenomenon may also explain why experiments with DB plan members who were offered a lump sum payment are more likely to stick to their annuities than DC plan members. (Benartzi, Previtro, & Thaler, 2011; Büttler & Teppa, 2007; M. Hurd & Panis, 2006)

Until now, the framing hypothesis has only been tested for the US American context and mainly in “one-pension-size-fits-all” experimental surveys. (Agnew, Anderson, Gerlach, & Szykman, 2008; Beshears, Choi, Laibson, Madrian, & Zeldes, 2014; Jeffrey R Brown, Kapteyn, & Mitchell, 2013; Jeffrey R. Brown & National Bureau of Economic Research., 2008) These experiments show two major pitfalls: First, the stated preferences are relatively disconnected from the participants’ actual preferences because the presented choices are far from realistic to the respondent. In other words, the data is likely to be biased and unsuited for predicting real life behavior. And second, it is likely, that the framing hypothesis only applies to that specific institutional environment which has educated and framed the underlying population over decades. Bringing the framing hypothesis to the Dutch context opens up an opportunity to test for its general validity. It will be explained, why Dutch plan members do not fall victim to the investment frame when valuing annuities but rather evaluate them through a consumption frame. Testing for the framing hypothesis in the Netherlands completes the empirical evidence on the phenomenon.

The research carried out at APG among a set of plan members of a large Dutch pension fund can contribute to two streams of literature:

- 1.) It is an assessment of the annuitization puzzle in a pension system that is deeply rooted in collective risk sharing and DB like pension schemes: It has been argued, that the annuitization puzzle is a rather circumstantial phenomenon occurring in DC focused pension systems, where accrual is in terms of lump sums. (Benartzi et al., 2011) The low annuity take-up could then be due to endowment effects (Kahneman, Knetsch, & Thaler, 1991) or status quo bias (Samuelson & Zeckhauser, 1988) arising from the particular institutional setting. In the Netherlands however, accrual is in terms of yearly pension income (annuities). Hence, there may be a strong endowment effect in favor of full annuitization observable in the data. Below it is shown, how even in the Dutch system, which does not know any lump sum payments, plan members show significant interest for lump sums when being offered the

choice. We observe that without any willful framing, about 60% of respondents choose for a partial lump sum. The results support recent findings of endowment effects playing a subordinate role for the annuitization puzzle. (Jeffrey R Brown, Kapteyn, Luttmer, & Mitchell, 2014) The data however does not show truly “puzzling annuitization rates”. Since the maximum lump sum cash out was 20% of accrued pension rights, overall annuitization rates remain very high (93% on average). Additionally, the data allow for an assessment of lump sum take-up across individual characteristics giving a precise picture of the “typical lump-sum-pensioner “ and the typical “full annuitizer” for the Dutch case. (Chapter 6.2.2)

2.) The research adds to the literature on the framing hypothesis regarding three aspects:

2.1.) It is a test for the validity of the framing hypothesis in a DB focused environment: It is reasonable to assume, that plan members in the Netherlands encounter themselves in a consumption frame rather than in an investment frame. Hence it is to be shown, whether active framing has significant influence on annuity choice even under these different institutional settings. In fact, the data show a significant impact of both frames (consumption and investment) on annuitization behavior, confirming the general validity of the framing hypothesis regardless of institutional circumstances.

2.2) It creates a much more realistic scenario for respondents compared to previous studies (Beshears et al., 2014; Jeffrey R Brown et al., 2013; Jeffrey R Brown, Kling, Mullainathan, & Wrobel, 2008) and offers therefore a better approximation of real preferences: The analysis is based on a survey with a personalized hypothetical pension decision where respondents were asked to allocate their retirement income across a lump sum and an annuity. The presented numbers were calculated using real individual projected pension accrual (at retirement) and actuarially fair discount factors as they are currently applied by the pension fund.

2.3) The project offers a unique dataset based on participants in a real-existing pension fund, combining a vast selection of variables that have been applied in previous research on the drivers of annuitization. The data matches a hypothetical annuitization decision with a particular frame and variables taken from explanatory models based on standard economic theory as well as behavioral economics. It can therefore be tested for the robustness of framing to the integration of most variables from previous research. In fact it will be shown below, that framing is robust to the inclusion of any set of variables available in the dataset, further underlining the importance of framing in retirement income. Also it is possible to test for interaction effects between framing and other variables. Significant differences in the sensitivity to framing across individual characteristics are revealed. As a byproduct, conclusions about the relative importance of standard economic variables versus behavioral variables can be drawn.

The framing hypothesis, as appealing as it may seem as an explanation to the observed annuitization behavior, brings along very strong policy implications which will be discussed in the last chapter: While the investment frame gives a plausible explanation for the relatively high preference for lump sums in the US, the other side of the coin, the consumption frame, may only apply to those who are actively “pushed” into the consumption way of thinking. Hence is the framing hypothesis right at the verge of a “nudging” approach (R. H. Thaler & Sunstein, 2008) to the annuitization puzzle. Retirees’ preferences are actively influenced by

“playing tricks” on their human biases in decision taking. Framing the annuity-vs-lump-sum-decision must always be discussed together with its paternalistic dimension and implications for policy makers as well as pension professionals. While this thesis will not engage in a normative discussion on the role of pension professionals in nudging retirees or an assessment of libertarian paternalism (Hausman & Welch, 2010) in the context of pension income, it provides for insights and predictions a debate of that kind can emerge from. The clearness and robustness of the results highlights, that policy shapers and pension designers must be very aware of the impact they have on individual decision-taking through information architecture (Goldstein, Hershfield, & Benartzi, 2014; E. J. Johnson et al., 2012), be it unconsciously or by willful framing.

The remainder of this work is organized as follows: Chapter 2 will give an overview of the related literature and set the theoretical frame for the research project. Chapter 0 is to give a brief introduction to the Dutch pension sector and its implications for research into annuitization behavior. Before getting to the core analysis, chapter 4 precisely summarizes the research questions and hypothesized answers. In chapter 0 the reader will be introduced to the methodological approach as well as the applied datasets. Chapter 6 descriptively evaluates the data and presents results from in depth statistical testing. Eventually, chapter 7 concludes.

2 Literature and Theoretical Background

This part is to layout the theoretical context in which the research project and below analysis is to be placed. The objective is to give an idea of the economic principles behind annuity demand as well as an overview of the empirical literature on related phenomena. While the basic principles are valid for a homo oeconomicus based analysis, they often appear to be relatively disconnected from the very specific Dutch case underlying the empirical part of this paper. Also, many of the findings in the empirical literature may not apply to the Netherlands. Nevertheless it is important to understand these principles and phenomena, since they are the point of departure for the analysis and may become relevant for the Dutch context in the future. Section 0 will explain in detail the unique characteristics of the Dutch pension system and what the implications are for a present analysis of annuity demand.

Expected utility and the Annuitization-Puzzle

The moment a utility maximizing, risk averse individual retires, she faces one major uncertainty: The unknown length of retirement or, to put it differently, her life-expectancy. As a result she needs to balance two risks simultaneously: First she needs to make sure, not to outlive her savings through excessive consumption and second she wants to avoid to die with a considerable amount of her savings unspent while she could have enjoyed more consumption during retirement. (Jeffrey R Brown & Warshawsky, 2001) Such is the delicate tradeoff resulting from what is generally referred to as longevity risk.

Yaari (1965) was the first to show, that in a model of life-cycle investment, individuals with no bequest motive will choose to fully convert their wealth into an actuarially fair annuity simply because it maximizes their expected life-time utility. Annuities should be particularly

appealing because they offer full insurance against longevity risk and because they yield a mortality premium on top of the return offered by a riskless bond.

A straight forward explanation of the dominance of annuity returns over the riskless rate can be found in Jeffrey R Brown, Kling, Mullainathan, and Wrobel (2008): Assume that an individual maximizes the discounted utility of retirement consumption, given a concave utility function, a discount factor < 1 and time of death as a stochastic variable. Under these assumptions, annuities transfer income from after death (where its marginal utility is zero) to a period, where income does increase utility: Suppose individuals live in a two period world where they face probability q of dying before reaching period two. If an individual invests her wealth W in a bond with return R , she can consume $W(1+R)$ in period two. If she invests in an actuarially fair annuity, she can consume $W(1+R)/(1-q)$ if she survives period one. In other words, she earns a mortality premium because all wealth is being shared among survivors.

As straight forward as this result may appear, as strong are the assumptions made in Yaari's seminal paper.¹ Therefore it may well be, that annuities do not provide for the consumption path preferred by retirees. This shortcoming was later corrected for by Davidoff et al. (2003) who get to similar results as Yaari under more relaxed assumptions. They find that even when annuity markets are not perfect and annuities not priced actuarially fair, full annuitization is still utility maximizing. When, however, bequest motives are allowed for, full annuitization is no longer optimal even with annuities earning a positive mortality premium. Nevertheless, it is shown that a high degree of partial annuitization is still optimal. In fact, they arrive at the conclusion that the low annuitization observed on markets may arise from behavioral issues. A further expansion of the life cycle model by Yogo (2009) has shown significant welfare gains associated with access to annuities, even after allowing for social security benefits, db pension income and bequest motives.

Going beyond the standard life-cycle model, welfare gains from annuitization can be assessed focusing on "annuity equivalent wealth". The concept compares the utility level offered by a lifetime annuity and the additional wealth required to arrive at the same level of utility when annuitization is no longer available. In this manner researchers have identified significant welfare gains from annuitization. (Jeffrey R Brown, 2001; Jeffrey R Brown, Mitchell, & Poterba, 2001; Jeffrey R Brown & Poterba, 1999)

Overall can be concluded that economic theory predicts a strong preference for annuities among retirees. This however is not being reflected by actual annuitization rates. The so called annuitization puzzle, brought to attention by Modigliani (1986), still remains to be resolved. Recent studies confirm that annuitization, especially in US American DC plans, remains far below what is being considered optimal: Annuitization rates range from 6% in a survey on American DC plans (Schaus, 2005) to 86% in swiss DB plans with an annuity as the default payout (Bütler & Teppa, 2007). Johnson et al. (2004) find 10% annuitization for DC plan members retiring after age 65. Mottola and Utkus (2007) report results on a DB plan as well as a cash balance plan¹. Interestingly, they find an annuitization rate of 27% in the DB plan and 17% in the cash balance plan. While most plans offer their members an "all or nothing" choice between annuity and lump sum, there is survey evidence that partial lump

¹ In cash balance plans, benefits are accrued in terms of an individual balance as in a DC plan rather than in pension income as in a DB plan. Nevertheless, the investment risk is entirely born by the plan sponsor as in DB plans and plan members are offered a guaranteed rate of return. Also they are by law required to offer an annuity option.

sums significantly increase take up rates: Beshears et al (2014) find that 59% of respondents will prefer partial annuitization. The variety in annuitization rates across countries has two implications: First, the under-annuitization observed in US-based studies may well be due to institutional features. The annuity puzzle would then indeed be circumstantial. And second, if the observed behavior is a mere reaction to institutional settings and defaults, annuitization rates do not reflect stable preferences. They would in fact be subject to human biases in decision taking. Overall it seems, however, that the majority of employees show a stable preference for annuities when facing a simple decision between an annuity and a lump sum (Benartzi et al., 2011) or when forced into an active choice (absence of defaults) between the two options.(Previtro, 2008).

2.1 Explaining Annuitization Behavior:

From the above explained annuitization puzzle a large body of literature has emerged trying to find the driving variables behind real world annuitization behavior. Mostly there is an initial modeling approach complemented by empirical research confirming or questioning the theoretical hypothesis. There are two main strands of research: First there are “standard theory economists” arguing, that a rational agent life-cycle model, when extended with the right variables can indeed explain observed behavior. Second, a big part of the annuity related literature stems from “behavioral economists” who stress, that agents are prone to human biases in decision taking when it comes to retirement income. Behavioral biases drive a wedge between normative preferences, as implied by the life cycle utility-maximizer, and revealed preferences as observed in empirical research. This piece of research will have a closer look at the wedge between normative and revealed preferences and how to steer it by actively playing on behavioral biases. It is therefore crucial to understand how much of the observed wedge can be explained by adding variables to the life-cycle model and how much is due biased decision taking. The following chapter will give a brief overview of the variables extending the rational economic model as well as the relevant behavioral biases. Finally an introduction to the framing hypothesis on pension annuities will be given which is in essence an applied combination of different behavioral principles. All together this opens up a toolbox which is eventually put to use in the survey based experiment where annuitization behavior is explained and actively steered (i.e. framed) .

2.1.1 Expanding the life-cycle model

Before jumping to conclusion about the behavioral dimension of the annuitization puzzle it is crucial to understand what other real world factors outside the simplified Yaari model keep rational agents from buying annuities. The explanations center around institutional features, market conditions and individual preferences. (Garcia Huitron, 2014)

2.1.1.1 Institutional Features:

The large differences in annuity take-up across countries (see section 0) point to the fact that institutions do matter. This can be due to differences in the availability of annuities or the relative importance of state pensions (first pillar annuity income) for retirement income. Bernheim (1992) finds social security pension to drive down annuity demand making it easier for pensioners to leave a bequest. Pashchenko (2013) arrives at the same conclusion following a quantitative modeling approach. Similarly was it shown, how individuals decide to cash out pension rights when means-tested-social benefits are easily available. This applies

especially to low-income pensioners. (Butler, Peijnenburg, & Staubli, 2011) Another institutional feature, which is right at the verge to behavioral explanations, are defaults or implicit defaults. Default options become institutionalized as they are being adopted as best practices in a pension systems and heavily distort annuitization choice. (Butler & Staubli, 2010; Bütler & Teppa, 2007) Given that only 21% of DC plans and not even one single 401(k) plan in the US offer annuity payout options (PSCA, 2009), the low annuitization rate in the US does not seem surprising. Because Dutch plan members have no opportunity to cash out their pension assets, the Netherlands do not appear in these studies. In chapter 0 it will be explained in detail how the specific set of Dutch institutions is expected to shape annuity demand.

2.1.1.2 Market Conditions

With respect to annuity markets there are two relevant aspects being discussed in the literature. First, annuities tend to be priced above an actuarially fair rate mainly because of adverse selection. And second, low perceived reliability of financial and pension markets drive down annuity take-up.

The fairness in **annuity prices** is usually measured applying the Money's Worth Ratio (MWR), which sets the discounted expected future annuity payments in relation to the paid annuity price. Calculations range between 80 and 85 cents in a dollar in a research for the US American case (Mitchell, Poterba, & Warshawsky, 1997) but are found to be "surprisingly high" in an international comparison by James and Song (2001) and Cannon and Tonks (2011).

One common explanation for unfair pricing is **adverse selection**. The marginal utility of consumption, and hence of annuitized wealth, decreases together with an individual's health condition. (Finkelstein, Luttmer, & Notowidigdo, 2013) At the same time, an individual of poor health can expect himself to die relatively early and to have less need to insure against longevity risk. Thus, annuitization is less attractive for individuals in poor shape while it becomes very attractive to those who expect themselves to experience high marginal utility of consumption after retirement and to outlive most of their peers. Assuming that insurers cannot tell those types apart, information asymmetry will cause higher prices as companies expect healthy individuals to actively self select into annuities. (Jeffrey R Brown, 2001) At the same time, there will be "passive selection" simply because of the correlation between life expectancy and variables such as wealth and income.² (Finkelstein & Poterba, 2002). Another reason for high prices is seen in the difficulties faced by insurance companies in hedging longevity risk. (Blake, Burrows, & Orszag, 2002)

Financial market stability and **default risk**: At least with the onset of the financial crisis in 2008 market participants realized that even contracts with the strongest players come with significant counterparty risk. The same principle applies to annuities, which in the end are contracts with an insurance company which may or may not default at some point in time. The need to refinance retirement income in case of default can significantly hinder growth in annuity markets. (Jang et al., 2013) Evidence from a continuous time annuity model points to

² It is not the case, that people with higher life-expectancies annuitize. It is rather people with large wealth annuitizing more. Wealthy people live longer on average, which leads to the impression of long living individuals choose annuities.

the same direction: "...even a little default risk can have a very large impact on annuity purchase decisions." Furthermore can "insolvency guaranty programs have a big impact upon the levels of rational life annuity purchases particularly annuities of large size". (Babbel & Merrill, 2006)

2.1.1.3 Individual Preferences

Particular characteristics as well as individual preferences have played a big role in explaining the annuitization puzzle. Mostly they center around socioeconomic variables and risk preferences.

Initially it was argued, that individuals showing high **risk aversion** like annuities because they offer insurance against outliving one's resources. In fact, there is much empirical evidence supporting that the preference for annuitized wealth increases with risk aversion. (Agnew et al., 2008; Chalmers & Reuter, 2012; Horneff, Maurer, Mitchell, & Dus, 2006). This becomes an even more important factor when considering that risk aversion is particularly high in the pension domain.(M. C. Van Rooij, Kool, & Prast, 2007) Doubts were brought forward by Bommier & Le Grande (2013) who find that, from a modeling perspective, sufficiently risk averse individuals with a bequest motive should choose not to annuitize. This notion is based on a reversed sentiment for risk in annuities, namely the risk of "dying early without leaving bequest". While this is generally regarded a result of behavioral biases (see below: mental accounting), it becomes a rational calculus in combination with bequest motives.

The largest part of the literature is dedicated to **bequest motives**. From a modeling perspective it was argued, that the wish to leave a bequest is enough to reduce optimal annuitization rates to levels close to empirical observations. (Friedman & Warshawsky, 1990) Since annuities are designed to eat up all wealth invested and leave nothing for later generations this makes intuitive sense. Empirical evidence, however, does not support the hypothesis. (M. D. Hurd, 1987) A commonly used proxy for bequest motives is parenthood. Brown (2001), however, finds no significant impact on annuity choice. The modeling approach by Davidoff et al. (2003) presents a somewhat middle course solution arguing that individuals should partially annuitize their wealth to the extent they want to leave a bequest. More recent results from a life-cycle model however imply that even partial annuitization should be avoided given a considerable bequest motive. (see above) When discussing bequest motives it is to be noted, however, that empirical evidence is often biased because the underlying proxies such as parenthood are in fact disconnected from bequest motives. (Lockwood, 2012)

Next there are effects coming from spousal annuities and **marriage** as a form of intra family longevity insurance.(Kotlikoff & Spivak, 1979) Empirical evidence is rather mixed though: Brown (2001) finds a decreased likelihood to annuitize for married couples as well as lower utility gains in an annuity equivalent wealth framework. (Jeffrey R Brown & Poterba, 1999) Later, survey based studies find no such difference. (J. Brown & Mitchell, 2007)

Lastly there is a wide set of standard economic variables affecting the decision to annuitize: Most intuitively the fact, that an individual who already expects certain amounts of **annuitized wealth** outside her pension assets will annuitize less within her pension plan. This may be due to country specific institutions such as social security benefits as discussed above. Also in a more general case there was shown to be a negative relation between already

annuitized wealth and annuitization rates within pension plans.(Chalmers & Reuter, 2012; Dushi & Webb, 2004)

When an individual decides to annuitize 100% of her wealth, by definition this will have adverse consequences in terms of **liquidity**. Individuals may show demand for more liquidity for a variety of reasons. Typically the literature names health shocks (although this applies mostly to countries with variation in health insurance coverage like the US and to much lesser extent to countries with very egalitarian health care system as in many European countries). (Browne, Milevsky, & Salisbury, 2003; Pang & Warshawsky, 2010) Next to emergency concerns there is notable liquidity-demand for consumption, explaining why annuities with liquidity or bonus options are particularly popular. (Beshears et al., 2014) Another rationale related to liquidity is outstanding **debt** that is preferred to be payed off from accumulated pension wealth. In a similar vein has the illiquidity of **housing** been shown to reduce annuity demand, since an annuity would further deteriorate a household's liquidity. (Pashchenko, 2013) Another standard variable is economic wellbeing expressed in **wealth and income**. Plan members with low wealth will show a higher preference for cash-outs since their marginal utility of an additional euro in wealth is relatively high. Given a high positive correlation between wealth and income, the same holds for low income levels. (Cappelletti et al., 2013) This becomes even more apparent when taking into concern that low income and low wealth are associated with higher dependence on social security or first pillar pensions, leaving second pillar annuitized wealth relatively unimportant to these individuals. (Benartzi et al., 2011)

2.1.2 Behavioral Biases and the Choice to annuitize

The Nobel Prize winning works by Kahneman and Tversky on prospect theory changed the way, economists assessed individual utility and decisions under uncertainty (Kahneman & Tversky, 1979; Tversky & Kahneman, 1974). Over the decades, the branch of behavioral economics emerged, offering an alternative explanation to the puzzling behaviors of real world agents. This section will focus only on phenomena relevant to the annuitization decision. Explanations are therefore given in a pension context rather than in a general setting.

