Behavioral finance and pension decisions

An extensive literature review and a focused analysis on how framing effects, financial literacy, self-control and loss aversion affect pension decisions

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Abstract

The retirement landscape is rapidly changing with pension savings shifting to Defined Contribution plans. This means that individuals are increasingly confronted with more responsibilities to make decisions about their retirement savings. They are however, neither qualified enough, nor always willing to make such difficult decisions. The present paper after reviewing relevant behavioral theories and studies, uses the Transamerica Center for Retirement Studies (TCRS) 15th Annual US Retirement Survey to examine the impact of framing effects, financial literacy, self-control and loss aversion on those decisions. It finds strong framing and anchoring effects on the match threshold of a matching contribution feature within 401 (k) or similar plans. Moreover, the findings of this paper suggest that financial literacy cannot significantly mitigate these framing effects. Lastly, this paper shows that commitment devices such as having multiple savings accounts can significantly increase 'out of work' savings for retirement.

Acknowledgements

About the author

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1. Introduction

1.1 Motivation & objectives

As longevity and life expectancy are increasing, retirement is becoming an element that is of paramount importance to people's lives. Individuals will have to work longer and save more to retire in dignity. The Transamerica retirement survey[1]-in line with other research-shows that people are not preparing enough for retirement. The often mentioned, educational, social and economic reasons not always depict the full picture of this problem. Behavioral aspects of retirement savings need to be also addressed in order to better understand why people do not save enough for retirement.

Behavioral economics is commonly associated with academic research that offers an alternative to standard economic theory, when it comes to explain decision-making. Behavioral economics can have applications in real-life problems though. Standard economic theory assumes that people are perfect calculators that can assess all information about the prospects they face and make optimal, rational decisions. However, actual practice shows the opposite; people often make biased or irrational decisions. Saving for retirement is perhaps the greatest example of applied behavioural economics and there is an extensive body of research on this topic, suggesting that psychological factors also contribute to low retirement readiness and saving levels. The objective of this paper is using behavioral economics insights and through a survey research, to elicit behavioral biases that may occur in people's decisions about retirement savings and to illustrate the important role that behavioral finance can play, in designing effective retirement policies and products.

As the present paper is produced in collaboration with the Transamerica Center for Retirement Studies and the Aegon Center for Retirement Studies, it aims also to provide complementary research to the work that has successfully been done within these two research entities. What is more, this paper strives to provide some relevant for the industry implications, as well as hopes to generate some insightful discussion on behavioral finance, which is a resource relatively new and surely underutilised by the pension industry.

1.2 Thesis structure

This paper in chapter 2 describes how the current retirement landscape looks like and which are the developments in this area.

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[1] Information about the Transamerica Center for Retirement Studies is included in the endnotes.

In chapter 3, the present paper provides an extensive literature review on theories, experiments and research related with retirement decision-making. Hence, it addresses prospect theory, in specific loss aversion. It also provides insights on how intertemporal choice theory applies to retirement savings. In particular, how hyperbolic discounting and self-control issues affect savings decisions and in turn savings outcomes. Moreover, the present paper investigates aspects of mental accounting theory, which relate to retirement decision-making. A review of research on behavioral biases in 401 (k) retirement plans is also provided in chapter 3. This specific sub-section is divided in 3 parts in which biases in participation, contribution and investment decisions within these plans, are examined. Furthermore, the literature review includes an example of successful applied behavioral economics, as well as a discussion on where financial literacy literature diverges with behavioral economics. Chapter 3 aims to provide the readers with a comprehensive overview of the prevalent theories, research topics and schools of thought concerning behavioral finance and pension decisions.

In chapter 4 the research questions of the present paper are stated.

This research paper focuses on specific behavioral biases, namely self-control, loss aversion and framing effects, and through a survey research identifies how they affect retirement decisions and savings outcomes. This survey is part of the annual Transamerica Center for Retirement Studies (TCRS) survey, circulated among 4,000 workers in the US. In chapter 5 the methodology is described. In particular, this part discusses the design of the survey questions used to examine how these biases affect retirement decisions. What is more, chapter 5 includes a sub-section on data description.

The analysis follows in chapter 6. Here, a detailed description of the analysis tools and methods is provided. More specifically, this section includes a description of how the data tables are designed so as to examine statistical differences and to make all necessary comparisons possible. Moreover, this paper seeks to examine the interaction between the level of education and the way people decide for their retirement savings. This in turn aims to identify whether financial literacy mitigates and framing effects. This part of the analysis is possible using the data tables design, described in chapter 6.

In chapter 7, this paper discusses the results of the analysis and provides an interpretation of them.

Chapter 8 constitutes the discussion part of this thesis. In this part recommendations for further research as well as the limitations of the present one, are provided.

As the related with retirement savings behavioral research has to a large extent prescriptive characteristics, the present paper includes an "implications for retirement plan providers" part

in chapter 9. In this part recommendations drawn from both the literature review and the survey research and analysis are provided.

Finally, chapter 10 is the conclusive part of this study, which summarises the findings and the main conclusions.

2. Current environment

The retirement landscape is dramatically changing with many people being at risk not having enough in retirement. Increasing life expectancy and longevity make the need for retirement income increasingly important. What is more, the recent crisis puts extra pressure on public pension systems. Employers face greater risks and costs in funding retirement and therefore are rapidly shifting risks and responsibilities to employees. Hence, it becomes more and more obvious that we have entered the "era of personal responsibility". People have to save themselves and more in order to fulfill their retirement objectives. During the last decades indeed, a shift form Defined Benefit (DB) pension plans towards Defined Contribution (DC) plans occurs. DC[2] pension schemes require participation from the employees.

However, research shows that people are not preparing enough for retirement. Financial illiteracy, associated with retirement risks and costs, lack of financial planning and the general attitude to delay saving are the main drivers of low retirement readiness (HSBC "the future of retirement" 2013, Mercer global DC survey 2013). Several studies also recommend that participation level and saving rates are not sufficient for the employees to get a full retirement income. Hence, the Annual Transamerica Retirement Study 2013 shows that being financially stretched is the main reason why employees do not participate in their employers retirement plan. Other findings include, limited member understanding, mistrust in financial institutions, conflicting priorities and the "do it myself" mentality (Deloitte "Meeting the retirement challenge" 2013).