2.1.2.1 Mental Accounting

A crucial concept in understanding how individuals decide on annuitization rates is mental accounting as it had been brought forward by Thaler (R. Thaler, 1985). The idea is that individuals assess economic decisions in different accounts rather than having the big picture of overall wealth (utility) in mind. For example, they do not assess the consequences of holding an annuity at the overall life time utility level but rather only in a separate financial product account where it is assessed as a risky gamble on one's lifetime³ (Jeffrey R Brown & Warshawsky, 2001). The utility gains from reduced longevity risk are not taken into consideration leaving the annuity relatively unattractive.

³ The notion of the risky lifetime gamble is derived from the fact, that individuals engage in a break-even analysis where they assess how long they need to live so that the annuity „pays off“. „Losses in this gamble on lifetime occur, if the total discounted value of payouts falls below the initial investment (Hu & Scott, 2007) This is where the annuity switches from being a longevity insurance to being a risky financial product dependent on one's lifetime.

2.1.2.2 *Cumulative Prospect Theory: Loss Aversion and the reflection effect*

At the heart of prospect theory (Kahneman & Tversky, 1979) and later cumulative prospect theory (Tversky & Kahneman, 1992) stands a non-linear value function for gains and losses. (see: Graph 2) Departing from a fixed reference point the shape of the **value function** implies that losses are felt about twice as strong as an equivalent gain. (Tversky & Kahneman, 1991) Therefore, a fair lottery with equivalent chances of winning and losing will be disliked. People are not risk averse, but “loss averse”.

There are more implications from prospect theory: Because gains and losses are valued differently, an individual’s risk preference will be different when she faces only gains and only losses. Kahneman & Tversky have shown, how individuals are risk seeking for negative gambles and risk averse for positive gambles. Or to put it differently: Individuals are inclined to take a gamble in order to avoid losses but prefer not to take gambles when it comes to gains. This effect has been coined the “**reflection effect**”. (Kahneman & Tversky, 1979)

In their later work they demonstrated how risk seeking behavior and risk aversion are subject to perceived certainty rather than expected pay-offs. This bias in the assessment of risky outcomes was labeled “**pseudo certainty effect**”. (Kahneman & Tversky, 1984) The implications for the annuity choice are large, since additional annuitization can be presented either as a gamble or a safe option as well as in terms of gains or losses. This will be discussed in more depth below.

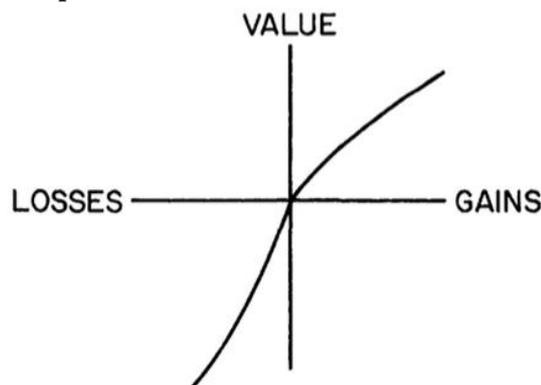
2.1.2.3 *Endowment Effect and Status Quo bias*

The notion that people don’t like change makes intuitive sense and anybody can think of anecdotal evidence for the phenomenon. Gazzale & Walker (2009) argue that the same holds for the decision to annuitize. Departing from loss aversion they find a significant bias towards initial endowments. Interestingly this holds when initial endowments are in terms of lump sums as well as when they are in terms of annuities. The latter effect would be expected for the Netherlands. (recall: pension accrual in the Netherlands is in terms of annuities) Similar to the endowment effect, the status quo bias causes people to stick to an initial situation (or endowment). (Kahneman et al., 1991; Samuelson & Zeckhauser, 1988) In the pension domain the more applied conclusion is a “reluctance to exchange” one’s assets for an annuity because they are assigned irrationally high prices. (Jeffrey R Brown et al., 2013)

2.1.2.4 *Risk ordering bias and Availability Heuristic*

Another crucial element of prospect theory is the probability weighting function: Outcomes are not valued with their underlying probabilities but rather their “perceived probabilities”, or decision weights. (Tversky & Kahneman, 1992). The form of this probability-weighting-function implies that individuals overweight very low as well as very high probabilities, while they underweight the somewhat moderate probabilities.

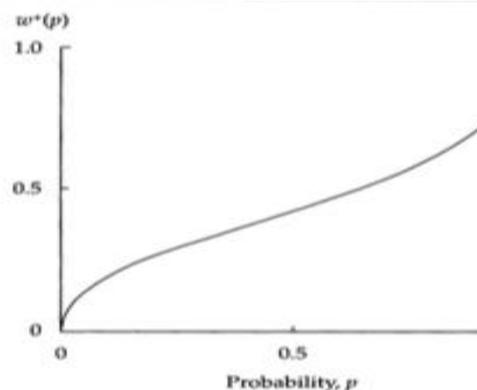
Graph 1 Possible Value Function



Source: Tversky and Kahneman (1986)

With respect to the annuitization problem, this means, that the relatively low probability of dying early is outweighed while the most likely event of the longevity insurance to pay off (when reaching avg. age) is underweighted. (R. Gazzale, Mackenzie, & Walker, 2012; R. S. Gazzale & Walker, 2009) A similar line of argumentation underlies the availability heuristic (even though it is strictly speaking not derived from prospect theory):

Graph 2 Probability Weighting Fctn.



source: Hu and Scott (2007)

Individuals will overestimate easily imaginable events even though they may be very unlikely. (Tversky & Kahneman, 1974) The event of dying early is then an obvious suspect for being perceived much too likely. (Hu & Scott, 2007)

2.1.2.5 Fear of Illiquidity

A somewhat related phenomenon is fear of illiquidity. Hu & Scott argue, that as a result of the availability heuristic, individuals overestimate the risk of needing extra cash for emergency spending or their pension income provider going bankrupt. This irrational fear of illiquidity decreases annuitization.

2.1.2.6 Illusion of Wealth

In a recent study, Goldstein et al. (2014) demonstrated how lump sum payments are perceived larger (more attractive) than actuarially equivalent annuities. Interestingly, this relation reverses for higher levels of wealth, where lump sums are perceived as less satisfactory. Hence, annuities are particularly unattractive for low-wealth individuals.

2.1.2.7 Hyperbolic discounting

A commonly applied model, especially when explaining why people save too little, is hyperbolic discounting. (for an overview see: Loewenstein and Elster (1992)) The underlying principle is, that individuals apply different rates of discount over time. (Ainslie & Haslam, 1992) The rate at which future income or wealth is discounted between time t and $t+1$ is larger than the rate to discount from $t+2$ to $t+1$. This has strong implications for savings behavior: Saving now hurts more than saving tomorrow, and once tomorrow is today it is going to hurt just as much as today. This human bias in discounting is exploited by saving tools and self-commitment plans such as the save more tomorrow program™ (R. H. Thaler & Benartzi, 2004). While buying an annuity is not necessarily the same as postponing income to the future (the lump sum was meant to be spent in the future as well), the loss of consumption potential and liquidity may feel very similar and hurt more, the sooner the consequences are to be faced. Hence, one would expect it to be easier for younger people to commit to buying an annuity at retirement than for older individuals.

2.1.2.8 Choice overload, Complexity of choice and cognitive skills

While more choice should facilitate utility maximization, real agents show serious difficulties when facing too many options (choice overload) as well as too difficult options (complexity of choice). In the pension domain, Iyengar et al. (2004) have shown, how participation

decreases as the number of investible funds within a pension plan increases. People tend to avoid choice, when there is too much complexity which highlights the interaction between adherence to defaults, inertia and complexity of choice. For the US social security context it has been demonstrated, how individuals of higher financial sophistication (measured by financial literacy) tend to rather take up an annuity and do not fall for the “easier” lump sum choice. (J. Brown & Mitchell, 2007)

Next to measuring financial literacy as a proxy for financial sophistication and the ability to deal with complex choice (Lusardi & Mitchell, 2007), another proxy can be pension literacy which has been found negatively related with annuitization rates. (Cappelletti et al., 2013) Lump sums appear as the safe and easy option. Individuals with low literacy scores therefore favor them. Digging deeper into cognitive skills and overload, Agnew & Szykman (2010) assessed cognitive as well as emotional overload in the annuity context. Furthermore they analyzed individuals' confidence to have taken the right decision and to be financially literate. They expect annuity take-up to increase as literacy and confidence decrease and as overload increases. The empirical relevance of these variables, however, is still to be shown, especially with respect to the robustness to control variables.

2.1.2.9 Adherence to social norms and defaults

Behavioral economics often stress, how people, driven by regret aversion (Bell, 1985; Loomes & Sugden, 1982), tend to stick to what they perceive as the social norm. (Samuelson & Zeckhauser, 1988) In a way, this will also hold for defaults, when the default setter has some degree of normative power which may well be argued for pension funds. In fact it is very likely that defaults on retirement age and annuitization are perceived as social norms people adhere to. (Benartzi et al., 2011; Beshears, Choi, Laibson, & Madrian, 2009) This behavioral pattern is further fostered by the tendency to passive choice and procrastination. (Beshears, Choi, Laibson, & Madrian, 2008)

2.1.2.10 Illusion of control

A study by LIMRA international (2006) revealed that “loss of control” over one’s assets is the most striking disadvantage of annuities in the eyes of plan members. And in fact, once wealth is converted into an annuity, pensioners loose control over their assets. It must be doubted, however, that they would do a better job in arranging for their retirement income if they were to draw from a lump sum and kept investing what is left. The reluctance to annuitize is then rather be due to an “illusion of control”. Individuals believe themselves to have control over an outcome over which they do in fact have no control. (Langer, 1975) Hence, one would expect people with high trust in their capabilities and decisions to be particularly reluctant to convert wealth into annuities.

2.1.2.11 Discounting and Impatience

The insight that, given the shortness of life, the rate of time preference is particularly high for long income streams was initially developed in the “theory of interest” by Fisher (1930). With annuities converting wealth into income streams reaching as far as the end of the holder’s lifetime, the choice to annuitize will heavily depend on one’s patience, i.e. rate of time preference. While this is not a behavioral bias per se, it does become a problem when impatience leads to situations in which retirees need to lower their retirement consumption more than they had initially planned to. Additionally, there is a link between heavy

discounting and other behavioral fallacies such as procrastination. (Reuben, Sapienza, & Zingales, 2007) Even more relevant for this research is the finding by Van der Heijden, Klein, Müller, and Potters (2012) of impatient people being more susceptible to framing effects.

2.1.3 The Framing Hypothesis

The following quote by late stoic philosopher Epictetus perfectly summarizes the essence of the framing hypothesis: *“(m) en are disturbed not by things, but by the views which they take of things.”*

In a series of publications, Kahneman and Tversky challenged the theory of rational consumer choice when demonstrating that the stability of preferences is severely affected by the frames through which prospects and outcomes are evaluated. (Kahneman & Tversky, 1984; Tversky & Kahneman, 1981, 1986) Describing a decision problem in terms of gains or in terms of losses as well as suggesting certainty in a situation of uncertainty (pseudo certainty effect) can reverse preferences.

More recently the concept was applied to explain the annuitization puzzle. Below it will be shown how annuities can be perceived very differently across different frames. Drawing from the already discussed behavioral biases it will be pointed out how individuals are affected by framing and how frames are deeply rooted in the way we think about annuities or the way we are made to think about them.

2.1.3.1 Framing annuities:

Of course one could think of many ways to frame the decision to annuitize. And in fact there have been different approaches: Since annuities are both, a collective longevity risk insurance as well as a financial product, highlighting either aspect will change how fair people perceive an offered contract. Annuities will appear more attractive when framed as the former. (Gentry & Rothschild, 2006) Another kind of framing occurs when people receive their pension statement in terms of retirement income streams as opposed to total lump sum values. Benartzi et al. found that plan members receiving income oriented statements are much more likely to annuitize, other things equal. (Benartzi et al., 2011)

The focus of this paper will be on the framing approach as it was brought forward by Brown et al. in recent years. (Jeffrey R Brown et al., 2013; Jeffrey R Brown, Kling, Mullainathan, Wiens, & Wrobel, 2008; Jeffrey R. Brown & National Bureau of Economic Research., 2008) The frames center around the difference between consumption related and investment related language. They were later expanded with effects from gains and losses:

2.1.3.1.1 Consumption vs Investment

Recall the result from the example given in Section 0: An annuity was shown to dominate the investment in a riskless bond because the earned mortality premium allows for higher expected levels of consumption (utility) during retirement. This result, however, takes into consideration two aspects: First, a pensioner needs to decide on how to invest her pension assets and second, she needs to decide on the preferred consumption path during retirement. In the end of course this is one single decision with one single overall effect on lifetime utility. Brown et al. argue, that mental accounting applies and annuities are either evaluated only as one possible investment among many (investment frame/account) or only as a smooth retirement consumption path (consumption frame/account).

In an **investment frame** annuities become relatively unattractive because their total pay-off depends on the unknown length of lifetime. Income from a riskless bond, in turn, will be independent from that stochastic variable. Additionally one runs the risk of losing the entire principle, while a bond could be passed on as bequest. The fear of losing the principle will be amplified by loss aversion, leaving the annuity overly unattractive. Furthermore, annuities appear as poor investments because of fiercer liquidity constraints. Recall that fear of liquidity has been shown to be a major concern in this context.

The complementary frame (in accordance with the relevant mental accounts) is the **consumption frame**. Individuals filtering annuities through a consumption frame will appreciate the protection against outliving their resources and not having to cut down on consumption in case of a surprisingly long life. Exchanging longevity insurance for a bond will then appear very unattractive, since the loss of longevity protection looms stronger than possible gains from holding the bond (loss aversion).

Brown argues, that the annuity puzzle observed on US-American markets is because annuities are usually evaluated in an investment frame. To what extent the framing hypothesis is universally applicable to annuitization rates in other national contexts remains to be discussed. This research adds evidence for the Dutch case in that context.

In order to **control for the effect** of consumption and investment framing in experiments, Brown alters the vocabulary used in explaining one and the same decision problem: For investment frames the decision problem will be explained in investment related language using words such as invest, risk, return, pay-offs etc. For the consumption frames, the language avoids anything related to financial products and talks instead about purchasing power, consumption payments etc.

2.1.3.1.2 Gains vs Losses

Prospect theory suggests that, departing from a reference point, losses have much stronger effects than gains and hence more potential to influence decisions. In this context, gains and losses refer to an initial annuity allocation from which the decision problem is either explained in terms of gains or losses.

As it was shown above, both frames are affected by loss aversion but in very different ways: In a consumption frame, individuals are afraid of losing their longevity insurance, whereas in an investment frame they fear the loss of principal. To dig into these interaction effects Brown et al in a later experiment on social security claiming behavior (Jeffrey R Brown et al., 2013) combined the investment and consumption frames with gain and loss frames. Hence there were four different frames, which are also part of this research: Investment-Gain, Investment-Loss, Consumption-Gain and Consumption loss.

2.1.3.1.3 Interaction

In the four interacted frames there are two behavioral effects at play: Loss Aversion and Pseudo Certainty Effect. According to the Reflection Effect these two separate effects interact with each other in a way that changes individual risk preferences. Below it is first explained how loss aversion and pseudo certainty each affect annuitization separately and then how they combine into the reflection effect:

1. **Loss Aversion (gains vs losses):** Because losses loom heavier than gains, annuities are more appealing in a loss frame than in a gain frame. Individuals want to avoid losing their annuities.
2. **Pseudo Certainty Effect (consumption vs investment):** The key difference between the consumption and the investment frame is how agents perceive the risks associated with annuities. In a consumption frame annuities are appealing because they are perceived as a certain payout. In an investment frame they are unattractive, because they are perceived as an uncertain payout.

Since the underlying risk is in fact identical and only the perceived riskiness changes, this can be seen as a practical application of the pseudo certainty effect as implied by prospect theory. The consumption frame creates a “pseudo certainty” or more applicable to annuities: The investment frame creates a “pseudo-uncertainty”.

3. **Reflection Effect:** Once losses and gains are interacted with certainty and uncertainty, prospect theory states that risk preferences reverse: People show risk aversion for positive gambles and risk seeking behavior for negative gambles. Thus they will prefer certain gains over uncertain gains but uncertain losses over certain losses. To put it differently, they take a gamble to avoid losses but they avoid gambles to increase possible gains.

Individuals will show a strong preference for annuities when additional annuitization is explained in consumption language (certain gain) and will have less interest in annuities when investment language is used (uncertain gain).

When however the effects of less annuitization are explained in investment language (uncertain loss), agents will show more demand for annuities than when consumption language is used (certain loss). Now they do take the gamble in order to avoid losses.

The table below summarizes, how the different behavioral effects change the way annuities are perceived (framed). In the effect columns, “+” and “-” indicate the impact on annuity demand stemming from a specific behavioral effect. For each column the arrows highlight where the behavioral phenomena affect annuity pick up differently in a pairwise comparison.

Table 1 Frames and their impact on Annuity Demand

Frame	Effect of Loss Aversion	Effect of Pseudo Certainty	Annuity perceived as	Risk Preference	Effect of Reflection Effect
Cons Gain	+ Annuity 	+ Annuity	Certain Gain	Risk-Averse	+ Annuity 
Cons Loss	++ Annuity 	+ Annuity 	Certain Loss	Risk-Seeking	- Annuity 
Invest Gain	+ Annuity 	- Annuity 	Uncertain Gain	Risk-Averse	- Annuity 
Invest Loss	++ Annuity 	- Annuity	Uncertain Loss	Risk-Seeking	+ Annuity 

2.1.3.1.4 Framing as a Nudge: Net Effects and Comparison to a “Neutral Frame”

In the introduction it was argued that framing can be a tool to actively steer individual decision taking and lays therefore right at the verge of a “nudging” approach to the annuitization decision. (for a brief discussion of the concept and its implications see section 7) When looking at framing as such a tool, the above analysis suffers one strong restriction: It is only focused on how the four frames compare to each other. Theory consistently predicts why annuities are more appealing in a consumption gain frame than in an investment gain frame (certain gain is preferred over an uncertain gain) and why they are more appealing in an investment loss than in a consumption loss frame (uncertain loss is preferred over certain loss). This analysis does also well in explaining different annuitization rates across countries in which people (collectively) value annuities through different frames. Imagine for instance the US-American case: It has been argued that plan members, when considering to buy an annuity, filter the decision problem through an investment (gain) frame. This paper argues that in the Dutch case annuities are seen through a consumption (gain) frame. Hence, the above theoretical framework predicts that annuities are more appealing to Dutch plan members than they are to their US-American peers. But what remains to be shown is how people react once they are actively framed. Predictions need to be made in which direction decisions are steered once the frames are applied as tools of nudging (or information architecture). In the experimental context this raises the question of how the frames compare to a neutral frame. What is the net effect of the four frames once they are applied? While this research acknowledges that there is no such thing as an entirely neutral frame and that participants will always be partly framed by their previous real life experience, it is argued that the frames have predictable net effects and therefore serve as implementable nudges in policy design:

- *The consumption gain frame* is expected to have an overall positive effect on annuity demand. Respondents like gains as well as safe consumption paths.
- *The Consumption loss frame* is expected to have positive net effect as well. Even though annuities are presented in terms of certain losses, which people dislike compared to an uncertain loss, the overall effect will be driven by their fear of losing parts of their safe consumption path.
- *The Investment Gain frame* will be the only frame with a negative net effect on annuity demand. Even though people like gains, they strictly dislike positive gambles and will therefore prefer more lump sums.
- *The Investment Loss frame*, in turn, will incentivize individuals to take up more annuities. Even though they dislike the uncertainty of the annuity, they are inclined to take a gamble (the annuity) in order to avoid losses.