Companies use features such as matching contributions, auto-enrollment and auto-escalation to incentivise people enroll in pension plans and contribute more. It seems though, that despite the fact that people acknowledge that they have to do so, they do not significantly save more. This paper aims to provide a behavioral explanation to this.

3. Literature Review

3.1 Relevant theories

In this part relevant to retirement decisions behavioral theories are discussed. Namely, Prospect Theory, Intertemporal choice and self-control and Mental Accounting.
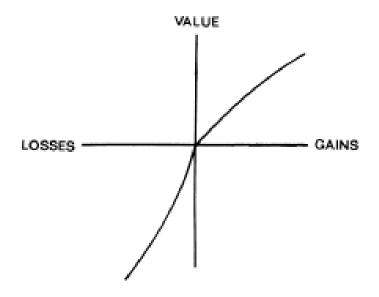
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[2] Retirement plans and features terminology is provided in the endnotes.

3.1.1 Prospect Theory

Prospect theory is a model of decision making under risk and uncertainty. It serves as a critique and an alternative to expected utility theory (Kahneman and Tversky, 1979). Prospect theory includes characteristics such as risk aversion and loss aversion. Prospect theory models people's decisions, using a S-shaped value function, which significantly diverges from the traditional expected utility (EU) function. According to the prospect theory value function, decision-making is done on a gains and losses basis and not on a total wealth basis, as the EU theory assumes. What is more, the shape of the value function itself implies that people treat gains and losses in a very different manner. The S-shaped function is concave for gains and convex for losses (figure 1). This means that individuals are risk averse for gains and risk seeking for losses. Moreover, the losses function (convex) is much steeper compared to the gains function, suggesting that people are loss averse. According to experimental evidence from Kahneman and Tversky (1979), people weight losses more than twice as much they weight gains. The index for loss aversion applies in investment decisions as well; people for instance are willing to *"take a gamble if confronted with a choice of realizing an incurred but not-realized loss, versus taking the gamble in which they might break or lose more"*. People are therefore averse to realize losses.

As far as investment decisions are concerned, aspects of prospect theory such as overconfidence and loss aversion appear to be very relevant. Overconfident behavior is observable at the gains area where people tend to create future forecasts based on excess optimism about their own capabilities. Individuals seem to underestimate the role of random chance when making predictions about the future. This can translate in sub-optimal and certainly not rational decision-making (Barber and Odean, 2000). Loss aversion on the other hand may lead to sub-optimal decisions in the losses area of the prospect theory value function. People are often reluctant to realise unrealised losses, as the act of realising the paper losses is perceived as more painful. People appear to be "slow" to "cut losses" in contrast to what they do for gains. In fact, they tend to rush to realise gains. This phenomenon is what Shefrin and Statman (1985) call the "disposition effect". Overconfidence and loss aversion may be even more impactful in a "narrow framing" mind-set. Kahneman (2003) suggest that individuals are more willing to accept a risky gamble when is played multiple times versus when it is played only once. They therefore *"think small"* for an one-time occurring gamble or investment decision, and *"think large"* for a sequence of the same gamble.

Figure 1. The Prospect Theory Value Function

3.1.2 Intertemporal choice and self-control

Intertemporal choice is defined as the study of the relative value that people assign to present and future consumption. Psychological research shows that individuals' discount rates for short-term are a lot higher to those for long-term (Laibson et al., 1998). A key component of intertemporal choice is hyperbolic discounting which means that people tend to overweigh near-term consumption or discount present more heavily (Shane, Lowenstein, O'Donoghue, 2002). Hyperbolic discounting implies that future opportunities of saving more are perceived more attractive compared to present ones (Thaler, 1981, Thaler and Benartzi, 2004). Therefore, contrary to what Standard Economic Theory would suggest, one dollar saved today appears to have more value in the short-run compared to the long-run. This implies that hyperbolic discounters are overconsuming today at a substantial cost to their future consumption. Hyperbolic discounting implies also decreasing impatience. In other words people are more willing to wait for outcomes further in the future. Impatience means that utilities at later points in time are assigned a lower weight. Impatient individuals are more willing to speed up events with positive utility and delay events with negative utility.

Moreover, Quasi-hyperbolic discounting, which is a type of hyperbolic discounting, implies decreasing impatience if time 0 is involved, but constant impatience if only future periods are involved. This is also called present-biased preferences (O'Donoghue and Rabin, 1999). Present-

biased preferences in practice refer to peoples' tendency to take immediate rewards and to delay immediate costs. Furthermore, O'Donoghue and Rabin (1999) make a distinction between sophisticated and naïve behaviour. Sophisticated individuals faced with immediate costs tend not to procrastinate, while naïves do. The exact opposite occurs though for immediate rewards, where naïve agents are potentially better off as they are intrinsically motivated to wait due to the fact they overestimate the benefits of waiting.

Using quasi-hyperbolic discounting preferences theory, Diamond and Koszegi (2003), suggest that earlier self, in a dual-self model, think that the deciding-self tent to retire too early and therefore is willing to save less so as to induce later retirement. A dual-self model includes a planner self and a doer self.

There is enough evidence that people have hyperbolic preferences when it comes to decide about retirement savings. Warner and Pleeter (2001) found that US army retirees that were offered the choice between getting a lump-sum and an annuity, they chose the lump-sum. The retirees were offered an annuity with approximately 18 percent internal rate of return, at a time when government bonds returns were around 7 percent. Despite opposite expectations, retirees opted for the lump-sum, clearly underscoring that people tend to prefer lump-sum to annuities, and undervalue *"the appeal of a lifetime annuity at a substantial cost".* A different explanation of this would be that the "fear" of dying early makes people choose an immediate payment such as the lump-sum. Furthermore, Laibson et al. (1998) show that hyperbolic consumers would react more positively to DC pension plans compared to exponential consumers.

Moreover, self-control theory suggests that people's behavior can be summarized using the phenomenon called "lack of willpower" or "bounded self-control". This means that people often try to save but they seem to be failing to execute their desire. In fact, research shows that people report that they have to save more but they lack the ability to take action on their knowledge (Clark et al. 2006). In line with this, are the findings from the Aegon Retirement Readiness Survey 2013 and 2014 in which respondents acknowledge that they are not saving enough for retirement but in practice only few of them, for instance, have a written plan.

People often use commitment devices to overcome self-control issues. A commonly used such device is "Pay yourself first" which is imposed by financial planners to trigger disciplined saving behavior. This is also the intuition behind the structure of payroll deduction 401 (k) plans. The structure of the payroll deduction is a successful commitment device, as contributions are deducted before the individual can spend the money. Successful commitment devices currently used are also the auto-enrollment and the auto-escalation features within retirement plans.

A direct implication of self-control theory is that the shape of income stream can have a great influence on saving behaviour. Thaler and Shefrin (1981) point that if an employee is paid a portion of her salary as a lump-sum bonus, there is a higher chance to save more compared to an employee paid the same amount but in a smooth pattern. Therefore, such a bonus could serve as an external self-control device. However, this suggestion from Thaler and Shrefin's model does not seem to apply in 401 (k) savings specifically. This is due to the fact that contributions to such plans are structured through payroll deduction from each pay-check, irrespectively of what kind this pay-check is. Hence, the way that 401 (k) plans are structured, implies that individuals cannot direct the amount of a bonus that goes into them; whatever the payroll deduction percentage is, will be the amount contributed to the plan for the bonus and all other pay-checks.

3.1.3   Mental accounting

"Mental accounting is the set of cognitive operations used by individuals and households to organize, evaluate, and keep track of financial activities" (kahneman and Tversky, 1984, Thaler, 1985, 1999). According to mental accounting theory, people "mentally" divide their money into the *"new money account"* and the *"old money account"*. Old money refer to money that have already been contributed to a DC plan, while new money refer to amounts that have not already been pledged to a DC plan. People appear to be more willing to differentiate the allocation of new money compared to old money. This is because individuals are worried that they will regret reallocating old money that might perform worse than the original allocation. In contrast, for the new money there is no history-no reference point. For new money, reluctant behaviour is therefore mitigated. Americs and Zeldes (2000) studied a sample of TIAA-CREF participants throughout 1987-1996. They observe that only 27 percent of the participants changed their assets. However, 53 percent of them reallocated their future contributions.

3.2   Behavioral biases within 401(k) or similar retirement plans

This section discusses behavioral biases that occur in people's decisions within 401 (k) retirement plans[3]. Decisions related to such plans can be divided in three categories: participation decisions, contribution decisions and investment decisions. These three types of decisions refer respectively, to the three initial stages of 401 (k) plans and render the accumulation phase. There is also the decumulation phase in which individuals receive their retirement benefits after they retire. A behavioral bias that occurs in the decumulation phase is hyperbolic preferences as described in Warner and Pleeter's (2001) study and earlier in this paper. The following paragraphs though, focus on behavioral biases in the three stages of the accumulation phase.

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[3] See description in the endnotes.

3.2.1 Biases in participation decisions

A predominant problem that people face is the decision to enrol or not in a retirement plan and when to do so. Framing effects seem to play a very important role in participation rates. Hence, the way the default decision to join a 401 (k) plan is framed, influences significantly participation rates. A large body of survey, empirical and applied research shows that automatic enrollment significantly increases participation rates. Therefore, when the decision to join the plan is framed as " you are automatically enrolled in the plan but you have the right to opt-out at any point" instead of "you can opt-in the plan", the participation rates dramatically increase. Madrian and Shea (2001) using data from a large US firm, show that when individuals are required to opt-in, the decision is to save nothing, whatsoever. However, under auto-enrollment the decision is to save at the pre-specified rate by the employer. In fact, participation rates in the sample they studied moved from 37 percent to 86 percent for people hired after the introduction of the auto-enrollment scheme. Choi et al. (2002, 2004) and Benartzi and Thaler (2004) also show that automatic enrollment drastically increases participation rates within 401 (k) plans. What is more, a large number of studies using cross-sectional data, show that where an employer match is available, participation increases as well (Andrews (1992), GAO (1997), Basset, Fleming and Rodrigues (1998), Papke and Poterba (1995), Engelhardt and Kumar (2003), and Huberman, Iyengar and Jiang (2003)). These studies moreover, reveal that the level of the match can increase participation in the plan. These results are in support to the general behavioral notion of the "default options". People tent to anchor to the default options and do not make any changes. It is therefore obvious that the success of automatic enrollment in participation rates is to a large extend attributed to inertia.

What seems to play a role in people's decisions about participating in a retirement plan, is also peer effects. Benartzi and Thaler (1999), state that people ask for advice from their spouses, friends or colleagues instead from specialised advisors. In support of this statement is a study from Duflo and Saez (2000, 2002). They tested participation rates in 11 different libraries of a university where people that were about to be hired did not know upfront in which of these 11 libraries would be assigned to. Results of this study show that there were large differences between the participation rates across the libraries, suggesting strong peer effects.

3.2.2 Biases in contribution decisions

While auto-enrollment proves to be a very effective tool to increase participation rates, its effect is partly offset by inertia and procrastination. Choi et al. (2001) show that people stick to the default options offered by the plan. Given the fact that the average default contribution rates are often too low, inertia leads to low saving rates. The authors state that individuals tend to follow "the path of least resistance", meaning that they would follow any pre-set option instead of making active decisions. This is also called passive decision-making. Choi et al. (2001)

combining survey research with plan records, powerfully show that very few of the employees that report that they will raise their contribution, actually do so. This suggests a clear existence of the "default option" bias.