3 The Dutch Pension System and how it relates to framing

Since this research project takes the framing hypothesis to the Dutch case it is imperative to have a basic understanding of the Dutch pension system and its specific set of institutions. Over the decades, these institutions and pension arrangements have shaped the way Dutch plan members think about their pensions. Especially when it comes to annuities they will look at things from an angle very different from what can be expected in the US-American case.

The pension system in the Netherlands is based on three pillars: A first pillar, public pay-as-you-go pension (AOW-pension), an obligatory second pillar funded system and a complementary third pillar to provide for additional tax sheltered retirement saving. (Pensioen-Federatie, 2015)

The **first pillar** pension guarantees a minimum degree of annuitization regardless of previous income or employment. Its height depends on the time insured under the AOW-system and whether or not one lives with a partner. The pension is paid out from the moment, “aow-age” is reached, regardless of one’s occupational situation. Rates range between 767.39€ for married and 1113.56€ for singles per month, which can go up to 1509.43 if a partner does not receive AOW pension yet.⁴ From these numbers it becomes apparent that the first pillar will make for a considerable amount of pension income at the lower end of the income distribution. It must be assumed that whatsoever annuitization behavior is observed, it will be partly driven by the relative importance of the state pension.

Participation in a fully funded **second pillar** pension scheme is obligatory for all employees. (self-employed are not eligible for collective employer sponsored plans) These pension plans are mainly run by pension funds and are independent from the employing company. As a result, pension rights are hardly affected by the bankruptcy of the employer. Pension funds in the Netherlands can be industry-wide funds, corporate funds or funds for independent professionals. In the past, nearly all schemes, were traditional DB plans with fully indexed pension rights based on final salaries. Even though there is a shift towards conditional indexation in so called hybrid DB plans with pension rights based on average salaries, the Dutch pension system is still highly collective in its main characteristics. It is far from being as individualistic as the US system: Accrual rates, contribution rates, indexation rates, asset mixes as well as benefit cuts (if necessary) are all uniform. Also it is important to note, that currently there is no such thing as (partial) lump sum payments. Pension wealth is automatically converted into an annuity by the fund it has been accrued in. To put it differently, the annuitization rate in the dutch second pillar equals 100%.⁵ As it has been discussed in the introduction there is an ongoing debate regarding the implementation of partial lump sum payments. Despite the collective nature of Dutch pension plans there are several choices individuals can make especially with respect to pension payouts. For an overview of these choice options see chapters 5.3.1 and 6.1. With respect to financial stability and reliability the Dutch system does extraordinarily well. The supervision of pension funds

⁴ The partner supplement is currently phasing out. More details on this and other aspects are provided by the “sociale Verzekeringsbank”: https://www.svb.nl/int/en/aow/hogte_aow/bedragen/index.jsp

⁵ note that funds may have different cash out options for accruals below 417,74€ gross per annum (2009),(Pensioen-Federatie, 2015)

enforces strict rules with respect to funding ratios: In case a fund's assets fall below 105% of liabilities a recovery plan needs to be presented. While plan members did forgo indexation in distressful times in the past, Dutch pension rights are generally regarded as safe. (M. C. Van Rooij et al., 2007) For an overview of the main characteristics as well as differences to other systems, see Kemna et al. (2011).

Another important feature are uniform pension statements. Dutch plan members receive annual statements on their projected accrual upon retirement, given their current income level. These statements do not indicate the total value of accrued wealth but give expected yearly pension income. This of course has important implications for the framing hypothesis. Mottola and Utkus (2007) find significantly higher annuitization rates, when pension accrual is stated in terms of annuities rather than lump sums. Benartzi et al. (2011) find the same pattern and argue this is because accrual in lump sums fosters investment framing, while accrual in annuities promotes consumption framing.⁶ It is therefore reasonable to assume that Dutch plan members, by nature, filter the annuitization decision through a consumption frame rather than an investment frame.

The third pillar summarizes all additional and individual pension products. It is mainly used by self-employed as well as employees for which no collective scheme is available or who want to build up additional pension rights. (Pensioen-Federatie, 2015)

4 Research Questions and Hypotheses

As it has been discussed in the introduction, this paper contributes to the empirical literature on annuity demand in two ways.

First, it assesses the driving variables behind **annuity demand** in a very unique institutional and cultural environment. Since empirical research will always be biased by specific institutional and cultural settings, it is crucial to countercheck explanations in different environments. It will be shown, in how far rational drivers and behavioral biases play a role in the Dutch environment. Four questions are answered in particular:

Q1. Do plan participants take active choice (within the currently possible options) with respect to their pay-out structure? Is there an increasing trend?

H1: Given the current debate on individualistic pension solutions there will be a considerable increase in active choice over recent years.

Q2. Will plan participants (of the underlying fund) make use of partial lump sum payments, if such option was introduced to the Dutch pension system?

H2: Given, that the Dutch are not familiar with the principal values of their pension accrual, it is likely that they filter the decision problem through a consumption frame. They will therefore prefer full annuitization over partial lump sums.

⁶ They further argue: "this is consistent with what is called the compatibility hypothesis in psychology. The basic idea is that choice attributes will be weighted more heavily when they are compatible with the response scale than when they are not. [...]" (Slovic, Griffin, & Tversky, 1990)

Q3. *Which characteristics (economic and behavioral) are associated with higher lump sum take-up and which with higher degrees of annuitization?*

H3: Even though the Dutch institutional environment is unique in its own way, we expect to confirm the previous literature on rational and behavioral drivers⁷. The fundamental mechanisms will be the same as in any other context.

Q4. *Can the choice outcome with respect to partial lump sum payments and high low constructions be steered by default setting?*

H4: In line with the literature, adherence to defaults is expected.

Second, a cross check of the **framing hypothesis** will be carried out. Applying the frames suggested by Brown et al. to the Dutch case will shed light on the general validity of the framing hypothesis and provide additional evidence on the steerability of individual choice through information architecture. Specifically, three questions will be answered:

Q5. *Can framing effects explain annuitization behavior in an institutional context that fosters consumption frames rather than investment frames? Can choice outcome be steered through active framing?*

H5: Despite the specific Dutch context, all frames are expected to have significant impact on annuitization rates. Since respondents are assumed to filter the decision through a consumption frame by nature, the consumption frames are expected to lead to less variation in annuity demand.

Q6. *Is the framing hypothesis (consumption vs investment and gains vs losses) robust to the inclusion of other explanatory variables⁸ and what role do other variables play, once plan members are actively framed?*

H6: Framing will have most explanatory power for the variation in annuitization rates. "Hard characteristics" such as risk appetite, bequest motive, debt and intertemporal discounting are expected to be influential even under framing.

Q7. *Does framing interact with other variables? Is the sensitivity to framing dependent on certain characteristics?*

H7: Given that framing effects result from human biases in processing information, characteristics such as age, gender and cognitive skills are expected to change the sensitivity to framing, as they also change how information is processed.⁹

⁷ Explicitly formulating hypotheses for all rational and behavioral variables that are added to the regression specifications at this point is avoided to keep hypotheses simple. For a full list of testes variables and corresponding hypotheses with respect to their relation to partial lump sum take-up see Table 15 in the appendix.

⁸ See note 7

⁹ For an overview of how these characteristics affect information processing see: Darley and Smith (1995); Kirsh (2000); Phillips and Sternthal (1977)

5 Methodology and Data

In order to answer the above-described questions, data from a survey-based experiment with a hypothetical annuitization decision is analyzed. The stated annuitization preferences can be matched with an array of behavioral and rational variables which has been obtained through the survey and internal client data. Additionally, data on past choice behavior was made available by the fund. Note that the literature mostly explains “annuitization rates”. Because of the specific Dutch context and because the experiment does not allow for 0% annuitization, the analysis will focus rather on lump sum take-up than on annuity take up. In the end these are two sides of the same coin. However, given the Dutch context, it is more intuitive to talk about lump sum take-up or the acceptance of the hypothetical partial lump sum option.

5.1 Three step approach

The analysis of lump sum take-up proceeds in three steps, answering the above research questions:

1. Real past choice behavior will give a first impression of recent trends. (only of currently available choice options; there is no data available on partial lump sum take-up) As far as the data allows, the characteristics of active choosers as opposed to passive choosers will be pointed out. (Q1)
2. Since there is no such thing as lump sum payments in the Dutch pension system, the second step will establish a hypothetical baseline level of (partial) lump sum pick up from a survey-based experiment. All necessary information is given in the most neutral way possible. This will give stated lump-sum preferences under a minimum degree of private information.¹⁰ At this point it will also be possible to draw a picture of the typical “full annuitizer” and the “lump sum taker”. (Q2 & Q3) The baseline level of lump sum take-up will later serve as the benchmark when assessing the impact of active framing.
3. Eventually the impact of framing can be assessed. Keeping other things equal, the language and explanatory examples in the experiment were altered in accordance with the four frames explained above: Consumption gain (CG), Consumption loss (CL), investment gain (IG) and investment loss (IL). Additionally two frames with different defaults were applied: One, with a default set at 0% lump sum (Dflat) plus a flat annuity and one with 10% lump sum payment plus a high-low construction (Dhigh). The assessment of framing proceeds in three sub-steps:
 - 3.1. The level of lump sum take-up across the different frames and defaults is analyzed giving a first idea of the direction the frames and defaults work in (if they have an impact at all). (Q4& Q5)
 - 3.2. Regression analysis will be run, to assure the statistical significance of the results of step 3.1 and to test for the robustness to the inclusion of other variables. At this point it will also become apparent which other (rational and behavioral) variables show explanatory power for the annuitization decision. (Q6)

¹⁰ The idea is to be as transparent as possible in order to rule out information asymmetries on how lump sums and annuities are calculated and what rules apply to indexation. The fund, however keeps an information advantage over the necessity to cut indexation and the plan member keeps her private information on life expectancy given her health condition.

- 3.3. As a last step, interaction terms between frames and other variables will be added to the regressions from 3.2. The question at hand is, which characteristics are associated with a higher or lower sensitivity to framing. (Q7)

5.2 The Experiment

The experiment as such is a personalized two-step allocation game. In step 1, respondents allocate their projected pension income to a lifetime annuity and a (partial) lump sum payment of up to 20% of the projected pension right. In step 2, respondents can decide to receive the resulting annuity as a flat annuity or they can choose for a high-low/low-high construction. Respondents were allowed to switch back and forth between the two steps to assure they choose what they considered an optimal allocation. The second step was included in the game in order to make the decision more realistic for Dutch plan members and also because it is in essence a form of lump sum payment that is already available in the Netherlands. The choices people make (or would make) in their high-low decision are expected to heavily influence the lump sum take up and vice versa. By looking at the two steps it will become apparent in how far respondents are consistent in their preference for early/late cash and in how far it is possible to frame the already available high-low option. To avoid further complications, some real life options (see 5.3.1) were fixed in the experiment: Retirement age was fixed at the aow-age (67), partner pension reallocation was left out and the high low switching point was set to age 70. Further note, that the conversion between annuity payments and lump sum payments as well as between high-low payments is based on uniform actuarially fair discount and exchange factors as they are currently applied by the pension fund. This also includes gender and birth-cohort specific mortality tables.

5.2.1 Methodological Remarks on Annuity Experiments – Advances and Pitfalls

The experiment's objective is to derive stated preferences that get as close as possible to real life (revealed) preferences regarding annuities and lump sum payments. In fact, it has been shown that stated preferences of risk attitudes and consumption paths are closely related to predicted behaviors. (Barsky, Kimball, Juster, & Shapiro, 1995) Even more relevant for this research, appear parameters based on revealed preferences to be similar to parameters based on stated preferences. (Louviere, Hensher, & Swait, 2000). Nevertheless, two major caveats of stated preferences remain, especially in the context of annuities: First, the decision as such has no real consequence, while it would have massive consequences in real life. In other words, the stakes feel much higher in a real life decision. There will be some bias, because people may not put as much thought in their decision as they would in real life. Second, the presented decision problem, its dimensions and the hypothetical stakes may be too far from what many respondents can relate to in a meaningful manner. In fact, many annuitization experiments suffer from alienation bias (Hanemann, 1994; Whittington, 2002), stemming from the applied "one-size-fits-all" decision problems: Cappelletti et al. (2013) asked Italian survey respondents whether they prefer a monthly annuity of 1000€ to a variety of lump sum payments. Agnew et al. (2008) run a multi-period pension income allocation-/investment-game, in which respondents allocate an initial endowment of 60€. Beshears et al. (2014) give a lump sum equivalent value of \$330.000, which is then allocated across different optionalities. Similarly, Jeffrey R Brown, Kling, Mullainathan, and Wrobel (2008) test for the framing hypothesis in an online survey experiment with different choice options all worth 100.000\$.

Regarding the first problem, the fact that respondents deliberately signed up for being a panel member implies they are well involved in pension related questions and may take the decision problem seriously. But still, this does not imply they put as much thought in the decision as if their real pension accrual was being affected. The second problem, alienation bias, is more likely to be minimized: First, the experiment was conducted through the pension fund the respondent is enrolled in. And second, the figures presented in the choice options are based on respondents' individual, real projected pension accrual (as in the yearly uniform pension statements received by plan members). Even though the consequences of the decision are not to be faced, the stakes at play are as they would be in a real life situation. Overall this creates a very realistic scenario of choice options the respondent can actually relate to. This is a major advantage over one-size-fits all decision problems as they are often applied in the experimental literature.

5.2.2 Setting up the Two Step Decision Problem

The allocation game / hypothetical annuitization decision is set up in two steps, each on a separate page in the online survey:

In **step 1**, respondents are introduced to the allocation game. They are asked to imagine they retire at age 67 where they will have accrued X€ in annual pension rights. They are told that they decide on their preferred pay out scheme in two subsequent steps. After a brief introduction to the two steps, it is explicitly stated that the first choice will influence the options in the second step and that they can switch back and forth as often as they wish. Additionally, they are informed that the pension fund aims to adjust for inflation. (Which is in line with current practice, see chapter 0) Then, an example explains how a decrease/increase in lump sum take up affects one's annuity. In this explanatory example, respondents are treated with different wording according to the four frames.

On the same page respondents are asked to take the first step and select one out of five lump sum cash outs (0%; 5%; 10%; 15%; 20% of total pension right). For every option the remaining annual pension right is displayed as well. For an individual with 24000€ of projected annual pension right the choice options in step 1 appeared below the explanatory text as in Table 2 .

Table 2 Choice Options Step 1

- eenmalig bedrag = 0 & jaarlijkse uitkering = 24000
- eenmalig bedrag = 17100 & jaarlijkse uitkering = 22800
- eenmalig bedrag = 34200 & jaarlijkse uitkering = 21600
- eenmalig bedrag = 51200 & jaarlijkse uitkering = 20400
- eenmalig bedrag = 68300 & jaarlijkse uitkering = 19200

In **step 2** (on the following page) respondents receive further explanations on the high-low decision as well as an explanatory example which again differs in wording according to the frames. Below, they see eleven choice options: One flat annuity which is exactly the remaining annual pension right from step1 and five high-low as well as low-high schemes covering both, the upper and lower most extreme allocations currently allowed for by the pension fund.¹¹

¹¹ The ratio between the highest and lowest payment must not be higher than 100:75. That is after including the aow-pension .

Respondents can either select an option and proceed to the following questions or go back to step 1 if they are not happy with the offered options in step 2.

The offered high-low constructions all have a fixed “switching-age” of 70. While this may not be the preferred switching point for all respondents, this simplification was introduced in order to make the experiment only as complicated as necessary.

Given that the above-mentioned individual chose for the second option in step 1, the presented options in step 2 will be as in Table 3.

Table 3 Choice Options in Step 2

- Bedrag in de eerste 3 jaar = 15700 & bedrag vanaf het 4e jaar = 20900
- Bedrag in de eerste 3 jaar = 19500 & bedrag vanaf het 4e jaar = 24400
- Bedrag in de eerste 3 jaar = 20400 & bedrag vanaf het 4e jaar = 24000
- Bedrag in de eerste 3 jaar = 21200 & bedrag vanaf het 4e jaar = 23600
- Bedrag in de eerste 3 jaar = 22000 & bedrag vanaf het 4e jaar = 23200
- Bedrag in de eerste 3 jaar = 22800 & bedrag vanaf het 4e jaar = 22800
- Bedrag in de eerste 3 jaar = 23600 & bedrag vanaf het 4e jaar = 22400
- Bedrag in de eerste 3 jaar = 24400 & bedrag vanaf het 4e jaar = 22000
- Bedrag in de eerste 3 jaar = 25400 & bedrag vanaf het 4e jaar = 21600
- Bedrag in de eerste 3 jaar = 26400 & bedrag vanaf het 4e jaar = 21100
- Bedrag in de eerste 3 jaar = 27400 & bedrag vanaf het 4e jaar = 20600

5.2.3 Implementing the frames

In total there are seven different frames: Neutral (baseline), consumption gain, consumption loss, investment gain, investment loss, flat default, partial lump sum default. All of the frames were designed in such a way, that they contained the same amount of information and the same explanatory examples. They only differ in wording or the preselected default. For details on the wording, see the exact Dutch survey questions in the appendix. It is important to note, that all respondents were randomly assigned to only one of the seven frames. While this does slash observations per frame (459-486 per frame), it allows for high quality data without any disturbance from learning and spillover effects.

The Neutral Frame gives a hypothetical baseline level of annuitization for the Dutch case once partial lump sum payments are allowed for. It also serves as the benchmark level of lump sum pick up against which the other frames are compared. It does neither use explicit consumption related language nor investment related language, but only lays out the facts as neutral as possible. The explanatory example goes both ways, meaning gains and losses to assure neutrality.

The Flat Default is exactly the same as the neutral frame in terms of language and examples, but adds one sentence explaining, that if the respondent prefers not to take an active choice herself, the fund has preselected 100% annuitization (i.e. zero lump sum) and a flat annuity (i.e. no high low variation). The corresponding choice options were preselected (pre-activated) in the online survey and could be altered by the respondent.

The 10% & High-Low Default is a variation of the flat default. The only difference is, that now a 10% lump sum pay out and the second high low allocation (pension during first three years of retirement 10% larger than for the remaining lifetime) is pre-selected.

The Consumption Gain Frame differs from the neutral frame in terms of language and examples. The wording explains the tradeoff between lump sum payments and annuities in terms of purchasing power and “money to pay the bills”. This is expected to highlight the longevity insurance component of the annuity. In the examples it is explained how

purchasing power can be increased and additional protection against having too little to spend during retirement can be gained by picking a smaller lump sum. For the second step this is by picking a lower pension during the first three years of retirement.

The Consumption Loss Frame uses the same language and terms as the consumption gain frame, but rather explains how one loses purchasing power and money to spend when picking a higher lump sum (higher early pension in step 2).

The Investment Gain Frame uses investment related language such as return on accrued pension assets. Thereby the annuity is expected to be perceived as a financial product with uncertain returns. The examples then explain how one can increase yearly returns by choosing for a smaller lump sum (lower early pension).

The Investment Loss Frame is again identical in wording to the IG-frame but uses examples explaining how yearly return will decrease once a higher lump sum (higher early pension) is chosen.

5.3 Sample Group and Data

There are two datasets being used for the research project: First, the past choice data and second the observations from the survey. Both datasets contain only observations from the same, single, Dutch pension fund. While individuals may differ, they are both sub samples of the same pool of subjects.