Moreover, individuals tend to use savings heuristics to ease their decision making about contribution in retirement plans. Benartzi and Thaler in collaboration with Hewitt (2002b) find that people's stated contribution rates follow certain patterns. In particular, individuals asked how much would they contribute to their plan, tent to use multiples of 5 to define the contribution rate. Note here, that in this experiment all plans offering an employer match are excluded to avoid getting responses that try to maximise employer's match. In fact, the authors using this same study find that the latter is a commonly used strategy by employees; that is, contributing only up to percent necessary to receive the "free lunch" from their employer. Furthermore, it is a very common practice for plan providers and employers to offer matching contribution so as to induce higher contribution rates from the employees. In the US the vast majority of the 401 (k) plans offer a match and in some cases even the state is subsidizing low-income households' contributions. Such an example is the Saver's Credit in the US.

Overall, the largest part of the existing literature on matching contributions seem to yield heterogeneous results on whether employer matches positively affect contributions and in turn savings outcomes. Some find a positive relationship (Andrews (1992), Papke and Poterba (1995), Even and Macpherson (1997), Kusko, Poterba and Wilcox (1998)). Some others find a negative relationship (Clark et al. (2000), Munnell, Sundén, and Taylor (2001) Vanderhei and Holden (2001) Mitchell, Utkus, and Yang (2007)). According to Choi et al. (2005) and to Madrian (2012) though, the most convincing study on the effect of matching on contribution rates is the one of Engelhardt and Kumar (2004, 2007). It seems to be the most careful study as it controls for nonlinear savings incentives, it uses data records of contributions and it accounts for other factors that may affect contribution rates such as taxes. In fact, Engelhardt and Kumar conclude that there is no clear positive relationship between match and contribution levels and question the effectiveness of matching contributions as a mean to increase savings. Consequently, it seems that employer's match can increase contributions but only up to a point.

Interestingly, Choi et al. (2002, 2004b, 2006) and Madrian (2012) argue that the impact of the match threshold rather than the match rate is the most important element of employer match feature. It is so, due to the fact that people see the threshold as a reference point and tend to anchor to it. Anchoring effects have well been documented in the behavioral economics literature. Kahneman and Tversky (1974) suggest that people heavily anchor to starting points or values. The impact of the match threshold in contribution rates is also examined later is the present paper using survey data.

3.2.3 Biases in investment decisions

Once participants join a 401 (k) plan and choose an amount to save, they then are asked to invest their contributions. What people usually do when faced with asset allocation and complex investment decisions is to follow simple rules of thumb. One such rule is to follow a naïve diversification strategy. That means that people faced with "n" options, tend to evenly divide assets across these options, which is called the naïve 1/n diversification rule. Benartzi and Thaler (2001) asked UCLA employees to allocate their retirement contributions between five funds. The employees were divided in two groups, with the first group being asked to divide their contributions among four equity funds and one fixed-income fund. The second group was provided with a reverse mix of funds; hence with the option to allocate their contributions among four fixed-income funds and one equity fund. The employees offered only one equity fund, allocated 43 percent of their contributions to equities, while those offered four equity funds, put 68 percent in equities. The results clearly suggest a 1/n heuristic. What seems to be strongly driving individual's investment choices therefore, is the framing effects of the investment menus. Benartzi and Thaler (2001) also find that people who were asked to select an investment mix for their pension plans between 2 different funds, chose a 50 / 50 mix of the funds offered. However, the underlying asset allocation, across the different fund choices, was significantly different.

In line with this, are the findings from research by Huberman and Jiang (2004) who using records of actual individual choices, show that that people tend to allocate their contributions equally among the funds chosen. They call this rule the conditional 1/n rule because it seems to be applied when it is "easy" to be applied. For instance when n=2 or n=4, 37 to 64 percent of the individuals use the naïve diversification rule. However when n=3 only 18 percent of the individuals use this rule.

Another key element of investment decisions within 401 (k) plans, appears to be the number of funds offered. Huberman and Jiang (2004) using data from Vanguard Group find that irrespective of the number of funds that 401 (k) participants are offered, the median number of funds chosen, lays between three and four. The range of the funds offered is 4 to 59. Additionally, they find that the tendency to follow the 1/n rule declines as the number of funds used increases. One can observe therefore, that as the number of options increases, people will have to adopt simplifying strategies. Consistent with this, is evidence from Iyengar and Jiang (2003). They show that when the number of investment options raises the 1/n heuristic is less used and people tend to choose the safest investment option. The authors report that by adding 10 funds to the investment pool, the percentage allocated to money market funds increases by 4 percentage points. Worryingly, these other simplifying strategies can include "no choice, whatsoever" as well.

Furthermore, a study by Benartzi and Thaler (2002) suggests that people do not have *"well-defined preferences"* when deciding about investments. The authors provided people with possible outcomes from investing in portfolios they have constructed themselves and from the median portfolio their peers have constructed. When asked to choose between these two portfolios, 62 percent of the respondents went for the median portfolio.

To test for inconsistent preferences when it comes to investment decisions, Benartzi and Thaler (2002) also investigated the "extremeness aversion" effect. According to the authors, extremeness aversion is defined as *"the tendency for consumers to prefer an option that does not appear to be at the extreme point of some relevant continuum"*. They tested extremeness aversion by asking UCLA staff to choose between portfolios A, B, C and D which resembled a privatized Social Security account and ranged from low risk (A) to high risk (D). The experiment was performed in three different conditions. In the first condition investment choice C was framed as an extreme option. Hence, the continuum was A, B, C. In the second condition prospect C was shown as a neither-nor option compared to B. Finally, in the third one, investment option C was framed as the middle option by forming the sequence as B, C, D. The results of this experiment show that in the first condition only 29.2 percent preferred option C, over option B. In the second condition 39.0 percent chose C to B and in the last third condition 53.8 percent of the participants opted for option C, over option B. These findings consequently, confirm the existence of extremeness aversion in people's decisions about portfolio choices.

Inertia and procrastination play also a role in investment decisions within 401 (k) plans. Madrian and Shea (2001) and Choi et al. (2001b) find significant levels of inertia in investment decisions. What is more, Mitchell and Utkus (2006), using Vanguard group data for 2.3 million plan participants, show that very few of these participant changed their asset allocation from 1999 through 2003; a finding largely suggesting inertia occurrence. These research findings highlight the importance of default options or *"starting values"* in decision making. People tent to anchor to these defaults leading to a prolonged inertia.

Finally, there is a body of research studying investment decisions within 401 (k) plans and suggesting that people due to framing effects and due to familiarity effect, tend to over-invest in their own company stock; decisions that often result in unfavourable or sub-optimal outcomes (Benartzi and Thaler, 2001, Holden and VanDerhei, 2001, Liang and Weisbenner, 2002, Agnew, 2002). However, the present study chooses not to elaborate on this topic, as at this juncture, it is considered as somewhat "outdated". In fact, according to Transamerica Center for Retirement Studies (TCRS), only 1 in 5 US workers are offered the option to invest their 401 (k) contributions in their own company stock and it is not very common that employers match 401 (k) contributions using company stock.

3.3 Successful applied behavioural economics-the Save More Tomorrow Plan

As mentioned previously, auto-enrollment seems to be a very successful way to increase participation rates and in turn savings outcomes. However, savings rates still remain low. This is mainly due to inertia and anchoring to the default options (default contribution rates), which are most of the times low. To overcome this problem Benartzi and Thaler (2004), introduced the "Save More Tomorrow" (henceforth SMT) plan. Through this plan the authors-founders address self-control, loss aversion, the fact that losses are usually assessed in nominal terms and lastly, inertia.

Taking on board these biases the SMT plan introduces an auto-escalation scheme which serves as a pre-commitment device for participants. Employees have to commit in advance that they will increase their contribution every time they get a pay raise. This way people would never see their *"take-home"* money decreasing. Moreover, since these increases are automatic, inertia will keep participants in the "loop" of saving more and more. The results of the first implementation of the plan, in a mid-sized manufacturing company, were overwhelming. Most participants remained within the plan until the fourth pay raise. That translates in tree and a half years later. The most significant result though is the fact that participants started with a 3.5 percent savings rate ended up with 13.6 percent. What is more, the very few that opt-out earlier, did never return to the very low contribution rates they had before enrolling to the SMT plan.

Since this initial success, the plan has been adopted by retirement plan providers such as Vanguard, TIAA-CREF, Fidelity and Hewitt Associates. It is now available in numerous workplace plans.

3.4 Financial literacy versus Behavioural Economics

Lack of financial literacy is one of the most cited reasons that people do not save enough for retirement. There is enough evidence that people in general are not much sophisticated in terms of knowledge of basic financial notions such as the compound interest , inflation and diversification. Lusardi and Mitchell (2007a, 2007b, 2007c, 2008, 2009, 2011) through extensive survey research show that there is widespread financial illiteracy among Americans. The authors find that people experience real difficulties to understand basic financial concepts. What is more, in a survey they contacted in a sample of 50 plus aged Americans, they found that only a third could successfully address compound interest, inflation and diversification. This survey consists of only three simple questions on those topics respectively. These findings are particularly important when individuals need to decide about complicated savings such as savings for retirement.

One of the most recommended ways to overcome this problem is to provide financial education from a very early age in the school curriculum. However, it is unclear whether such a measure is in reality effective. Fernandes, Lynch and Netemeyer (2014) using a meta-analysis, study the relationship of financial literacy to actual behaviour in 168 papers. They find that financial education has only small effects in people's financial decisions. What is more, they also claim that the way financial literacy is studied so far-with many correlational studies-does *"mask"* the limitations of financial education. Finally, the authors recommend that financial education should be provided in specific moments and for the specific needs it aims to address.

Thaler (2013) also challenges the effectiveness of financial education within schools, saying that it is a useful tool but is not alone enough to improve financial decisions. The author identifies three paths that could be more effective than financial education. Firstly, providing what Fernandes, Lynch and Netemeyer call "just-in-time education", when for instance taking a loan or when individuals are about to retire. Secondly, Thaler suggests that offering rules of thumb can more effectively increase retirement savings than financial literacy could do. Lastly, he recommends that an effective way to help people save more is to make financial products and services easier for people.

The present paper seeks to examine the relationship between financial literacy and behavioral biases than can occur in people's retirement decisions. Hence, it aims to identify whether financial literacy can mitigate these biases.

4. Research questions

Main research question: Are behavioral factors key drivers of retirement savings? In specific: do self-control, framing effects and loss aversion influence savings for retirement?

Through the survey research, this study specifically focuses on answering the following sub-research questions:

i. Does the framing of a matching contribution feature within 401(k), 403(b) or similar employee-funded retirement plans, affect people's contribution rates?
ii. Does the number of retirement savings accounts influence retirement savings?
iii. Can the framing of an automatic escalation feature within 401(k), 403(b) or similar employee-funded retirement plans, increase the use of the feature?
iv. Does financial literacy mitigate significantly the influence of framing effects?

5. Methodology

To provide answers to the four previously mentioned sub-research questions this paper uses a survey research. Hence, 3 sets of questions are circulated to US workers as part of the annual TCRS survey.

5.1   TCRS survey methodology

The TCRS survey is a 22-minute online panel survey among a nationally representative sample of 4,000 using the Harris online panel.

Respondents are US residents aged 18 years old or older and are full-time or part-time workers in a for-profit company employing 10 or more people.

5.2   Focus on behavioral biases to be tested

As previously stated, besides reviewing theories and specific behavioral biases related to retirement decisions, this thesis focuses on specific biases and through a survey research aims to test whether they occur or not. The following lines are dedicated to providing a close look at the focus areas of the present paper. These are: framing effects, self-control and loss aversion.

5.2.1   Matching contributions and savings outcomes using framing effects

Behavioral research indicates that people adopt various heuristics and rules of thumps to make their decisions easier, when it comes to decide about complicated saving matters. Existing literature suggests that financial incentives are not always as effective as standard economic theory assumes. Choi, Laibson, and Madrian (2011) conclude that even with matching features in DC plans, participations rates are often low. Madrian (2012) suggests that research in the matching and saving rates field shows that increasing the match rate most of the times does not increase the contribution rates significantly. The most important element in that field appears to be the match threshold, as it serves as a reference point in deciding how much to save (Madrian, 2012). This means that a lower match rate with a higher match threshold could incentivise people to contribute more, than a higher match rate with lower match threshold.