5.3.1 Past choice data

The fund provided for data on choices taken by 36189 plan members upon retirement covering the years 2007 to 2014. Individuals had the following choice options:

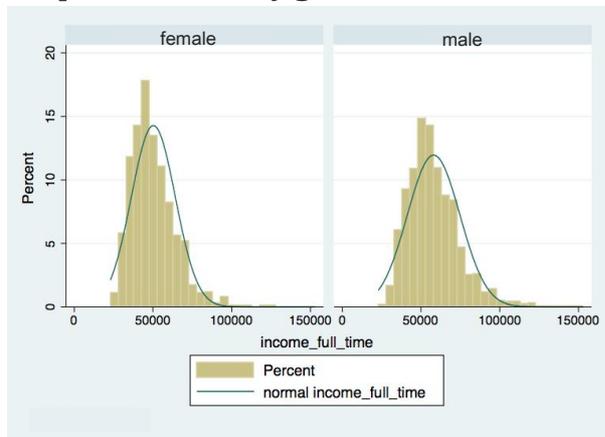
- **Retirement age:** Individuals can choose to retire before or after the statutory retirement age (aow-age). Early retirement leads to lower pension income. Beyond the statutory age, there is no additional accrual.
- **Part Time Pension:** Next to an immediate switch from full employment to full retirement, plan members can work part time during late years of employment and “fade into retirement”. During this period, they may receive a part time pension on top of their work income.
- **Exchange partner pension:** Plan members automatically accrue pension rights for their partners as they accrue for themselves. Upon retirement they can choose to allocate a larger part of total accrual to their spouse’s pension or move more to their own pension.
- **High-Low Construction:** High-low constructions allow for higher (lower) payments during an initial time span after retirement and a lower (higher) pension for the remainder of one’s lifetime. The option can fulfill two purposes: First, it allows to bridge shortcomings in pension income when retiring before reaching aow-age. And second, it allows for individualized consumption paths. In a way, a high low construction can be seen as a spread out partial lump sum solution. A low high construction would be the exact opposite of a lump sum payment. Note, that the current default is a flat payout. This includes an automatic compensation mechanism (high-low construction) for the missing aow-pension when retiring early.

Because the focus of this research project is on lump sum payments and high low constructions, the past choice dataset will only be employed to give an in depth analysis of recent high low choices. It will be shown to what extent pensioners already take active choice (deviate from the default) and appreciate more or less liquidity during early years of retirement. The chosen high low constructions can be matched with an array of socioeconomic variables.ⁱⁱ Additionally it will be shown, how these trends evolved over time. With respect to the remaining choice options, previous research within the same pension fund will provide for an overview.

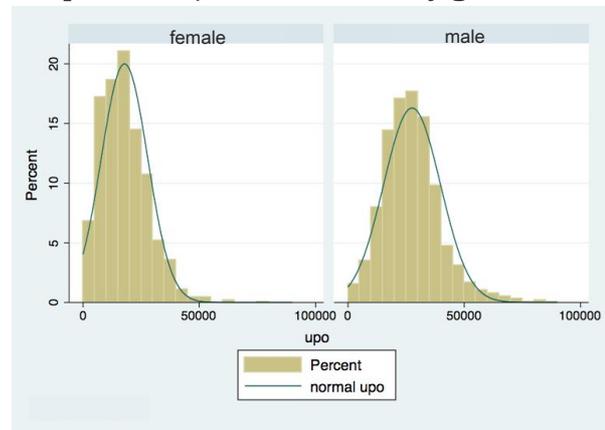
5.3.2 Survey Data

The survey conducted among plan members had two purposes: First, collect a vast set of relevant variables for the annuitization decision that was not available in the client database. And second, run an experiment with a hypothetical lump sum vs annuity choice to test for plan members reactions to partial lump sum payments and framing. This part will give a brief introduction to the obtained dataset and some of the constructed variables.

Graph 3 Income by gender



Graph 4 Projected Pension by gender



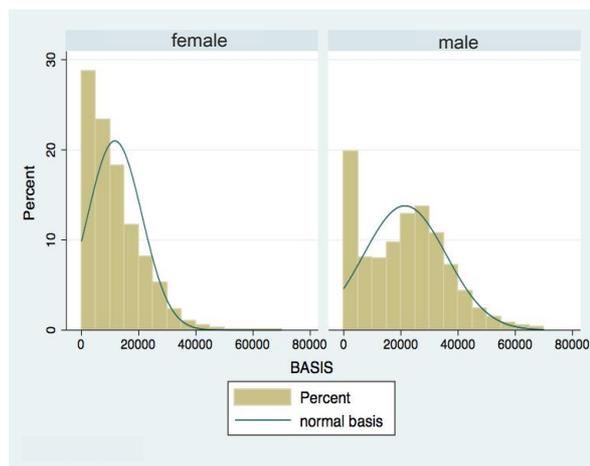
5.3.2.1 Obtained Dataset

The online survey was sent to 15.000 individuals, which were randomly selected from a panel of plan members available for client research projects. After two weeks, 3.161 plan members had answered at least all questions including the experiment of which 2.963 had answered all questions.¹² Since all questions forced responses before proceeding to the next question, the above difference arises only from dropouts. The panel as such shows an overrepresentation of elderly as well as more “involved” plan members. The average age of the respondents was 55.2 years (Median=57.8, Min=23.4, Max=65.2), 72.6% were male and 71.2% married. Male earned an average full time income of 58.475€ and female of 50.220€ per year. Projected retirement income was on average 17.834€ for women and 27.578€ for men. For the entire fund, there are 51% women and 57% married plan members. The strongest age group is the one between 55 and 65 with 57% being 45 years or older and 29% being 55 years or older.

¹² To ensure data-quality, those who had taken a decision on the first choice in less than 2.5 minutes were dropped from the dataset (it is impossible to answer the preceding questions and absorb all information within that time)

The sample is not assumed to be perfectly representative for the fund's population. A number of selection biases must be expected: First there is a strong overrepresentation of male respondents. Since male plan members earn on average higher incomes, the average income among survey respondents will be higher. Additionally there will be a bias towards individuals showing more interest in pension related issues since participation was voluntary. These expected biases, however, have no impact on the assessment of the framing hypothesis since control variables addressing all expected effects are included in the regression analysis.

Graph 5 Distribution Basis Pension by Gender



5.3.2.2 Derived Variables

From the survey four types of variables can be derived which will later be used in the statistical analysis of annuitization behavior: Variables to be explained (dependent variables), framing variables (independent), behavioral explanatory variables (independent/control) and rational explanatory variables (independent/control). Below only selected variables will be discussed in detail. For a full list of variables see Table 15 in the Appendix.

The Dependent Variables capture the choices taken in the two steps of the experiment, hence the stated annuitization and lump sum preferences. The following variables will be explained in the analysis:

- *lump sum take up* (which can take the value 1,2,3,4,5 for lump sum take up of respectively 0;10;15;20% of total projected pension right)
- *lump sum* (dummy variable= 1 if one of the four partial lump sum options was selected)
- *high-low-allocation* (dummy variable =1 if a high-low allocation was chosen)¹³
- *low-high-allocation* (dummy variable =1 if low-high allocation was chosen)

The framing variables are dummy variables indicating the frame the experiment was presented in. They are used to assess the framing hypothesis in statistical testing. The following six dummies were constructed: cg (consumption gain); cl (consumption loss); ig (investment gain); il (investment loss); dflat (default set to 0 LS and no high-low); dhigh (default set to 10% LS and high-low)

Rational Variables mostly expand the explanatory framework given by standard life-cycle models (see chapter 2.1.1). They serve as control variables when assessing the robustness of the framing hypothesis but also as explanatory variables when defining the driving characteristics of annuity and LS take-up. Mostly they capture standard socioeconomic variables covering income, wealth, annuitized wealth, house-ownership, debt, pension accrual, marital status, bequest motives but also risk preferences, intertemporal discounting,

¹³ high-low meaning that a higher pension during the first three years of retirement will be paid and low-high meaning that a lower pension during the first three years will be paid

health-condition and life-expectancy. For a full list of variables and brief explanations see Table 15 in the appendix. Below, only those variables are explained in detail which were constructed from multiple survey questions:

- *Risk aversion* is measured following the survey based approach by Barsky et al. (1995) where people are subsequently offered more risky, but possibly better paying job opportunities. From these income gamble questions respondents can be divided into four groups. For future research it is important to note that the examples used by Barsky et al. may need to be calibrated to the underlying case. For the sample underlying this research there is not much variation and a strong skew towards highly risk averse individuals (given, that a well calibrated measure should yield a normal distribution, there should not be 68% falling in the most risk averse group). While it may still be the case, that the entire sample is very risk averse, the measure will not be suited to explain intra-sample variation in annuity choice.
- *Discount* measures the individual rate of time preference. Patience in waiting for a lottery payout is employed as a proxy. Respondents are told to imagine they won a lottery, which pays out in one year. Then they are asked how much of the prize they were willing to give up in order to receive the money now. The questions are as in (Cappelletti et al., 2013) and sort respondents into five groups of discounters.

Behavioral Variables are designed to detect individuals showing difficulties in properly valuing annuities. They derive from the behavioral literature discussed above (see Chapter 2.1.2.). It is important to note that while these variables are behavioral in nature, the behavioral bias, this research focuses on, is the framing effect. In that sense, are these additional behavioral variables rather control variables that help to assess the robustness of the framing effect and the relevance of purely rational explanations. Variables include: involvement, trust, financial and pension literacy, literacy confidence, education, cognitive overload, decision confidence, regular debt on cash account. For a full list of variables and brief explanations see Table 15 in the appendix. Below, only those variables are explained in detail, which were constructed from multiple survey questions:

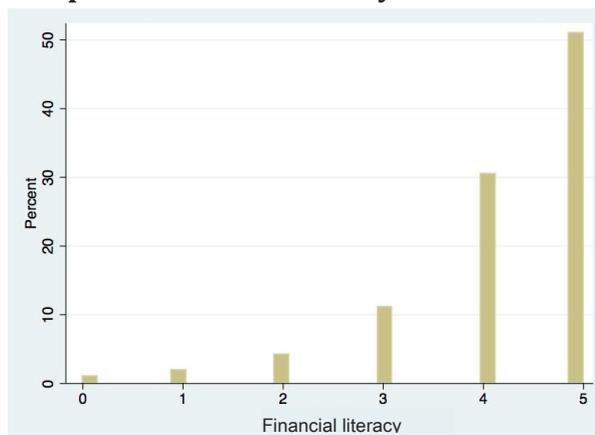
- *Involvement* ranges from 0 to 1 and is constructed from five statements to which respondents had to indicate their degree of agreement on a five point likert scale.ⁱⁱⁱ The questions were taken from previous, internal research projects. The average score was 0.84. Cronbach's alpha¹⁴ to test for the reliability of the constructed variable yields 0.73.
- *Trust* ranges from 0 to 1. It is derived from one question and the agreement to three statements on systemic and pension fund specific trust, which was to be indicated on a five point likert scale.^{iv} Average = 0.57 ; Cronbach's Alpha = 0.81
- *Cognitive overload* ranges from 0-1 and is constructed from the agreement (five point likert scale) to four statements as they had been brought forward by Agnew and Szykman (2010).^v Average=0.53 Cronbach's Alpha=0.84

¹⁴ Cronbach's Alpha can be defined as „[...] the internal consistency or average correlation of items in a survey instrument to gauge its reliability.” (Santos, 1999). The measure ranges from 0 to 1.

- *Pension Literacy* captures system specific literacy through eight knowledge questions as they have been previously used within the fund. They are combined into a score ranging from 0 to 1. Average=0.78 Cronbach's Alpha = 0.6
- *Financial Literacy* is an application of the measure and questions developed by Lusardi and Mitchell (2007). It was scaled from 0 to 5. Average = 4.2 Cronbach's Alpha = 0.53.

The average may be showing two things: Either the original questions are not suited to the underlying population (too easy), or the population is indeed very literate and therefore shows little variation. Defining what is actually the case, however, is beyond the scope of this research. Furthermore is it surprising, that an often-applied concept shows such low (alpha) reliability (regardless of the low overall variance).

Graph 6 Financial Literacy Distribution



6 Analysis & Results

As discussed in section 0, all initially posed research questions will be answered following an analysis in three steps. Step 1 will describe past choice behavior, Step 2 assesses expected lump sum take up for the Dutch environment under a neutral frame and step 3 will dig deeper into the framing hypothesis and the drivers of lump sum take up. At the end of each sub-chapter conclusions summarize the most important insights. The earlier raised research questions will be addressed by rejecting or not rejecting the hypothesized answers (see section 4).

6.1 Step1: Past Choice Behavior

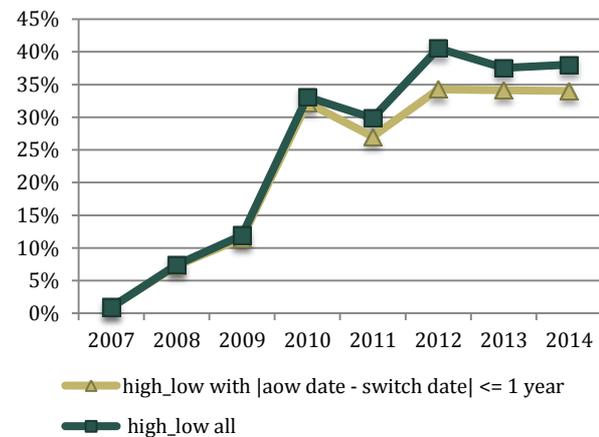
This chapter will give an overview of the choice activity within the underlying pension fund during recent years. As the survey experiment (Step 2 and 3 of the analysis) allows only for adjusted high low constructions and lump sum cash outs, the focus in this first step of analysis will be on past high low choices. Other available choice options (retirement age, part time retirement, exchange partner pension) will be addressed briefly based on previous projects within the same fund.

6.1.1 High-Low Constructions

Of all observations, 33.7% chose some sort of high low construction. This large share, however, is mainly because high low constructions are automatically applied in order to compensate for missing aow-pension when retiring prior to aow-age. Hence, a large part of the high-low uptake will be because of early retirements and current default settings.

The dark green line in Graph 7 shows the overall increase in high-low constructions during recent years. The light colored line illustrates the share of “passive high-low choosers”, namely those who accept the default switching point (aow-age) or those who pick a switching date not further than one year from aow-age. Since 2010 a spread between the two graphs evolved indicating a significant share of retirees choosing high low constructions that go clearly beyond compensating for a missing aow pension.

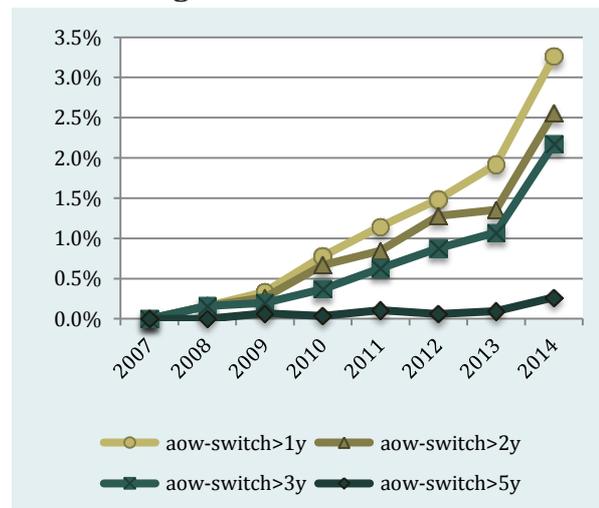
Graph 7 Share of high-low/ low-high choosers



For this research it is more interesting to focus on plan members taking such active choice. (plan members whose high-low switching points lay relatively far from aow-age) These “active timers” express a clear preference for or against higher liquidity during early retirement (high-low/ low-high choosers).

Graph 8 illustrates how the share of active timers evolved over time. The four graphs show the trends for those choosing a high-low switching point at least 1 year, 2 years, 3 years and 5 years from the date they reach aow-age. In fact, there has been a significant increase of active timers over the past years. And what is more, most trends do not level off around 2010 (as for the overall number of high-low choosers) but keep a positive slope. The increasing number of active timers reflects the recent trend among Dutch plan members towards more individualization as well as the heterogeneity preferences.

Graph 8 Share of active high-low /low-high choosers



The next step will be to assess the characteristics associated with a typical active timer. The focus will be on those choosing a switch date at least 2 years away from the date they reach aow-age. The data show that males are more active, with 1.72% choosing a switching point at least 2 years away from aow-age, whereas among women the share is only 1.04%.¹⁵ For married this share is 1.61% while it is only 0.93% for unmarried. Furthermore, active timing appears to be related to income: Active timers show an average income of 53600€ while the opposite group has an average work income of 40400€. Not surprisingly are the accrued pension rights of active timers significantly higher with 29800€ vs 17400€ for passive timers. In line with this finding they also work ten percentage points more hours. Table 4

¹⁵ Note: If not stated otherwise, all differences across characteristics in conditional averages and shares of choice variables are significant at the 1% level (according to t-test, not reported here).

summarizes how active timers differ from the opposite group (passive timers and no high low construction). The regression results in Table 7 mostly confirm these trends. Gender, however, shows no significant relation once it is controlled for income related variables.

Table 4 Average characteristics of Active Timers and Non-Active Timers

Active Timer	Male	Married	Work Income	Part Time Factor
Yes	56.3%	72.6%	40,365.6 €	78.5%
No	68.2%	82.1%	53,568.1 €	88.1%

6.1.2 Other Choice Options

Dellaert and Ponds (2014) and fund-internal research have found rather mixed evidence on the remaining choice options. For an overview see Table 5.

Table 5 Average use of choice Options

	2007	2010	2013	2014
Early Retirement	27.5%	20.5%	25.9%	28.0%
Late Retirement	-	-	2.6%	4.5%
Part Time Retirement	2.2%	7.0%	5.8%	7.1%
Allocate from partner to own pension	-	-	54.1%	47.2%
Allocate from own to partner pension	-	-	0.2%	0.3%

Source: Dellaert and Ponds (2014) and fund internal sources

While there is currently no trend towards more active choice in reallocating between partner pension and own pension there appears to be more and more active choice with respect to retirement age as well as part time retirement. Even though these may be rather reactions to the gradual increase in retirement age in recent years, they are active decisions that imply a deviation from the preselected default. In fact, it is well possible, that a status quo bias towards the old retirement age in combination with the increasing statutory retirement age fosters active decision taking and leads to less adherence to defaults. People are then (unintentionally) being educated towards more active decision taking.

6.1.3 Conclusions

Coming back to the first research question (Q1), the above section presents mixed results. The hypothesis, that in recent years, plan members have increasingly taken active choice with respect to their pay out structure cannot be rejected when focusing on active timers. But even though these plan members are significantly different from the opposite group, it is important to note, that the overall level of active decision taking is economically marginal. The absolute numbers of active choosers are small compared to the total group: In 2014, 251 out of 9806 plan members chose a switching point at least 2 years from aow-age. For 2013 it were 115. (note the growth rate of 218% !) For the other choice options the evidence is weak. Here, the hypothesis of increasing active choice must be rejected.

Nevertheless, it must not be ignored, that the currently discussed increasing demand for flexible pension solutions is already materializing in choices made by real plan members. Given, that these are still very recent trends, they can be expected to gain momentum in the

coming years, putting increasing pressure on pension professionals to satisfy the demand for more individualization. Additionally, certain choices appear to be related to specific characteristics. Typically, low income, married and male plan members appear to be inclined to deviate from preselected defaults. The next chapters are a first attempt to take the second step in the discussion regarding more flexible pension solutions: It will be assessed how these people react to new choice, to what degree their choice will be rational and to what extent the overall outcome is steerable.

6.2 Step 2: Hypothetical Lump Sum Take-up

The second step of analysis takes a new optionality, partial lump sum payments, to the Dutch market and analyzes in how far it is being accepted. Similar to the above analysis of past choice data, will the observed behavior be matched with individual characteristics. It is important to note, however, that the analysis is rather a by-product of the research into the framing hypothesis. In this chapter, a subset of the larger survey dataset is applied, namely only those 474 observations which received no intentional framing, i.e. the neutral frame.