5.2.2   Using commitment devices-testing self-control

Research shows that commitment devices such as the automatic enrollment feature can significantly increase saving rates. Another such commitmenet device is having multiple savings accounts. Soman and Cheema (2011), using a field experiment, show that *"partitioning*

earmarked savings into multiple accounts increased realized savings by 39–216%". They assumed that *"opening a savings envelope, or violating the partition, induces guilt"*. Therefore, having multiple accounts or partitions increases the psycological cost of spending money that has been set aside for a specific purpose. For retirement savings, this implies, that having multiple retirement accounts can lead to higher retirement savings. For instance, an individual that has both an IRA and a savings account may be saving more compared to an individual that only has a general account.

5.2.3 Loss aversion

Loss aversion is the fact that people overweigh losses and implies that households may be reluctant to increase their contributions to a saving plan, as reductions in disposable income are viewed as a loss (Thaler, Benartzi, 2004).

5.2.4 Rationale for focusing on loss version, self-control and framing effects

This paper besides reviewing relevant behavioral finance literature is also focusing on testing loss aversion, self-control and framing effects. The first reason for selecting these three behavioral biases is feasibility. Given the fact that this study uses self-reported responses from a survey and not data from actual retirement choices, these three biases seem to be the most adequate to be tested in this framework.

The second reason for choosing these specific biases, is the fact that framing effect on matching contributions, auto-escalation features and commitment devices such as having multiple accounts, are considered as "hot topics" at this juncture in the US.

Lastly, the questions used to examine how these behavioral biases affect retirement decisions have to be in line with the structure of the actual TCRS survey. All the questions used in the TCRS survey follow a certain "storyline" that enables a trending analysis throughout the years. Therefore, any question that is not in line with this specific "storyline", could disrupt the flow of the questionnaire and lead to confounded responses and in turn confounded results.

5.3 Survey questions: design and hypotheses

In this section the survey questions design is described in detail, as well as the hypotheses to be tested using each one of the questions are provided.

5.3.1 Testing for framing effects

In this set of questions framing effects are used to examine whether framing the match rate and the match threshold differently, would trigger people to contribute more to their 401(k), 403(b) or similar employee-funded retirement plan. Individuals are asked how much would they contribute to their retirement plan in different employer-match situations. Hence, employees are asked how much percent of their salary would they contribute if their employer matched 25 percent on contributions up to 12 percent of their salary. This first option refers to the lower match rate-higher match threshold situation. People are then asked how much would they contribute if their employer matched 50 percent on contributions up to 6 percent of their salaries. This option refers to the higher match rate-lower match threshold situation.

Although this set of questions aims to examine the difference between the mean and median contribution rates between the first two options, a third option was also included. People are asked to indicate their contribution rate if their employer matched 100 percent on contributions up to 3 percent of their salaries. This match is considered as the "safe harbour" option for 401 (k) contributions in the US and is relevant for the TSRC survey purposes.

To keep calculations, if any, easy to the respondents the three prospects (employers' matching contributions situations) are mathematically equivalent and equal to 3 percent. The most important reason for using this match-rate-match-threshold structure though, is the intention not to use situations in which the cost to the employers is increasing. The aim is to examine whether framing the match differently, can influence the contribution rates given a specific cost to the employers.

It is worth mentioning that in the following question design, a text box for the response is provided versus a lengthy choice list. This is due to higher cost associated to the extent of the question within the TCRS questionnaire. The familiarity of the respondents with such retirement plan contributions and the fourteen years' experience of similar questions within this same survey are ensuring a quite safe framework for receiving realistic responses. The hypothesis used for this question is as follows:

H1: In the case where the match threshold is higher (a match of 25% on contributions up to 12%), stated contribution will be significantly higher.

And the set of questions for testing framing effects as originally placed in the TCRS questionnaire:

For the following questions we would like you to imagine that you are working for an employer offering different options for a retirement plan.

[ROTATE ORDER OF Q631/Q632/Q633]

BASE: THOSE WITH QUALIFIED PLANS CURRENTLY OFFERED TO THEM (Q1180 (OLD: Q580)/2, 3) (12 SEC)

Q631 (NEW)   If your employer offered to match 25% of your 401(k) or other company-sponsored retirement plan for up to 12% of your salary, what percent of your annual salary would you contribute?

|_|_|_|_% [NUMERIC OPEN END; RANGE 0-100] %

BASE: THOSE WITH QUALIFIED PLANS CURRENTLY OFFERED TO THEM (Q1180 (OLD: Q580)/2, 3) (12 SEC)

Q632 (NEW)   If your employer offered to match 50% of your 401(k) or other company-sponsored retirement plan for up to 6% of your salary, what percent of your annual salary would you contribute?

|_|_|_| % [NUMERIC OPEN END; RANGE 0-100] %

BASE: THOSE WITH QUALIFIED PLANS CURRENTLY OFFERED TO THEM (Q1180 (OLD: Q580)/2, 3) (12 SEC)

Q633 (NEW)   If your employer offered to match 100% of your 401(k) or other company-sponsored retirement plan for up to 3% of your salary, what percent of your annual salary would you contribute?

|_|_|_|_% [NUMERIC OPEN END; RANGE 0-100] %

5.3.2   Testing whether commitment devices mitigate self-control issues

In order to examine whether multiple accounts could work as a commitment device for people to save more, an already existing question of the TCRS survey is used in addition to 2 new questions.

In the first question a list of investment / saving vehicles is provided, asking individuals which of these vehicles they are using to save for retirement outside their work place.

Secondly, people that chose more than one of these accounts are asked to which of these accounts have they added money the last 12 months. This screening question is used to control for accounts or investment vehicles that are inactive. Furthermore, in this second question the online questionnaire is programmed to exclude the following options: "Your primary residence", "Real estate investments other than your primary residence", "other savings and investments", "none of these" and life "insurance policy". The reason for excluding these response options is that they are not considered as savings accounts and therefore would not serve the question's purpose; in fact they would probably cofound the findings of the question.

Finally, a third question asks both those who answered that they use only one and those who answered that they use more than one of the listed accounts, how much percent of their annual income have they added to these accounts in the last 12 months.

The same reasoning as in the previous question design about using a text box for the responses versus a choice list, also applies it this question.

This set of questions aims to investigate differences in the savings between people who use only one and people who use more than account to save for retirement. Hence, a comparison between the saving rates of those having only one retirement account and those having multiple accounts could reveal whether the following hypothesis is supported. The hypothesis used for this question is as follows:

H2: Individuals who have more than one retirement savings accounts will have significantly higher savings rates than those who have only one.

And the set of questions for testing self-control as originally placed in the TCRS questionnaire:

BASE: ALL QUALIFIED RESPONDENTS (Q99/1) (10 SEC)

Q740(T) Are you currently saving for retirement outside of work, such as in an IRA, mutual funds, bank account, etc.?

1. Yes

2. No

BASE: CURRENTLY SAVING FOR RETIREMENT OUTSIDE OF WORK (Q740/1) (25 SEC)

Q750 (T) What types of retirement investments are you currently saving in outside of work? Select all that apply.

[RANDOMIZE, MULTIPLE]

1. IRA[4]

2. Mutual funds

3. Annuity

4. CDs

5. Savings account

6. Stocks

7. Bonds

8. Your primary residence

9. Real estate investments other than your primary residence

17. Other investments (SPECIFY Q751) [Anchor to the bottom]

11. None of these [Anchor to the bottom, E]

13. Business

14. 401(k)

15. Life insurance policy

16. Money market fund

BASE: IF ANY SELECTED FROM Q750 (Q750 NE 11) (15 SEC)

Q752 (NEW)   Which, if any, of the following have you added money to in the last 12 months?

[MULTI-PUNCH; RANDOMIZE; DISPLAY ONLY CODES SELECTED AT Q750. ALWAYS DISPLAY CODES 10,11]

---

[4] See description in the endnotes.

1. IRA

2. Mutual funds

3. Annuity

4. CDs

5. Savings account

6. Stocks

7. Bonds

8. Your primary residence

9. Real estate investments other than your primary residence

17. Other investments [Anchor to the bottom]

11. None of these [Anchor to the bottom, E]

13. Business

14. 401(k)

15. Life insurance policy

16. Money market fund

BASE: CURRENTLY SAVING FOR RETIREMENT OUTSIDE OF WORK (Q740/1) (10 SEC)

Q753 (NEW)   What percentage of your annual income have you contributed to your retirement investments outside of work in the past 12 months?

_|_|_|_| % [RANGE 0-100%]

5.3.3   Testing whether addressing loss aversion could increase the use of auto-escalation features

The idea here, is to replicate Thaler and Bernazi's SMT plan (2004) and to use their design as a question. Hence, connecting an auto-escalation feature with a pay raise. In a similar setting Helman, VanDerhei, and Copeland (2007) ask participants of 401 (k) plans: "*Suppose your employer automatically increased the percentage of your salary contributed to the plan by 1% each time you received a raise. For example, your contribution might increase from 3% to 4% of your salary with your first raise, and from 4% to 5% with your next raise. You could choose to discontinue the automatic increase at any time. At about what percentage of your salary do you think you would discontinue the automatic increase?*"

They find that many of the employees (44 percent) would discontinue the increase between 6 to 10 percent. 25 percent would stop between 1 to 5 percent, while 14 percent of the respondents indicated that they would be willing to continue this increase after 15 percent.

The question used in this study aims to compare responses 'very likely' and 'Somewhat likely' combined between the two prospects below.

The rationale behind this design is that an increase in the salary level could make people not to perceive the contribution to the 401 (k) or similar plan as a loss. What is more, the following question implies that there is not an auto-escalation feature and therefore aims to examine whether people would choose the feature based on its type. The hypothesis used for this question is as follows:

H3: The plan where the automatic increase comes only after a salary raise will be preferred.

And the set of questions for testing loss aversion as originally placed in the TCRS questionnaire:

BASE: ALL QUALIFIED RESPONDENTS (Q99/1) (15 SEC)

Q702 (NEW)   How likely would you be to use a feature in a 401(k) or similar plan where your employer would automatically increase your contribution rate (as a percentage of your salary) to the plan by 1% each year, until you choose to discontinue this increase.

1. Not at all likely

2. Not too likely

3. Somewhat likely

4. Very likely

BASE: ALL QUALIFIED RESPONDENTS (Q99/1) (15 SEC)

Q703 (NEW)   How likely would you be to use a feature in a 401(k) or similar plan where your employer would automatically increase your contribution rate (as a percentage of your salary) to the plan by 1% only after a salary raise, until you choose to discontinue this increase.

1. Not at all likely

2. Not too likely

3. Somewhat likely

4. Very likely

5.4   Data

Data is weighted to account for differences between the population available via the internet versus by telephone. Furthermore, data is weighted to ensure that each quota group had a representative sample based on the number of employees ta companies in each employee size range. This weighting procedure is called "propensity score weighting-propensity score matching" (Rosenbaum and Rubin 1984) and it is mainly used is social policy studies to ensure that both experiment and control groups are of the same characteristics; where randomisation is not possible. According to Duffy et al. (2010), the propensity score weighting procedure consists of several steps. Firstly, online and telephone surveys are circulated in parallel using the same questions. Secondly, a logistic regression is run so as to create a model that estimates the probability that a respondent took part in the telephone survey rather than the online one. That is done based on individual characteristics of the respondents. The generated probability is also based on behavioural, attitudinal and demographic questions. The following step is to group respondents according to their propensity score within their survey group (telephone or online). Using this weighting process *"the distribution of characteristics will be asymptotically the same across all propensity groupings within both samples".* It is consequently evident, that propensity weighting produces results analogous to randomisation.