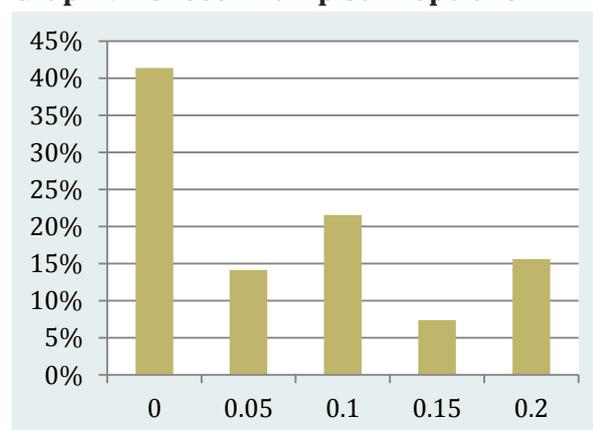
6.2.1 Under-annuitization in the Netherlands?

Even though, the 474 observations were not actively pushed into a certain frame, the nature of the Dutch context suggests, that survey participants were evaluating the offered choice through a consumption frame. Hence, acceptance of the four partial lump sum payments on offer (5%, 10%, 15%, 20% of total accrual) was expected to be low. (H2)

The data show two things: First, a majority of 58% percent chose for a partial lump sum. This suggests, that the option to partly cash out is very well accepted by plan members and may enrich the range of individualization options offered by the fund. Second, this does not imply a tendency to under-annuitize. With an average annuitization rate of 93% (or average lump sum pick up of 7%) one can hardly foresee an annuitization puzzle for the dutch case if partial lump sum payments were to be

introduced. This figure is of course the result of the cap at 20% lump sum cash out. But even when looking at it from a limit utilization perspective, 7% lump sum pickup make for an average limit utilization of 35% (given a limit of 20% lump sum). Annuitization rates from this experiment suggest, that the often discussed annuitization puzzle is rather circumstantial. (rates underlying the literature on the annuity puzzle are well below 50%, see chapter 0) Under the particular Dutch institutional setting, this research does not find a tendency to underannuitize. This is in line with Bütler and Teppa (2007) who do not see an annuity puzzle within the underlying Swiss pension fund where annuitization rates were 84.5% on average. In order to settle on this question it will be interesting to repeat this research without the 20% cash out limit. Generally, further research is necessary to define under-annuitization for the Dutch context.

Graph 9 Chosen Lump Sum options

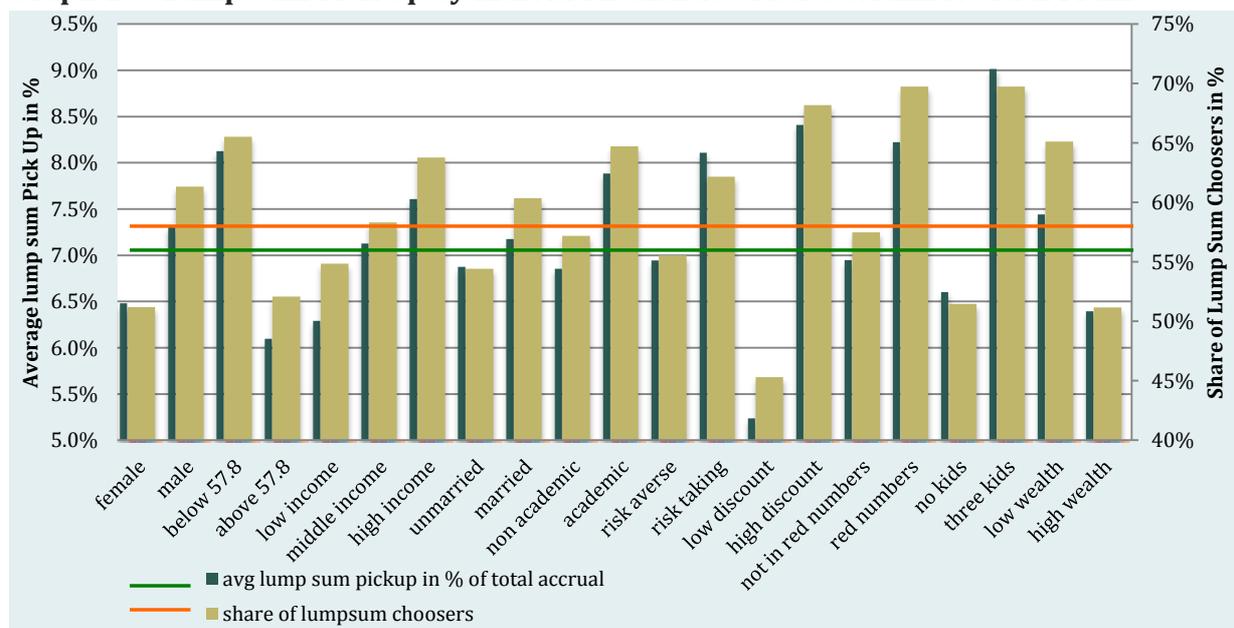


6.2.2 Who likes lump sums?

The literature has defined a wide set of variables explaining annuitization behavior. This chapter will assess how the lump sum take up observed in the experiment is related to these variables. The idea is to predict the characteristics of the typical lump sum taker in the Dutch context. On the one hand this adds to the general validity of these explanations across different institutional environments and on the other hand it gives guidance to Dutch pension funds planning to introduce partial lump sum payments. This is to give an overview of average lump sum pick up as well as the share of lump sum choosers across a selection of characteristics. It becomes apparent, how individuals showing these characteristics deviate from the overall lump sum pick up of 7% (green line) and the average of 58% (orange line) choosing some form of lump sum cash out. Below, the figures are explained in detail:

As it was the case with active timers, the typical lump sum taker in the dataset is a married male, but now with above average income. 61.5% of male chose a partial lump sum, while only 51.2% of female respondents did. Among married the share was 60.4% while it was 54.4% for unmarried plan members. (difference not statistically significant) After dividing the dataset into three income groups¹⁶, 63.8% of the high income group and 54.8% of the low income group picked a partial lump sum. Across educational levels there was not much variance. Most notably, 64.7% of academics picked a partial lump sum payment, whereas it was 57.2% among plan members without academic education. (difference not statistically significant).

Graph 10 Lump Sum Pick Up by individual Characteristics within Neutral Frame



Digging deeper into what has earlier been defined as rational variables, the picture becomes more precise: Of the least risk averse individuals, 62.2% would pick a lump sum, while only 55.6 of the most risk averse would do so. Quite remarkable is also, that 71.4% of those indicating poor health take lump sums, while only 57.1% of the healthiest do so. One may

¹⁶ 1 : income < (average income - one standard deviation), 2: average +/- one standard deviation, 3: income > average + one std.dev.

conclude now, that plan members have an intuitive understanding for the longevity insurance provided by the annuity. When looking at self indicated life expectancies, however, there is only very little variation. Furthermore, does overall individual wealth matter: 51.2% of the wealthiest took a partial lump sum and 65.1 percent of the least wealthy respondents did. Even though it is still to be discussed whether or not children are a good proxy for bequest motives, it is striking, that 51.5% of childless respondents and 79.2% of those with four or more children decided for a partial lump sum. Bequest appears to play an important role. Another straight forward rationale can be observed among house owners who do not expect to have paid off their loans until retirement. They show more demand for lump sum payments than those who expect to be debt free before they retire. (not significant)

Turning to behavioral variables, there is a very pronounced difference between young and old¹⁷: Only 52.1% of those above the median age of 58.7 years make use of the partial lump sum option, whereas 65.5% of those below the median age would make use of it. This finding is rather puzzling: Hyperbolic discounting implies that postponing income from today to tomorrow should be more “painful” than postponing tomorrow’s income to a yet more distant future. And yet, older people show a weaker preference for early cash outs. A simple explanation could be a general reluctance to try new options among the elderly. (note: this effect would disappear as the Dutch public gets used to the optionality) Unfortunately, it is beyond the scope of this research to explain how preferences in the pension domain evolve with age. This could be an interesting question to ask in future projects. Another important variable appears to be inter-temporal discounting, approximated by patience for lottery payouts. The most patient respondents take up on average 5.2% of their accrual as a lump sum. The most impatient ones take up about 60% more. Nevertheless remains to be discussed whether high discount rates are irrational or simply different (rational) preferences. Making frequent use of extremely expensive forms of credit such as on credit cards and cash accounts can be regarded irrational and to reveal low financial sophistication. In fact, these people also show significantly higher lump sum demand. (69.7% vs 57.5% taking a partial lump sum) When turning to financial sophistication measured by financial literacy and pension literacy, the full annuitizers do not differ significantly from the “early adopters”, who make use of the new partial lump sum option. Those early adopters do however show slightly less cognitive overload. At the same time, they appear to be less confident about their decision. The groups do not differ in terms of trust in the pension system/fund, involvement, self perceived capability to arrange for one’s pension as well as confidence in their own financial skills.

The following table summarizes the main characteristics of the average lump sum chooser (lump sum -yes) as opposed to the non lump sum chooser. (for scaling of the variables see Table 15 in the Appendix)

¹⁷ Age as a “behavioral variable”:

Annuity-preferences may indeed (rationally) change with age as “belief-updates” about uncertain variables come in (life expectancy due to health shocks, bequest motive as the family grows etc). Age does however become an “irrational” variable, when there are no such belief updates and preferences still change. An example can be hyperbolic discounting: It would not be rational, if older individuals applied a higher discount rate to retirement income than younger ones (other things equal).

Table 6 Average Characteristics of Lump Sum Choosers and Non Lump Sum Choosers

lump sum	male	married	age	part time income	part time factor	wealth	risk general	discount	red_numbers	kids
yes	77.0%	73.4%	54.5	55,233 €	96.4%	3.88	2.99	2.76	21.6%	1.83
no	68.9%	68.4%	56.1	50,499 €	95.0%	4.20	2.91	2.12	13.9%	1.51

6.2.3 Conclusions

Because of the relatively low number of observations, there will be no in depth testing (regression analysis) for this part of the analysis. Nevertheless do the above results give important insights into two research questions (Q2 & Q3). The hypothesis that plan members prefer full annuitization over partial lump sum payments can be rejected for the underlying sample. (H2) Generally, it seems that plan members were not confused by the new partial lump sum option but rather took it as a convenient choice to make. The fact that the majority of respondents makes use of the option underlines that pension professionals must find solutions for the growing demand for flexible in pension solutions.

Hypothesis 3, must be partly rejected. While annuitization rates did not vary across some of the variables that were found to be significant in the literature, there are others that did show the expected variation. It becomes apparent how the heterogeneity in preferences, which was already observed in past choice data, persists with respect to a hypothetical partial lump sum option. While many individuals appear to carefully take their overall wealth, debt and income situation into consideration, others seem to be very impatient and may lack the financial sophistication to take a utility maximizing decision. From a social planner's perspective it is crucial to understand these heterogeneities: Introducing new optionalities without assuring that plan members properly value these options may result in significant welfare loss. The next step will assess the impact of defaults and framing on the choice to partially cash out pension accrual. It will give valuable insights into the rationality and persistence of individual preferences, opening up a box of tools to actively steer retirement income choice.

6.3 Step 3: Steering the partial lump-sum decision

This section gives a comprehensive reassessment of the framing hypothesis. It will be checked for the robustness of the framing hypothesis to the inclusion of most rational and behavioral variables defined by the literature. Most importantly, however, it will provide for evidence in a very distinct institutional setting: In the Netherlands, annuitization rates are 100% by law and the natural filter through which plan members see their accrued pension is most likely a consumption frame. Additionally, before jumping to the framing hypothesis, the responsiveness of survey respondents to default settings is analyzed.

6.3.1 Adherence to defaults

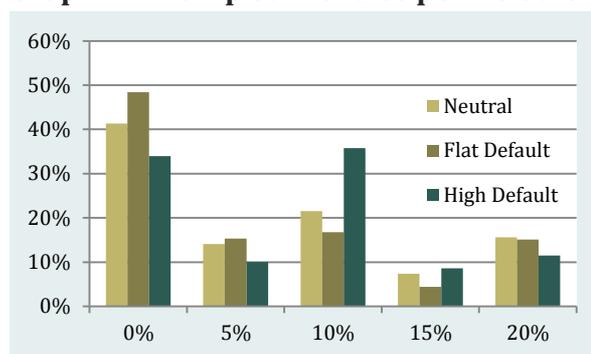
Since the introduction of the "Save more tomorrow™" program (R. H. Thaler & Benartzi, 2004) to many pension plans in the U.S., defaults have become a "bullet-proof" tool for pension professionals and policy makers. It is logical to think about defaults not only for the accumulation of pension assets but also for their decumulation. If at some point partial lump

sum payments are to be implemented in the Netherlands, pension professionals will have to decide on what shall be the default for those unwilling to take an active choice for themselves. While this research does not take any stand regarding the optimal default for a specific group of plan members, it does answer the question of how plan members react to defaults. In doing so, the efficiency of defaults and the responsiveness, given the observed heterogeneity, will be addressed. Note, that the analysis in this chapter is based on a reduced dataset of 1848 observations including only those respondents who were assigned either the neutral frame or one of the two default frames.

6.3.1.1 Defaults and the partial Lump Sum option

For the first step of the decision problem (the selection of a partial lump sum) adherence to defaults can be observed. Not only do more respondents (compared to the neutral frame) “choose” the preselected choice but also do they overall move closer to the default: For the neutral frame, average lump sum payout is 7.1%, for the flat default it is 6.1% while it is 7.7% for the 10% default. It appears that once partial lump-

Graph 11 Lump Sum choice per Default

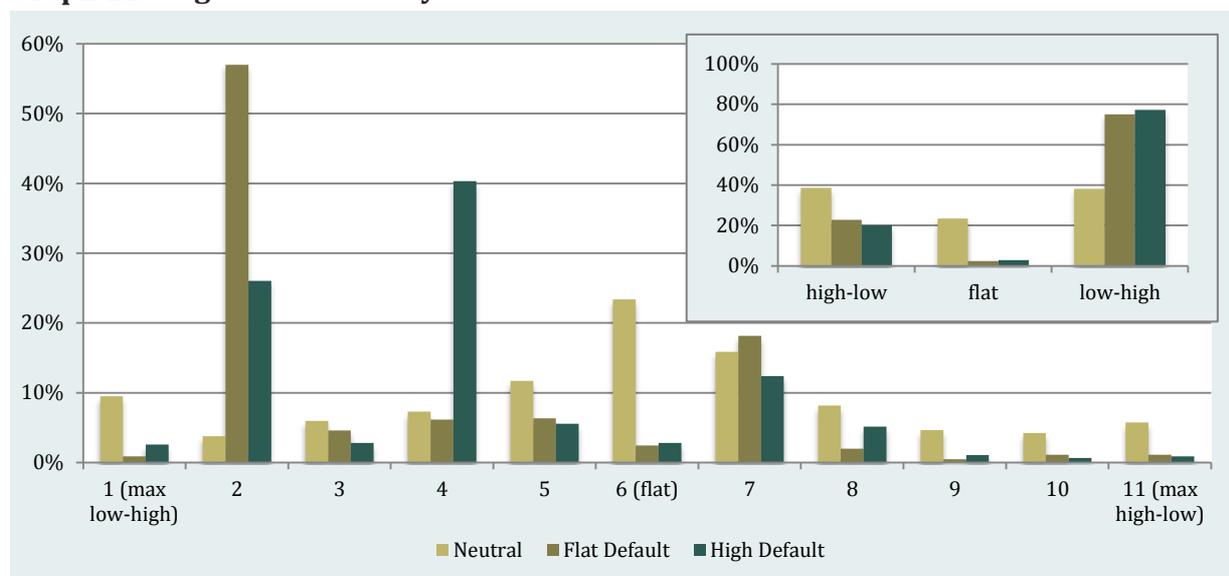


sum payments are introduced, their use can easily be steered through default settings. This impression is backed by the regression results in Table 9 in the appendix. Especially the impact of the flat default is a very robust result. Having a look at the characteristics associated with more lump sum demand (independent from the default-setting), the regression analysis highlights the importance of smart defaults: Respondents experiencing cognitive overload and less confidence in their choice tend to take up more lump sum payments. The fact that those taking a high low construction as well as those taking a low high construction tend to take more annuities suggests, that people are coherent in their willingness to depart from standard solutions. A more detailed analysis of the drivers behind lump sum demand will be given in section 6.3.2.2 .

6.3.1.2 Defaults and the High-Low construction

In the second step of the survey experiment, the reaction to preselected defaults is rather surprising. The different frames do in fact change the choices made by respondents. However, the reaction was not as in the first step a general alignment with the default but rather an overall stronger preference for low-high distributions than in the neutral frame. (see 0) Possible explanations could be confused choices due to choice overload. Probably the sheer number of choices was too much and respondents chose for the options at the upper end of the list (in the survey the options appeared as a list with 1 on top and 11 at the bottom, see Table 3). This however does not explain, why they did choose the center positions when there was no default. It is astonishing that after setting the default to the flat payment, less people “chose” for that option (compared to the neutral case).

When comparing the effects of the two defaults it is surprising, that in the high default there is overall less demand for high-low allocations than in the flat default. Apparently, as the fund proposes to choose a “progressive” payout structure (in the sense of eating up one’s pension assets more rapidly during early retirement), respondents choose for a less progressive one.

Graph 12 High Low Choice by Defaults

In that sense, the default would trigger an over-awareness of the possibility to run out of money during late retirement.

The regression analysis in Table 10 in the appendix confirms that both defaults foster low high consumptions and gives additional insights: First of all, most economic variables turn out to be insignificant which highlights the behavioral nature of the variation in choice behavior. Second, it can be derived that respondents with higher levels of trust rather pick low-high distributions while those with lower levels of trust choose a high-low allocation scheme. Apparently, plan members prefer early cash if they do not have much trust in the fund. Given the high standards of the Dutch system, cashing out pension assets because of mistrust does not appear very rational. Also quite interesting is, that high-low choosers show more confidence and less cognitive overload than low-high choosers.

6.3.1.3 Conclusions

Initially it was pointed out that the introduction of new optionalities automatically raises the question of what defaults to set and how people would react to such defaults. The evidence from this experiment is truly twofold: With respect to the partial lump sum decision, choice behavior appears to be steerable in predictable directions and hypothesis 4 cannot be rejected. Respondents did align with the defaults. With respect to the high low construction, steering plan members' decisions seems much more complex. Their reactions are more difficult to predict and for the high-low constructions, H4 must be rejected. Since respondents should already be familiar with the high-low optionality, the somewhat confused choices in the second step are particularly surprising. Unfortunately, the data does not allow to assess cognitive overload for each of the two choices/steps separately, which could offer an explanation for the different outcomes. The data show that putting the default on a flat payout actually pushes people into low-high constructions. (note, that currently the default is a flat payout!) Nevertheless, the bottom line remains clear: The currently available high low optionality requires much more thoughtful default setting than the still to be implemented partial lump sum payment. From the pension funds perspective, a partial lump sum option

will cause less uncertainty with respect to pension cash flows than the already implemented high low construction. A reason, why the uncertainty from high-low constructions is not materializing yet, will be the relatively small number of active choosers. As more and more people actively choose their preferred high low construction (like they had to in the experiment), serious difficulties concerning the predictability of cash flows may arise. While this analysis presents a powerful tool to steer individual choice and to make choice easier to predict for the fund, the question remains what would be the best direction to steer in from the plan members' perspective.

6.3.2 The Framing Hypothesis revisited

Finally this research project reassesses the significance of the framing hypothesis. By applying framing techniques to the partial lump sum as well as high low construction in the very specific Dutch environment, new insights into the general applicability of the framing hypothesis will be gained. At the same time, pension professionals are presented with a powerful tool to steer overall decumulation choice. The analysis will proceed in three steps: First the differences in lump sum take-up and high-low constructions across the different frames are described and motivated according to the predictions in chapter 2.1.3. . Second, standard economic as well as behavioral control variables are included in the analysis to check for the robustness of results. Third, there will be an analysis of interaction effects in order to assess differences in the responsiveness to framing in a heterogeneous sample of plan members.

6.3.2.1 To what extent do frames matter and why?

This section will provide first insights from only looking at the different distributions of choice across the frames. The following sections will engage in more solid statistical testing and check for the robustness of what is observed in this part.

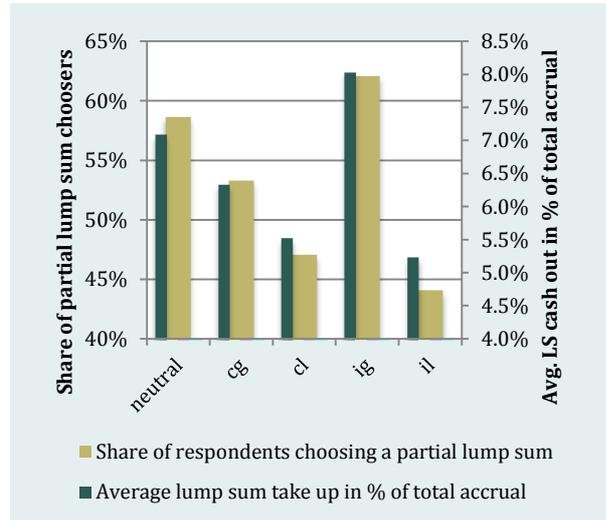
6.3.2.1.1 Framing the partial lump sum choice

Graph 13 shows how individual choice differs (on average) across the frames for the partial lump sum decision (step1 in the experiment). The effect holds for the share of those picking any partial lump sum option as well as average annuitization rates (i.e. lump sum cash out rates). Interestingly, only the investment gain frame is associated with an increased lump sum demand (relative to the neutral frame). All other frames seem to make individuals appreciate their annuities even more, which may reflect an activating effect stemming from the stronger language used in the non-neutral frames.

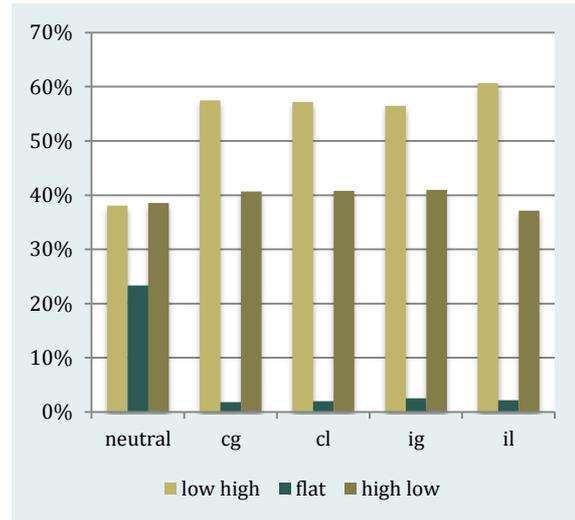
But most importantly, the differences between the frames are exactly in line with the predictions implied by the framing hypothesis. In section 2.1.3 it was explained how preferences are expected to change across the different frames. The very same mechanisms can be observed in the data: Because respondents are loss averse, they feel a stronger "nudge" towards annuitization, when choice options are explained in terms of giving up parts of their annuities. (loss frames) Graph 13 shows this pattern: There is significantly more annuitization (less lump sum take up) in the cl frame compared to the cg frame. Similarly, there is more annuitization in the il frame than in the ig frame. At the same time, people were assumed to be risk averse when offered uncertain gains but risk seeking when facing uncertain losses. (recall: reflection effect applies) The same holds for the choices made in the experiment: In the ig frame, where additional annuitization is put as an uncertain gain, much

less people go for the “risky” annuity payment than compared to the cg frame, where additional annuitization is presented as a certain gain. Hence, individuals do show risk averse behavior when facing gains: They prefer the certain gain relative to the uncertain gain. This changes when they face losses: There is significantly more annuitization in the il frame (uncertain loss) compared to the cl frame (certain loss). When dealing with losses, the “uncertain” annuity in the investment frame is particularly appealing because it offers the opportunity to take a gamble in order to avoid losses. The “certain” annuity in the consumption framework, however, is less appealing.

Graph 13 LS Pick up by frames (step1)



Graph 14 High-Low by frames (step2)



6.3.2.1.2 Framing Step 2 – The High Low Construction

For the second step (high-low construction) the effects are less straight forward: First of all, there is close to zero variation across the different non-neutral frames with respect to chosen high-low constructions. (Graph 14) What is quite striking however, is the strong move away from the flat payout (the current real default) towards low-high schemes once respondents are actively framed. This underlines the idea of an activating effect from framing: Once respondents are actively framed, they tend to deviate from the (here implicit) default and take an active choice showing a preference to postpone pension income to the future. This becomes even clearer when assessing the choices in detail: While in the neutral frame, 23% chose a flat payout, only to 2-3% did so in the other frames. At the same time, only 4% chose a low-high scheme of 8/10 (early income/late income) in the neutral frame while this particular low-high scheme was chosen by 32% to 42% in the other frames. (see Graph 15)

6.3.2.1.3 Conclusions

The overall impression is quite similar to what has been observed in the default frames: Framing does matter. As soon as plan members are actively framed, they show a higher preference for annuitization and postponed income (except for the ig frame). A possible explanation may be as follows: As Dutch plan members start to actively think about the annuitization decision, they do so in a consumption frame, which fosters annuitization.

Concerning research question five (Q5) the evidence is again twofold: The decision to partly cash out pension accrual can predictably be influenced through framing. Individuals react in line with prospect theory (loss aversion & reflection effect). In fact, it can be seen that the

investment frames cause more variation in annuitization than the consumption frames. Hypothesis five can not be rejected with respect to the lump sum decision. With respect to high low constructions, H5 must be rejected. Above it was argued, that partial lump sum payments and high low constructions are in essence very similar. Therefore, a similar steerability of choice was expected. Even though there are systematic patterns in the responsiveness to framing, these patterns are very different from those observed in the lump sum decision. While from an actuarial perspective lump sum payments can be seen as an extreme form of high low distributions, plan members may not perceive them very similar. Further research is required to lay a solid theoretical foundation for these patterns.

6.3.2.2 *The robustness of the framing hypothesis*

The descriptive statistics in the previous chapter already delivered strong evidence for the framing hypothesis to be a relevant explanation as well as steering tool for annuitization behavior. This chapter will dig deeper into statistics and check for the robustness of the results by applying multiple regression analysis. First, this allows to assess the statistical significance of the framing effects described above and second it allows to check for the robustness to the inclusion of other explanatory variables and their relative importance vis-à-vis the frames. As pointed out in section 0, different specifications of regression analysis will be applied. They all have in common, that a choice variable is being explained by framing variables (dummies for each frame) as well as rational and behavioral control variables. The box below shows a simplified version of the tested explanatory model:

$$\text{decumulation choice}_t = \text{frame}_t \beta_{\text{frame}} + \text{econ}_t \beta_{\text{econ}} + \text{behave}_t \beta_{\text{behave}} + u_t$$

with t indexing observations, for each t, frame_t is a 1xk vector of all frame dummies and β_{frame} is the kx1 vector of all frame parameters. The same vectors are defined for all standard economic variables (*econ*) as well as behavioral variables (*behave*). u denotes the residuals (error term)

The below tested models are all variations of the above equation¹⁸ with respect to the choice parameter to be explained as well as the variables included in the three vectors.

6.3.2.2.1 Methodological notes: Applied models and data

The below analysis is based on a reduced dataset including only observations from the neutral as well as the cg,cl,ig and il frame. The observations from the default frames were dropped because of the fundamentally different approach in the survey. Variables, whose scales do not allow for a meaningful economic interpretation, were standardized¹⁹ such that their mean is zero and standard deviation one. Their values are interpretable as the deviation from the mean measured in standard deviations. Because of the many variables available in the dataset, a vast variety of model specifications would be imaginable. The analysis mostly starts with a very broad specification, which is then subsequently shrunk down to what can

¹⁸ Note, that the models applied in the regression analysis below, do not follow this linear equation. The linear form is chosen to illustrate the explanatory model in a simplified form.

¹⁹ for variable x the standardized variable zx derives as $zx = (x - m) / sd$ with $m = \text{mean}$ and $sd = \text{std-dev of } x$
note: standardized variables carry a "z" as the first letter

be considered the best model. Not all specifications that were tested throughout this process of “manual data mining” are reported. Usually there is a minimalistic specification with only the framing variables, one specification controlling for (rational) economic factors, another one controlling only for behavioral variables and a combined specification putting together the most relevant variables. Note, that all results give robust standard errors to account for heteroskedasticity of unknown kind.²⁰ Throughout the entire section, the following two models are applied for multiple regression analysis:²¹

1. **Ordered Probit:** The variable to be explained in most specifications is the choice taken in the first step of the experiment, which ranges from 1 to 5 in categories of meaningful rank (5 means more lump sum than 4). Technically one could also assign quantitative meanings to these values (0, 5, 10, 15, 20% of accrual) and estimate a linear model using OLS. However in terms of model fit and normality of the error term, a maximum likelihood estimated ordered probit (oprobit) model has proven to do much better. And even though the choices can be assigned a quantitative meaning, the observations are rather based on rough categories than explicit income allocations. Therefore, an oprobit model is preferable. Furthermore has the model already been applied in a similar context by Cappelletti et al. (2013).
2. **Logit Model:** In some of the models, the following binary (dummy) variable are to be explained: taking a lump sum (yes/no), taking a high-low scheme (yes/no), taking a low-high scheme (yes/no) For some combinations of independent variable values, a linear model will predict probabilities below 0 and above 1, which for obvious reasons would not make any sense. A Logit model eliminates this shortcoming by estimating a logistic function, which yields values between 0 and 1 for all real numbers. Because of non-linearity, rather than applying OLS techniques, the function is estimated using the maximum likelihood method.

6.3.2.2.2 Regression Results

Oshows five ordered probit regressions of the choice taken in the first step (partial lump sum) on different sets of explanatory and control variables. Note, that next to the frame-dummies, it is also always controlled for the decision in step 2. This is necessary, first of all because the two steps were explained as part of the same decision problem and second because respondents could switch back and forth between the steps. Thus, the decision in step 1 is always highly dependent on the decision in step 2. This must be accounted for in all specifications.

Generally, the findings in chapter 6.3.2.1 are being confirmed by the regression analysis. Only the impact of the investment gain frame (compared to the neutral frame) turned out insignificant. All other frames have a significant negative effect on lump sum take up. This confirms the earlier hypothesis of the frames having an overall activating effect making respondents appreciate their annuities more. Given, that annuities are assumed to be very unappealing in an investment gain frame, and that the annuity puzzle is assumed to be largely

²⁰ The first hint to possibly non efficient estimates and biased t-values stems from non normally distributed error terms. Additionally the relatively low r-squared point to a possible omitted variable bias. It is well possible, that the variation of the unobserved terms, which enters into the error term, is not constant

²¹ Models and explanations in this chapter follow J. Wooldridge (2012) and J. M. Wooldridge (2010)

driven by this exact pattern in valuing annuities, the data confirm the framing hypothesis: All frames show a significantly negative effect on lump sum take up, except for the ig frame. Hence, relative to the other frames, individuals do assign lower values to “risky” annuities in an ig frame. They do not “gamble” (modify their risk profile) to increase their expected pension income. Above it was argued that loss aversion and reflection effect can predict the pair-wise differences between gain and loss frames as well as consumption and investment frames. The regressions now confirm these relative differences: The cl and the il frame are a stronger nudge towards annuities than their counterparts (cg and ig frame). Hence, people are loss averse with respect to their annuitized wealth. In the il frame people are more likely to pick a (risky) annuity (i.e. uncertain loss) than they are in the cl frame (certain loss) to pick a (safe) annuity. Hence, people take a gamble to avoid losses; they are risk seeking when facing losses. At the same time respondents were more likely to choose for more (certain) annuitization in the cg frame than they were in the ig frame (where it is perceived as an uncertain gain). They are risk averse when comparing positive outcomes. It is remarkable, that these results do not change across the different model specifications and are always highly significant.

Coming back to the interdependence of the two steps in the decision problem, the empirical evidence is partly surprising: On the one hand, taking a high low construction is associated with taking a higher lump sum. This would be in line with the earlier hypothesis, that a high low construction is in essence a less extreme lump sum payment. Therefore, demand for both options should move together if preferences (for early or late cash) are consistent across the two steps. On the other hand, there is also a highly significant positive relation between the choice to take a low-high scheme and a lump sum even though the low high allocation is rather the opposite of a lump sum payment. This, in turn, suggests that the high-low construction is not seen as something similar but rather as something to trade off against a lump sum. These plan members would take a lump sum but then choose a low high annuity which partly offsets the cash gains from the lump sum resulting in an overall modest early retirement income. One must note, however, that the positive relation with lump sum pick up is only about half as strong for the low-high choosers as it is for the high low choosers. The positive sign for the low high choosers may only reflect that low high choosers are generally more active decision takers also in the first step. (note: because all decisions were taken actively (no defaults), this holds only if zero lump sum and a flat annuity are perceived as the implicit default) The interdependence of partial lump sum payments and high-low constructions remains to be further explored.

The next step is to control for the effect of standard economic explanations on the variation in annuitization behavior. Specification B (Econ) in Oadds a wide set of variables relevant to a life-time utility maximizing agent. Much in line with the literature expanding the life-cycle model, the applied proxy for bequest motives (children) is positively related to partial lump sum payments. Furthermore do people tradeoff their wealth and debt position against their annuitization rates: Higher wealth is associated with less lump sum take-up. This is in line with standard economic theory since low wealth individuals experience higher marginal utility associated with an additional euro of un-annuitized wealth. It appears also rational, that those holding long debt (duration > 10Y) annuitize less, presumably to pay off loans and save interest payments. In chapter 2 it was argued that risk-averse plan members should value the longevity insurance offered by annuities more than risk-loving individuals. The data

confirms this hypothesis: Higher risk tolerance is associated with more lump sum take up. The specification also includes two at the verge to behavioral explanations. First, age, which has a highly significant negative effect on lump sum take up (in all specifications). Hyperbolic discounting implies that older individuals are more tempted by the soon to be received lump sum than younger ones, who feel less “pain” from postponing income to a more distant future. Apparently this is not the case. Instead, older people appreciate annuities more than younger ones. One explanation could be an increasing reluctance to exchange one’s accrued benefits (note, that this is in terms of annuities in the Netherlands) for a lump sum. Similarly could the elderly be more prone to inertia and not as keen on taking active choice in retirement planning as younger generations, who feel more connected to the recent trends towards more individual freedom of choice. Thus, it will be interesting to see how this “age-coefficient” evolves over time for the Dutch case as the old, defined benefit focused generations leave the sample. The second variable at the verge to behavioral economics is intertemporal discounting, approximated by patience for lottery payouts. While it may be argued for high discounters to simply have different (rational) preferences, there will be a degree of discounting or impatience leading to lifetime utility reducing choices. While settling on that question lies beyond this project, it is in line with expectations that discounting is highly significant and positively related to lump sum pick up.

The next specification (C, Behavior), controls for characteristics capturing why and how people make mistakes in valuing annuities and hence take irrational (not utility maximizing) choices. Quite surprisingly there is no significant effect on choice behavior stemming from involvement or financial sophistication related variables (newsletter, contact_fund, involve, p_literacy, f_literacy). What is significant though, is the positive relation between perceived financial literacy (lit_conf) and lump sum take up. Similarly is there a significantly positive relation between self indicated ability to arrange for one’s pension (know_arrange) and the choice to cash out pension accrual. From a social planners perspective this is an important insight: Not actual sophistication drives active decision taking (i.e. deviation from zero lump sum) but self perceived sophistication, which are likely to be two things quite apart from one another. Not only does this underline how the observed behavior is due to human biases but it also gives scope for steering interventions to avoid unwanted welfare loss. Another highly significant variable is trust. Those showing more trust in the fund as well as the Dutch pension system tend to take up less lump sums. This finding highlights how much impact the funds communication and behavior towards the plan member can have on pension related decisions via the perceived trustworthiness of the fund.

The combined specifications (D & E) mostly confirm the above findings. Interestingly, cognitive overload turns significant now. It is rather alarming though, that higher cognitive overload is associated with higher lump sum take up, given that taking up lump sums and using the money wisely requires more financial sophistication than simply living of a monthly paid annuity. Whether this is because the lump sum is perceived as the clearer and easier option remains to be discussed in future research.

Overall it is remarkable, that the frame-dummies are the most robust of all variables. There is no combination of control variables to which the framing variables are not robust.

Coming to framing effects on the second choice (high-low construction), the evidence for the general applicability of the framing hypothesis is much weaker. After having started with a very broad set of variables for the first choice, the analysis of the second choice starts with the best combined specification from the previous step and gets straight to a best model for the second choice. Table 12 presents the four resulting specifications: Two in which the dependent variable is a dummy on whether or not a respondent chose a high-low construction and another two, in which the dependent variable indicates whether or not a low-high scheme was selected. Both dependent variables are regressed once on the same set as the lump sum decision was regressed on and on a new best set for the second step.

Most notably, the framing dummies have no significant impact on the likelihood to choose a high-low scheme. They do, however, show a significant positive relation with the decision to pick a low-high allocation. This is confirming the hypothesis from section 6.3.2.1 that framing triggers people to postpone income to the future regardless of the chosen language and examples.

Regarding the consistency in preferences for early or late income across the two choices, the evidence from the regressions in Table 11 was not quite clear. (recall: high low and low high choosers take more lump sum cash than those choosing a flat annuity with high low choosers showing a stronger tendency towards lump sums than low high choosers) This picture becomes clearer in Table 12 : Higher lump sum cash outs are associated with a higher probability to take a high-low distribution and a lower probability to chose for a low-high scheme. This implies, that people are in fact consistent in their preferences for early or late pension income. The earlier result (from the regressions of step1/Table 11) of the positive impact of a low-high choice on lump sum take up will arise from the fact that those choosing a flat pay out took even less lump sums than the low-high choosers.

A striking difference to the first choice is that age does not matter in step2. This underlines the hypothesis that a reluctance to try new options (like the partial lump sum) is spread mostly among the elderly. As the high-low distribution has been there for longer older plan members make just as much use of it as the younger. Another difference is gender: While gender did not matter for the partial lump sum decision, the regressions in Table 12 show, that male take less high-low and more low-high schemes. Note, that this is the opposite in the past choice data! (see chapter 0) In general, it appears that the control variables derived from rational explanations do a better job in predicting the choices made in the second step of the experiment. None of the behavioral variables turned out significant. Wealth, debt and risk preferences, in turn, relate to the likelihood of taking a high-low construction the same way they did to the probability to take a partial lump sum. Finally, there is one more decisive observation: Literally all signs (regardless of significance) invert when predicting low-high choosers instead of high-low choosers. This underlines the importance of understanding underlying heterogeneities: There is significant variation in plan members' preferences and a sharp divide in terms of individual characteristics between those preferring higher early pensions and those preferring to postpone pension income.

6.3.2.2.3 Conclusions

The above analysis has provided strong evidence for the general validity of the framing hypothesis. Nevertheless, Hypothesis 6 (framing has most explanatory power) must be split again. While it must be rejected for the high low construction, it cannot be rejected for the

partial lump sum: All observed effects are in line with predictions from theory. Most importantly, it became evident that annuitization behavior is subject to framing and that active framing can have significant impact on overall annuitization rates. For the underlying sample, framing did outstrip all other variables in terms of robustness and explanatory power. In H6, “hard characteristics” were expected to be significant. While this is indeed the case, the fact that many of the variables, which capture difficulties in valuing annuities properly, are associated with higher demand for lump sum payments highlights the behavioral nature of the underlying decision problem and the scope for welfare protecting intervention. Clearly, it is not enough to focus only on expanding the life cycle model when predicting annuitization behavior. And even though there appears to be no annuitization puzzle observable in the underlying data, the revealed patterns in human valuation of annuities suggest, that the annuitization puzzle will not be solve-able in a rational agent based model. It becomes clearer that the annuitization puzzle is in fact a circumstantial phenomenon due to a specific set of institutions in the U.S., peoples’ reactions to this environment and human biases in decision taking.

In explaining high-low construction choice the evidence remains rather mixed. On the one hand there is significant heterogeneity and high-low choosers are fundamentally different from low-high choosers. But on the other hand it could not be shown, that framing matters in this context as well. This may, however, be due to an overly complex decision problem posed in the survey or other distortive effects in the experimental set up. Further research will be required to arrive at robust conclusions.

6.3.2.3 Elasticity to framing – Who interacts more?

Above it was shown that framing does have a significant impact on individual decision taking. But it became also apparent that there is significant heterogeneity not only in terms of individual characteristics but also with respect to choice behavior. When looking at framing as a tool of information architecture that can be applied to actively steer individual decision taking, it will be imperative to make predictions on how framing interacts with heterogeneity. Some frames may work very differently with certain subgroups of the population. Hence, the last step in assessing the framing hypothesis is to check how different people react to different frames. Or, econometrically speaking, how the frames interact with other variables. This is done by adding interaction terms to the regression models, multiplying each frame with another variable.

A similar assessment of framing in the Dutch environment has been conducted by Van der Heijden et al. (2012). They found only impatience to interact significantly with framing. This hypothesis, however, must be rejected based on the evidence provided below. While these insignificant results are not reported, the four variables that did significantly interact with the frames are discussed in more detail: Gender, Age, Debt and Risk-tolerance. Table 13 presents results for specifications including the interaction terms and the most relevant control variables (economic as well as behavioral). Table 14 shows the results when not controlling for other variables.

6.3.2.3.1 Gender

Above, it had already been shown that male and female differ significantly in the choices they take. But do they also differ in how they react to active framing? Agnew et al. (2008) found

males to be more affected by framing than females. Particularly, they are more likely to annuitize after they have seen an “annuity-bias-slideshow”, while this had no effect on women. After an investment bias slideshow both gender annuitized less with women showing a stronger reaction. In a way this is similar to the consumption and investment frames in this research. The results in Table 13 partly confirm these findings: The coefficients for the framing variables (cg, cl,ig,il) now represent the effect of the frames on a female respondent. The effect on males is the sum of these coefficients plus the corresponding interaction term. First of all it is striking that only the ig coefficient is significant (positive) now, while it was not significant in the analysis without accounting for interaction between gender and framing (see: Table 11). This means that only the ig frame has a significant impact on female choice behavior. Once women are put in an investment gain frame they show a much stronger preference for lump sums. (which would be in line with Agnew et al.) Apparently they show a very strong aversion to risky financial products (which is how additional annuitization is perceived in an ig frame) and rather take a lump sum in that case. The difference to their male counterparts becomes even clearer when adding up the ig coefficient (0.37) and the ig-male-interaction coefficient (-0.4), which leads to a negative net effect for men. Apparently, male plan members show even more demand for annuities once they are framed as a “risky” financial product. Additionally males are not affected by the cl frame, while the overall population was (-0.32). Hence, it is mainly women who take more annuities once they are explained that lump sum payments imply a “certain loss”. The pattern here appears to be that women assign much higher values to the safety provided by annuities while men are well willing to take some risk in retirement income. With respect to the cg and il frames, the interaction coefficients imply stronger framing effects (towards annuities) for male than for the overall population. Hence, Agnews finding of men being more sensitive to framing is confirmed for the cg and il frames but rejected for the ig and cl frames which appear to have a stronger impact on women. The evidence provided here does not support the hypothesis of gender playing a role in framing per se. It is not the case that one sex is more responsive than the other. What can be seen instead, is that men and women are responsive to different frames.

6.3.2.3.2 Age

After interacting the frames with a dummy indicating above-median-age (57.8 years), older plan members appear to be more responsive to framing. All interaction dummies show negative signs, indicating that the “overall nudge” towards annuities is stronger among older respondents. Again, there is even an inverting effect on the investment gain frame. While the coefficient for the younger is 0.23, it adds up to -0.12 (0.23-0.35) for above 57.8 year old respondents. Once the younger are framed with investment language and uncertain gains in return when they increase their annuity, they decide to rather take the (“safe”) lump sum. The elderly however feel encouraged to annuitize in the very same frame.

6.3.2.3.3 Debt

From an economic point of view it is utility maximizing to pay off loans by cashing out pension assets in order to save interest payments. (Given that the interest on loans is higher than the return on pension assets) Hence, loss of welfare will arise if framing discourages debt holders from doing so. The positive interaction coefficients in column C, however, show such strong values that they almost offset the coefficients for the frames. It seems, that if

there is a solid economic rationale behind the decision to cash out pension assets, it is hard to distort that decision. Framing does not severely interfere with stable preferences derived from individual, economic considerations.

6.3.2.3.4 Risk Tolerance

Risk preferences and how they are subject to perceived certainty lay at the heart of the framing hypothesis. Thus will it be interesting to see how risk tolerance interacts with the frames: Table 14 illustrates, how more risk tolerant individuals are influenced less by the frames. The negative coefficients for the frame dummies are partly offset by the positive values of the interaction coefficients. Overall, risk tolerant people are harder to steer towards more annuitization. This effect, however, is only for the cl frame robust to the inclusion of control variables (see Table 13).

6.3.2.3.5 Conclusions

The analysis of interaction effects has added one important insight to the framing hypothesis: Its validity depends much on the characteristics of the underlying population. With respect to the effectiveness of active framing, there are characteristics with a catalyzing effect (male, age) and others with a debilitating effect (risk tolerance, debt holdings). Hence, Hypothesis 7 cannot be rejected. This has strong implications for pension professionals: Given that individuals shall be steered actively into predictable directions, it becomes imperative to understand the population's heterogeneity. Frames can in fact have the exact opposite effects given certain characteristics.

7 Conclusions, Policy Implications and Final Thoughts

The implications of this research project go into two directions. First, they are relevant to the academic world and literature on the annuitization puzzle as well as the framing hypothesis. Second, they affect pension professionals and policy makers working on the decumulation of pension assets.

In section 2 it was explained how the predictions of the life-cycle model often do not match observed annuitization rates on real markets. Many authors have tried to solve the so-called annuitization puzzle by either expanding the life-cycle model or researching into the human limitations to properly valuing annuities. They all have in common, that they acknowledge the annuitization puzzle as a general phenomenon. Even though the evidence provided here is rather limited (since the minimum annuitization rate in the underlying experiment is 80%), the observed average annuitization rate of 93% does suggest that in the Dutch environment there would be no tendency to underannuitize. This supports earlier findings of the phenomenon being rather a circumstantial than a generally applying one. But then the question remains, why that is. Do the Dutch not make the same mistakes in valuing annuities as for instance US-American DC-plan members? Or do they simply make different mistakes and the decision to annuitize is indeed always subject to human biases? Brown et al. suggest the biggest problem in the US-american case is that annuities are evaluated through an investment frame rather than a consumption frame. Benartzi et al argue that pension accrual in lump-sums fosters investment framing, while accrual in annuities promotes consumption framing. With the latter being the case in the Netherlands it was well possible, that the observed high annuitization rates result from Dutch plan members filtering the decision

through a consumption frame. Hence they would be making similar “mistakes” as US plan members, but “for their own good”, leading to a somewhat reversed annuitization puzzle. When explaining annuity demand, one would then have to have in mind not only the underlying human biases but also the institutional environment. The idea is that different institutional settings can trigger different biases in decision taking leading to different overall outcomes. In order to test for this line of argumentation, we assessed the reaction to framing in the unique Dutch environment. If the frames work the same way as in the US-american environment this would significantly support the general applicability of the framing hypothesis and its explanatory power with respect to annuity demand. In fact, the frames did apply to the Dutch case. Respondents reacted as behavioral economics (mental accounting and prospect theory) predicts. The stronger impact of the investment frames compared to the consumption frames suggests that respondents were initially not thinking of their pension income as an investment product but rather in terms of a consumption path. The significance of these results is further supported by the fact that this research uses a personalized experiment based on actual individual pension accrual, which minimizes alienation bias. A rigorous testing for other explanations outstripping the framing effects rounds off the strength of the results. The final conclusion must therefore be that annuity demand in general depends significantly on framing effects. The effect framing has, however, depends on the institutional environment predefining the frames through which market participants filter annuities.

In the introduction, four practical questions concerning the introduction of partial lump sum payments were raised. How do the above insights give answer to these questions? How do the results from the experiment relate to everyday’s work of pension professionals and policy makers? To begin with, there are the lessons learned from past choice data: Even though the economic significance of active choice is still relatively low within the underlying fund, the steep growth trends point to conflicts coming up in the near future, if pension professionals do not address the increasing demand for individualized pension products. The debate on more personal choice is no longer only held by pioneer policy makers. It is already materializing in the choices taken by plan members. Departing from this insight, the question must be raised how the overall population would react if it was given way to those demanding more individualization with respect to partial lump sum payments. The results are clear on this point: The majority of plan members would make use of a partial lump sum payment if it was implemented as in the experiment. But given the insights from academia it is likely that many plan members may be falling victim to biased decision taking ,causing overall welfare loss. At the same time this loss is contrasted by the welfare gains of those being able to reach higher utility levels from more individualization. From a social planners perspective there is a delicate trade-off between freedom of choice and loss of welfare. An optimal solution will minimize the potential welfare loss from biased decision taking, given a certain degree of freedom of choice. (or a maximum degree of freedom for a given level of welfare) In order to understand where welfare loss arises from, it is imperative to know which biases apply to the decision to annuitize and how they can be avoided. This is where the framing hypothesis and this piece of research open up a whole box of tools to pension professionals. First of all, it became apparent how the decision to annuitize is subject to mental accounting and framing. Second, it was shown how individuals can be actively framed

and thereby “nudged” into predictable directions. But the above analysis does not only predict overall behavior, it also shows how to deal with heterogeneity. It was shown, how frames can have opposite effects for different age cohorts or gender for instance. Knowing about these differences in combination with a good understanding of the underlying heterogeneities makes framing a precise tool in steering individual choice in order to minimize overall welfare loss.

Nevertheless, there remain two major concerns regarding active framing: First, the fact that individuals are steered into predictable directions does not imply they are being steered in a utility maximizing direction. While the life-cycle model and Yaari’s application suggest that full annuitization is optimal for any individual, this recommendation will not hold in a complex real world context. This paper has shown that annuity choice is subject to human biases in decision taking and how it can be influenced by actively playing on these biases. Future research will have to define what is the optimal solution in a heterogeneous population, i.e. the directions different people are to be steered in. Given that stated preferences are subject to behavioral biases and modeled preferences subject to simplifying assumptions, this will be a challenging task.

But even if such a solution can be defined, a second big concern remains: Any kind of framing or nudging implies that people are pushed into taking a choice they would initially not have taken. This would be a severe interference with the free choice of mature citizens, which is hard to justify in an institutional democracy that respects personal rights. One could argue that the Dutch pension system with its paternalistic way of arranging for retirement income interferes even more severely with freedom of choice. The point, however, is that framing interferes with freedom of choice without making it transparent to individuals. Advocates of libertarian paternalism, in turn, point out that the approach is still superior to restrictive, purely paternalistic policies because it does not take away choice from those who show stable preferences. (which also applies to the underlying case; recall, that debt holders were less “nudgeable” towards annuities) At the same time it is regarded dominant to complete freedom of choice because it minimizes welfare loss from biased decision taking. The concept of nudging is truly a middle course between paternalism and liberalism. Once it is acknowledged that first of all, no choice is not an option and that second of all there is no such thing as a truly neutral presentation of choice, one can embrace libertarian paternalism²² as the best solution in policy making as well as pension plan design.

²² For an introduction to Libertarian Paternalism and a discussion of its implications and consequences see: R. H. Thaler and Sunstein (2003)

8 Appendix**Table 7 Logit Regression: Choice to switch at least 2Y away from aow age**

Specification:	A	B	C	D
VARIABLES				
male	0.00*** (0.00)	-0.00 (0.98)	0.00 (0.15)	-0.00 (0.10)
married	0.01*** (0.00)	0.00*** (0.00)	0.01*** (0.00)	0.01*** (0.00)
income	0.00*** (0.00)			-0.00*** (0.00)
basis		0.00*** (0.00)		0.00*** (0.00)
dtfvoor			0.02*** (0.00)	0.01*** (0.00)
Observations	36,186	36,011	36,189	36,008

pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1 dependent: switch_2y;
logit marginal effects at means**Table 8 Logit Regression: Choice for low-high**

Specification:	A	B	C	D
VARIABLES				
male	-0.01*** (0.00)	-0.02*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)
married	0.01*** (0.00)	0.01*** (0.00)	0.01*** (0.00)	0.01*** (0.00)
income	0.00*** (0.00)			-0.00* (0.07)
basis		0.00*** (0.00)		0.00*** (0.00)
dtfvoor			-0.00 (0.21)	-0.01*** (0.00)
Observations	36,186	36,011	36,189	36,008

pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1 dependent: low_high;
logit marginal effects at means

Table 9 Logit Regression Partial Lump Sum Choice

Specification: VARIABLES	A Frames only	B Economic	C Behavioral	D Combined	E Best						
dflat	-0.46*** (0.00)	-0.52*** (0.00)	-0.52*** (0.00)	-0.54*** (0.00)	-0.44*** (0.01)	red_numbers	0.28* (0.07)	0.07 (0.73)			
dhigh	0.11 (0.47)	0.01 (0.95)	-0.01 (0.97)	-0.05 (0.81)	0.09 (0.61)	contact_fund	-0.02** (0.02)	-0.01 (0.16)	-0.01* (0.06)		
low_high	1.38*** (0.00)	1.54*** (0.00)	1.39*** (0.00)	1.52*** (0.00)	1.34*** (0.00)	zinvolve	0.10 (0.13)	0.06 (0.41)			
high_low	1.85*** (0.00)	1.95*** (0.00)	1.94*** (0.00)	1.95*** (0.00)	1.89*** (0.00)	zf_literacy	0.12 (0.12)	0.13 (0.17)			
male		0.01 (0.97)	0.24* (0.09)	0.10 (0.56)	0.03 (0.86)	zp_literacy	0.03 (0.69)	0.01 (0.86)			
age		-0.04*** (0.00)	-0.03*** (0.00)	-0.04*** (0.00)	-0.04*** (0.00)	zlit_conf	-0.05 (0.51)	-0.00 (0.96)			
life_expectancy		0.00 (0.60)		0.00 (0.70)		zdecision_conf	-0.14* (0.07)	-0.11 (0.19)	-0.16** (0.04)		
married		0.21 (0.37)		0.24 (0.32)	0.39* (0.06)	zoverload_cogn	0.22*** (0.01)	0.28*** (0.00)	0.23*** (0.00)		
was_married		0.31 (0.28)		0.39 (0.19)	0.59** (0.02)	ztrust2	-0.03 (0.64)	-0.09 (0.25)	-0.08 (0.20)		
income_part_time		-0.00 (0.46)		-0.00 (0.59)		zknow_arrange	0.15** (0.02)	0.15* (0.05)	0.17** (0.02)		
annuity		0.00** (0.03)		0.00** (0.03)	0.00*** (0.00)	Constant	-0.90*** (0.00)	0.11 (0.91)	0.63 (0.20)	0.05 (0.96)	0.43 (0.41)
children		0.13* (0.06)		0.14* (0.05)	0.11* (0.10)	Observations	1,381	1,004	1,235	990	1,229
zhealth		-0.18** (0.02)		-0.16** (0.03)	-0.07 (0.28)	Prob > Chi2	0	0	0	0	0
zwealth		-0.12 (0.13)		-0.16** (0.04)	-0.10 (0.16)	Pseudo R2	0.0473	0.126	0.0808	0.147	0.134
long_debt		0.44*** (0.01)		0.49*** (0.00)	0.35** (0.01)	Robust pval in parentheses					
zrisk_general		0.16** (0.04)		0.17** (0.04)	0.18** (0.02)	*** p<0.01, ** p<0.05, * p<0.1					
stocks		-0.49*** (0.01)		-0.46** (0.01)	-0.47*** (0.00)	dependent variable: lump_sum_dummy (1=yes, 0=no); logit					
zdiscount		0.46*** (0.00)		0.43*** (0.00)	0.41*** (0.00)						

Table 10 Logit Regression: high-low / low-high

Specification:	A	B	C	D
Dependent:	high_low	low_high	high_low	low_high
VARIABLES	As in step1	As in step1	best	best
dflat	-0.78*** (0.00)	1.67*** (0.00)	-0.82*** (0.00)	1.71*** (0.00)
dhigh	-1.08*** (0.00)	1.85*** (0.00)	-1.19*** (0.00)	1.94*** (0.00)
step1	0.45*** (0.00)	-0.26*** (0.00)	0.43*** (0.00)	-0.24*** (0.00)
life_expectancy			-0.01 (0.47)	0.01 (0.52)
age	-0.00 (0.90)	0.01 (0.33)		
married	-0.20 (0.39)	0.34 (0.12)	-0.21 (0.34)	0.41** (0.05)
was_married	-0.15 (0.62)	0.20 (0.48)	-0.22 (0.43)	0.34 (0.21)
income_part_time			-0.00* (0.07)	0.00 (0.12)
annuity	0.00 (0.71)	0.00 (0.55)	0.00* (0.09)	-0.00 (0.35)
children	0.05 (0.45)	-0.05 (0.40)		
zhealth	0.02 (0.82)	0.04 (0.53)	0.04 (0.61)	0.02 (0.80)
zwealth	0.10 (0.17)	-0.16** (0.03)	0.13 (0.13)	-0.15* (0.07)
long_debt	-0.05 (0.75)	-0.08 (0.61)		
zrisk_general	0.14* (0.08)	-0.09 (0.20)	0.11 (0.17)	-0.08 (0.29)
stocks	0.12 (0.48)	-0.01 (0.96)		
zdiscount	-0.01 (0.91)	0.04 (0.59)		
red_numbers			0.19 (0.33)	-0.18 (0.35)
contact_fund	-0.01 (0.17)	0.01 (0.36)		
zdecision_conf	0.16** (0.04)	-0.18** (0.02)	0.10 (0.24)	-0.16** (0.05)
zoverload_cogn	0.10 (0.28)	-0.15* (0.06)	0.16* (0.08)	-0.23** (0.01)
ztrust2	-0.16** (0.03)	0.15** (0.03)	-0.21*** (0.01)	0.20** (0.01)
zknow_pension			-0.16* (0.06)	0.17** (0.04)
zknow_arrange	-0.13* (0.09)	0.05 (0.48)		
Constant	-1.42** (0.01)	-0.66 (0.23)	-0.41 (0.64)	-1.25 (0.15)
Observations	1,229	1,229	1,007	1,007
Prob > Chi2	0	0	0	0
Pseudo R2	0.118	0.149	0.128	0.164

Robust pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

dependent variable: high_low/low_high dummy (1=yes,0=no); logit

Table 11 Ordered Probit Regression: Step 1

Specification:	A	B	C	D	E						
VARIABLES	Frames	Econ	Behavioral	Combined	Best						
cg	-0.21*** (0.01)	-0.21** (0.02)	-0.24*** (0.00)	-0.22** (0.01)	-0.22** (0.01)	zdiscount	0.11*** (0.00)	0.11*** (0.00)	0.11*** (0.00)		
cl	-0.35*** (0.00)	-0.34*** (0.00)	-0.35*** (0.00)	-0.32*** (0.00)	-0.32*** (0.00)	red_numbers	0.23*** (0.00)	0.11 (0.13)	0.10 (0.15)		
ig	0.05 (0.49)	0.07 (0.44)	0.02 (0.83)	0.08 (0.39)	0.07 (0.42)	newsletter	-0.03 (0.82)				
il	-0.39*** (0.00)	-0.38*** (0.00)	-0.44*** (0.00)	-0.36*** (0.00)	-0.37*** (0.00)	contact_fund	-0.00 (0.60)				
low_high	0.58*** (0.00)	0.55*** (0.00)	0.59*** (0.00)	0.52*** (0.00)	0.52*** (0.00)	zinvolve	0.00 (0.99)				
high_low	1.00*** (0.00)	1.03*** (0.00)	1.06*** (0.00)	0.98*** (0.00)	0.97*** (0.00)	zp_literacy	0.02 (0.45)	0.03 (0.30)			
male		-0.05 (0.49)	0.03 (0.60)	-0.07 (0.32)	-0.07 (0.33)	zf_literacy	0.04 (0.26)				
age		-0.02*** (0.00)	-0.01*** (0.00)	-0.02*** (0.00)	-0.02*** (0.00)	zlit_conf	0.08** (0.02)	0.06* (0.09)	0.07** (0.04)		
life_expectancy		-0.01 (0.21)		-0.01* (0.05)	-0.01* (0.06)	zdecision_conf	0.00 (0.97)				
married		0.09 (0.34)		0.12 (0.19)	0.11 (0.24)	zoverload_cogn	0.04 (0.28)	0.06* (0.07)	0.06* (0.05)		
was_married		0.20* (0.08)		0.23** (0.04)	0.23** (0.05)	ztrust2	-0.10*** (0.00)	-0.09*** (0.01)	-0.10*** (0.00)		
income_part_time		0.00 (0.92)		0.00 (0.87)	0.00*** (0.00)	zknow_pension	-0.04 (0.26)	-0.06* (0.07)			
replacement		-0.22 (0.66)		-0.31 (0.54)		zknow_arrange	0.09*** (0.00)	0.08** (0.02)	0.07** (0.04)		
annuity		0.00 (0.44)		0.00 (0.45)		Cut 1	0.46*** (0.00)	-0.57 (0.23)	-0.16 (0.49)	-0.79* (0.10)	-0.66 (0.10)
children		0.05* (0.08)		0.05* (0.08)	0.05* (0.07)	Cut 2	0.85*** (0.00)	-0.14 (0.77)	0.24 (0.31)	-0.36 (0.44)	-0.24 (0.56)
zhealth		0.01 (0.78)		0.02 (0.45)		Cut 3	1.35*** (0.00)	0.39 (0.41)	0.77*** (0.00)	0.17 (0.72)	0.30 (0.47)
zwealth		-0.07** (0.03)		-0.07** (0.04)	-0.07** (0.03)	Cut 4	1.56*** (0.00)	0.59 (0.21)	0.96*** (0.00)	0.38 (0.42)	0.50 (0.21)
other_annuities		0.04 (0.56)				Observations	2,234	1,591	1,991	1,651	1,652
long_debt		0.15** (0.03)		0.15** (0.03)	0.16** (0.02)	Prob > Chi2	0	0	0	0	0
short_debt		0.09 (0.29)				Pseudo R2	0.0269	0.0522	0.0451	0.0570	0.0558
zrisk_general		0.10*** (0.00)		0.08*** (0.01)	0.08*** (0.01)	Robust pval in parentheses ; *** p<0.01, ** p<0.05, * p<0.1 dependent variable: step1 choice (1-5); ordered_numbers probit					
stocks		0.05 (0.51)									

Table 12 Logit Regression: High-Low & Low-High

Specification:	A	B	C	D
Dependent:	high_low	low_high	high_low	low_high
VARIABLES	As in Lump Sum	As in Lump Sum	Best	Best
cg	-0.09 (0.60)	1.01*** (0.00)	-0.09 (0.57)	1.00*** (0.00)
cl	0.06 (0.70)	0.86*** (0.00)	0.05 (0.77)	0.86*** (0.00)
ig	-0.17 (0.30)	1.05*** (0.00)	-0.18 (0.28)	1.04*** (0.00)
il	-0.16 (0.35)	1.09*** (0.00)	-0.13 (0.42)	1.05*** (0.00)
step1	0.33*** (0.00)	-0.24*** (0.00)	0.32*** (0.00)	-0.24*** (0.00)
male	-0.24* (0.07)	0.27** (0.04)	-0.22* (0.09)	0.25** (0.05)
age	0.01 (0.37)	-0.00 (0.62)	0.00 (0.69)	-0.00 (0.93)
life_expectancy	-0.01 (0.26)	0.01 (0.14)	-0.01 (0.42)	0.01 (0.25)
married	-0.21 (0.21)	0.17 (0.30)		
was_married	-0.35 (0.11)	0.33 (0.13)		
annuity			-0.00** (0.01)	0.00*** (0.01)
income_part_time	-0.00* (0.06)	0.00** (0.02)		
children	0.05 (0.38)	-0.03 (0.54)		
zhealth			-0.07 (0.24)	0.07 (0.21)
zwealth	0.16*** (0.01)	-0.16*** (0.01)	0.15*** (0.01)	-0.16*** (0.01)
long_debt	-0.29** (0.01)	0.24** (0.05)	-0.31*** (0.01)	0.25** (0.04)
zrisk_general	0.14** (0.01)	-0.13** (0.02)	0.15*** (0.01)	-0.15*** (0.01)
zdiscount	0.12** (0.02)	-0.08 (0.16)	0.11** (0.04)	-0.07 (0.21)
red_numbers	0.00 (1.00)	-0.05 (0.74)		
zf_literacy			-0.10* (0.09)	0.08 (0.16)
zlit_conf	-0.04 (0.56)	0.02 (0.73)		
zoverload_cogn	0.06 (0.31)	-0.04 (0.45)		
ztrust2	-0.10* (0.05)	0.10* (0.08)	-0.08 (0.12)	0.08 (0.15)
zknow_arrange	-0.06 (0.31)	0.01 (0.88)		
Constant	0.00 (1.00)	-1.61** (0.03)	-0.11 (0.88)	-1.39* (0.06)
Observations	1,652	1,652	1,691	1,691
Prob > Chi2	0	0	0	0
Pseudo R2	0.0650	0.0696	0.0639	0.0695

Robust pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

dependent variable: high_low / low_high dummies; logit

Table 13 Ordered Probit: Step 1 with interaction & control

Specification:	A	B	C	D
Interaction of frame with:	male	age	Long_debt	Risk_general
VARIABLES				
cg	0.05 (0.80)	-0.11 (0.32)	-0.59*** (0.00)	-0.22** (0.01)
cl	-0.24 (0.17)	-0.21* (0.05)	-0.58*** (0.00)	-0.34*** (0.00)
ig	0.37** (0.04)	0.23** (0.03)	-0.12 (0.53)	0.06 (0.52)
il	-0.04 (0.82)	-0.19 (0.10)	-0.68*** (0.00)	-0.37*** (0.00)
low_high	0.51*** (0.00)	0.51*** (0.00)	0.50*** (0.00)	0.51*** (0.00)
high_low	0.97*** (0.00)	0.97*** (0.00)	0.95*** (0.00)	0.96*** (0.00)
CG x Interaction	-0.36* (0.09)	-0.24* (0.08)	0.54*** (0.01)	-0.02 (0.83)
CL x Interaction	-0.10 (0.63)	-0.22 (0.12)	0.37* (0.06)	0.17** (0.05)
IG x Interaction	-0.40** (0.05)	-0.35** (0.01)	0.29 (0.17)	0.14 (0.14)
IL x Interaction	-0.44** (0.03)	-0.36** (0.01)	0.44** (0.03)	0.06 (0.52)
male	0.19 (0.17)	-0.06 (0.41)	-0.06 (0.37)	-0.06 (0.37)
age	-0.02*** (0.00)	-0.01* (0.06)	-0.02*** (0.00)	-0.02*** (0.00)
life_expectancy	-0.01* (0.06)	-0.01 (0.10)	-0.01* (0.07)	-0.01* (0.06)
married	0.11 (0.25)	0.09 (0.31)	0.09 (0.34)	0.11 (0.25)
was_married	0.23** (0.05)	0.20* (0.08)	0.22* (0.05)	0.22* (0.05)
income_part_time	0.00*** (0.00)	0.00*** (0.00)	0.00*** (0.00)	0.00*** (0.00)
children	0.05* (0.08)	0.05* (0.07)	0.06** (0.04)	0.05* (0.07)
zwealth	-0.07** (0.03)	-0.07** (0.03)	-0.07** (0.02)	-0.07** (0.03)
long_debt	0.16** (0.02)	0.14** (0.03)	-0.17 (0.21)	0.15** (0.02)
zrisk_general	0.08** (0.01)	0.08** (0.02)	0.09*** (0.00)	0.01 (0.86)
zdiscount	0.11*** (0.00)	0.11*** (0.00)	0.11*** (0.00)	0.11*** (0.00)
red_numbers	0.10 (0.16)	0.10 (0.18)		0.11 (0.14)
zlit_conf	0.07* (0.05)	0.07** (0.03)	0.07** (0.04)	0.07** (0.04)
zoverload_cogn	0.06* (0.05)	0.07** (0.04)	0.06* (0.05)	0.07** (0.05)
ztrust2	-0.10*** (0.00)	-0.09*** (0.00)	-0.10*** (0.00)	-0.10*** (0.00)
zknow_arrange	0.07** (0.03)	0.07** (0.02)	0.06* (0.06)	0.06** (0.04)
Constant	-0.46 (0.26)	-0.09 (0.83)	-0.88** (0.03)	-0.66 (0.10)
Observations	1,652	1,652	1,682	1,652
Prob > Chi2	0	0	0	0
Pseudo R2	0.0575	0.0587	0.0557	0.0573

Robust pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

dependent variable: step1 choice (1-5); ordered_numbers probit

Table 14 Ordered Probit: Step1 , interaction only

Specification:	A	B	C	D
Interaction of frame with:	male	age	debt	risk
VARIABLES				
cg	-0.32** (0.01)	-0.08 (0.36)	-0.50*** (0.00)	-0.21*** (0.01)
cl	-0.48*** (0.00)	-0.19** (0.04)	-0.60*** (0.00)	-0.37*** (0.00)
ig	0.09 (0.44)	0.20** (0.02)	-0.09 (0.53)	0.02 (0.75)
il	-0.28** (0.02)	-0.17* (0.06)	-0.58*** (0.00)	-0.39*** (0.00)
low_high	0.58*** (0.00)	0.58*** (0.00)	0.55*** (0.00)	0.57*** (0.00)
high_low	1.00*** (0.00)	1.00*** (0.00)	1.04*** (0.00)	0.98*** (0.00)
CG x Interaction	0.15 (0.25)	-0.25** (0.02)	0.43*** (0.00)	0.09 (0.13)
CL x Interaction	0.18 (0.15)	-0.34*** (0.00)	0.39*** (0.00)	0.17*** (0.00)
IG x Interaction	-0.06 (0.65)	-0.34*** (0.00)	0.17 (0.22)	0.22*** (0.00)
IL x Interaction	-0.15 (0.22)	-0.43*** (0.00)	0.24* (0.08)	0.12** (0.04)
Constant	0.46*** (0.00)	0.45*** (0.00)	0.43*** (0.00)	0.44*** (0.00)
Observations	2,234	2,234	2,000	2,234
Prob > Chi2	0	0	0	0
Pseudo R2	0.0278	0.0335	0.0340	0.0323

Robust pval in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

dependent variable: step1 choice (1-5); ordered_numbers probit

Graph 15 Distribution of choice in step 2 (pre-switch/post-switch pension) by frames

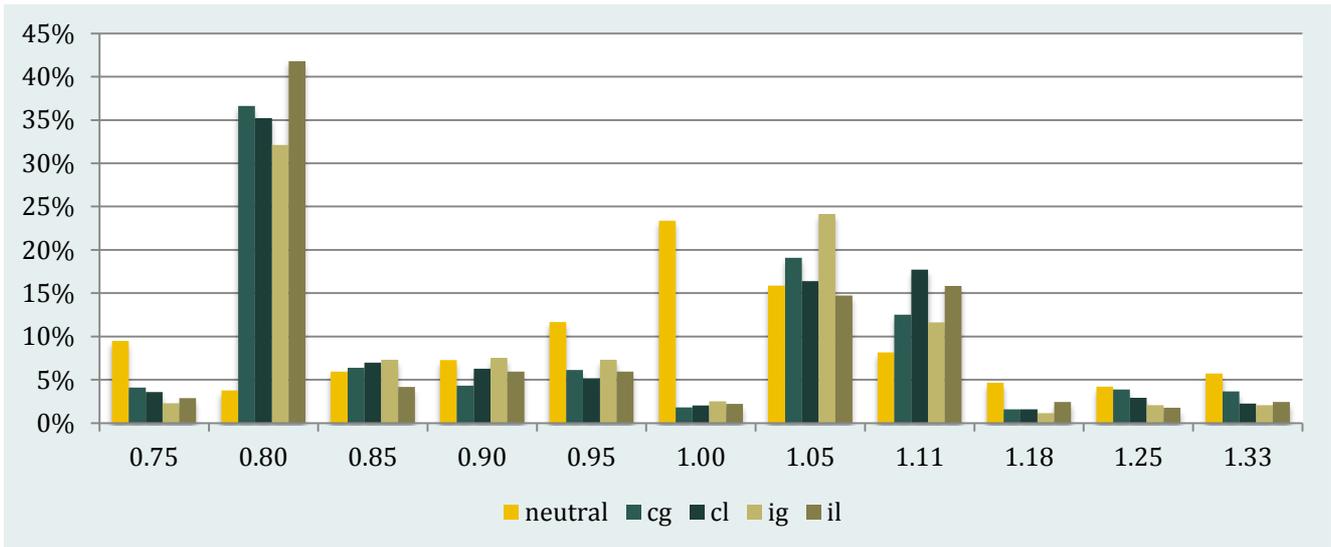


Table 15 List of variables in survey data

Variable	Explanation	Values	Expected effect on step1	Hypothesis
Dependent Variables				
Step1	Captures how much lump sum is taken in first step of experiment	1,2,3,4,5 for 0;0.05;0.1;0.15;0.2 lump sum		
High-low	Indicates if any of the 5 high-low allocations was chosen	1=yes, 0=no		
Low-high	Indicates if any of the 5 low-high allocations was chosen	1=yes, 0=no		
Framing Variables (explanatory / independent)				
cg	Respondent saw consumption gain frame	1=yes, 0=no	-	See Table 1 & section 2.1.3.1.4
cl	Saw consumption loss	1=yes, 0=no	-	See Table 1 & section 2.1.3.1.4
Ig	investment gain	1=yes, 0=no	+	See Table 1 & section 2.1.3.1.4
Il	Investment loss	1=yes, 0=no	-	See Table 1 & section 2.1.3.1.4
dflat	Default = 0 ls & no high_low	1=yes, 0=no	-	See Table 1 & section 2.1.3.1.4
Dhigh	Default=0.1 lump sum & high-low	1=yes, 0=no	+	See Table 1 & section 2.1.3.1.4
n	neutral frame	1=yes, 0=no	/	See Table 1 & section 2.1.3.1.4
Rational / Standard Economic Theory Variables (explanatory / independent / control)				
age	Respondents age	in years	-	Elderly are more risk averse, seek longevity insurance
male	Indicates gender	1=male, 0=fem	+	Men are more risk seeking and confident in financial skills
Married / was married	Two separate dummies to cover married, unmarried, widowed	For both: 1=yes, 0=no	Married +	Married engage in intrafamily longevity risk pooling
Income_full_time	Full time equivalent Income	in €	-	High income earners need less additional liquidity

Part_time_factor	Working hours in % of full time	0.1-1.2	-	See income
Income_part_time	Current work income	=part time factor*full time income	-	See income
upo	Projected annual pension right	in €	-	See income
other_annuities	Is any annuitized wealth expected outside the plan	1=yes; 0=no	+	Already annuitized wealth increases demand for liquidity
wealth	Total wealth, any assets	1=0-2000€ 2=2001-10000€ 3=10001-20000 4=20001-50000 5=50001-100k 6=100001-150k 7= above 150k	-	Need for liquidity decreases with wealth
houseowner		1=yes; 0=no	+	Illiquidity of housing → more lump sum
house_paid	Expects to have house paid off until retirement	1=yes; 0=no	-	When house paid off, no need to pay debt with lump sum cash out
short_debt	Has (consumption) credits with duration < 10Y	1=yes; 0=no		
long_debt	Has loans with duration > 10Y	1=yes; 0=no	+	Lump sum used to pay off loans
stocks	Holds stocks	1=yes; 0=no	+/-	More risk seeking → less annuitization / Higher finance. sophistication → value annuities correctly
risk_general	Self indicated general risk appetite	1=always avoid risks, 2=avoid risks, 3=neutral, 4=take risks, 5=always take risks	-	More Risk averse → value longevity insurance
risk_aversion_life	Life time income gamble	1=not risk – 4=very risk av.	-	See above
discount	willingness to delay lottery payout (patience)	1=very low – 5=very high	+	Impatient respondents or heavy discounters prefer lump sums
children	Number of children	1=1; 2=2 3=3 4= more than 3	+	Children as proxy for bequest motive → more ls
health	Self indicated general condition	1=poor 2,3,4, 5= very good	-	Good health increases demand for longevity insurance
life_expectancy	Self indicated life expectancy	In years (age)	-	Higher life expectancy → more longevity insur.

Behavioral Variables (independent / explanatory / control)				
red_numbers	Uses more than 5 times/year credit on cash account	1=yes; 0=no	+	Very costly form of credit as irrational as underannuitization
education	Highest level	1=basic 2=continued 3=lower 4=middle 5=higher 6=academic 7=phd	-	Higher educated will find it easier to value the annuity and have less need for liquidity due to higher wealth
involvement	Combines several questions, measure pension-interest	0-1	-	More involved have less difficulties in valuing annuities
newsletter	Receives fund-newsletter (e-mail)	1=yes; 0=no	-	Different proxy for involvement
contact_fund	Number of contact with fund in last	# of contacts	-	Different proxy for involvement
trust	Combines several questions, systemic & fund trust	0-1	-	More trust → rely on fund & less fear of default
f_literacy	Financial literacy (Lusardi, Mitchel)	1,2,3,4,5	-	More literate value annuities correctly
p_literacy	Pension literacy (system specific)	1,2,3,4,5	-	See f-literacy
Lit_confidence	# of f_lit. questions confident to have answered correctly	0,1,2,3,4,5	+	Overconfidence may lead to "underannuitization)
decision_conf	Confidence to have taken "right" decis. in experiment	1,2,3,4,5	-	Confidence is associated with understanding annuities → less LS
overload_cogn	Combines several questions about experiment	0-1	+	Overload → LS appears as less complicated (more attractive)
know_pension	Knows hight of current projected pension right	1,2,3,4,5	-	Well informed appreciated longevity insurance
know_arrange	Knows enough to arrange well for own pension	1,2,3,4,5	-	See above

9 Survey Questions

Available on request. Please send an e-mail to: eduard.ponds@apg-am.nl .

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Endnotes:

ⁱ Assumptions in Yaari 1965:

- Perfect annuity markets, current assets can eliminate future risks
- Annuities are actuarially fair
- Individuals maximize additively separable expected utility
- Longevity as the only source of uncertainty
- No bequest motive

ⁱⁱ variables available in past choice data: age (as of 01.05.2015), sector, fulltime income, part time income, marital status, retirement age, aow-age, pension, pension pre switch, pension post switch, switching point (in years), allocate from partner pension to own, allocate from own to partnerpension

ⁱⁱⁱ The five involvement statements in short:

1. I want more influence on my own pension.
2. I want to know more about how my pension is arranged.
3. I find it important to know how much I pay for my pension.
4. I find it important to know how much I will receive when retiring.
5. I would take action in case my pension prospects worsen.

^{iv} The four trust statements/questions in short:

1. I think, that I could make for a better pension when I arranged it myself.
2. I trust in how pensions are arranged for in the Netherlands.
3. I trust my pension fund.
4. How favorable is your image of the fund?

^v The four cognitive overload statements in short:

1. There was too much information to think about when taking the decision.
2. I found it hard to take a decision.
3. I found the decision overwhelming.
4. I found it difficult to grasp all the information.