What is more, percentages are rounded to the nearest whole percent. Differences in the sums of combined categories / answers are due to rounding.

6. Analysis

This chapter presents the analysis part of the present paper. It discusses the tools and methods used to analyse the survey data and the process used to arrive to the results.

As previously mentioned, this study uses the TCRS worker survey to retrieve its data. Hence, the responses to the survey questions are analysed in this chapter. The Transamerica Center for Retirement Studies (TCRS) collaborates with Harris interactive[5], a research firm, for the survey panels and for the statistical analysis. Hence, the data and the results are delivered from Harris interactive. This in turn means that the data and the results for the present paper are also delivered by Harris interactive, and therefore the analysis is compliant with the one of this firm.

The analysis discussed in the following paragraphs of this chapter, is divided in two parts. The description of the banner books' design and the detailed description of all the statistical comparisons made, in order to test the hypothesis.

6.1   Banner

Harris interactive and the Transamerica Center for Retirement Studies use an analysis format called banner. A banner is a statistical table that includes columns that are filters. These filters can be demographic or individual characteristics of the respondents. They can also represent answers to survey questions.

Such a banner is used to compare responses to a question with all the variables that the filters represent. In statistical terms a survey question's responses are the dependent variables and the filters-columns the independent ones. Hence a banner powerfully, shows how individual characteristics or question responses affect responses to a specific question. What is more, differences between the columns are tested for statistical significance. Hence, proportions and means are tested in the 5% and 10% risk levels. In the banner layout this is indicated with letters, due to the fact that each column-filter is marked with a letter. Significance is therefore stated using these letters. Upper case letters are used for the 5% level, while lower case letters are used for the 10% level.

However, this analysis uses also the median responses to make comparisons. This is mainly due to the fact that the distribution in many cases seems to be skewed. Hence, there are outliers that lift the mean responses in high levels. The main reason for this is that as the survey questions are structured, there is no upper bound for the responses. It is therefore fair to state that in the cases that the distribution appears to be heavily skewed, the median responses are a more robust method to compare contribution rates for instance.

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[5] See description in the endnotes.

6.2   Banner book

Banner book is a collection of the banners for all questions asked in the questionnaire. This means, that each banner book contains one banner, with the same filters, for each and every question asked in the TSRC survey questionnaire. Examples of banner books used for the TCRS research purposes are: age, household income, gender and marital status, education banner book and many more.

Furthermore, within a specific banner book, every question is presented in multiple different banners, which are different sheets of the banner book. What is different between these banners, is the base of the respondents. Hence, a question can be presented in banners filtered to display different samples of the population. Examples of different bases include, "All Qualified Respondents", "Participating In 401K Or Similar Plan", "Not Offered 401K Or Similar Plan Or Offered One But Not Participating", "Those With Qualified Plan Currently Offered To Them" and "Offered Plan But Not Participating".

For the present analysis a separate banner book was designed and requested to be delivered by Harris interactive. It includes both individual characteristics filters and filters that represent answers to particular questions. These filters are noted as headings and sub-headings in the banner book format. In particular, the main headings-filters include education, the number of accounts that people contributed to outside savings in the last 12 months, 'likelihood to use' the 2 auto-increase scenarios and whether they participate in an employee funded plan. Obviously, this banner also includes different sheets using different bases per question, as all other banner books do.

Besides the previously mentioned banner book designed specifically for this paper's purposes, the present analysis uses other banner books to retrieve data and comparisons. Namely the "education banner book", the "household income banner book" and the "age" banner book.

The following paragraphs describe all the filters included in the banner book designed specifically for this analysis and table 1 shows an overview of all headings-filters transposed vertically.

6.2.1   'Education' filters

The banner that this paper uses includes two filters for education. Namely, education 1 and education 2.

Education 1 is divided in 4 sub-filters. These are: high school or less, some college or trade school, college graduate and post graduate. These 4 sub-filters are respectively divided in 3

household income levels each. This means that each level of education is divided in 3 different household income ranges. These ranges are as follows: less than $ 50,000 per year, $ 50,000 to $ 99,000 per year, and more than $100,000 per year.

Education 2 refers to respondents aged 25 years old or more. This filter is split in 2 sub-filters which also represent 2 different education levels. Namely, high school to some college and 4 years of college or more. Here the household income ranges that constitute the next sub-filters are different from education 1. Hence, the two education level sub-filters are divided in 2 sub-filters each. These are, household income between $ 50,000 and $ 74,000 per year, and household income between $75,000 and $99,000 per year.

6.2.2 'Number of outside of work accounts' filter

This filter shows the number of accounts that respondents indicated to have contributed outside of work in the last 12 months, and refers to the question Q752 described earlier in the methodology chapter. It is divided in six sub filters that represent the number of accounts. That is 0, 1, 2, 3, 4, and 5 or more accounts.

6.2.3 'Auto-increase' filter

The 'auto-increase' filter is divided in two sub-filters that represent the 2 scenarios in the questions Q702 and Q703 described in the methodology chapter. These sub-filters are in turn, split in likely and unlikely. The likely and unlikely filters refer to the aggregate responses of likelihood in the questions Q702 and Q703.

6.2.4 'Participates in an employee funded plan' filter

The 'Participates in an employee funded plan' filter is divided in two sub-filters that show responses to the question that asks individuals whether they participate in an employee funded plan. Therefore, these two sub-filters are yes and no.

Table 1. Banner filters overview

Column	Heading	Subheading 1	Subheading 2	Condition
A			HHI < 50k	
B		HS or Less	HHI 50 to 99k	
C			HHI 100k+	
D			HHI < 50k	
E		Some Col /Trade	HHI 50 to 99k	
F			HHI 100k+	
G	Education 1		HHI < 50k	
H		Col Grad	HHI 50 to 99k	
I			HHI 100k+	
J			HHI < 50k	
K		Post Grad	HHI 50 to 99k	
L			HHI 100k+	
M		HS Diploma to some college	HHI 50k to 74k	
N	Education 2 (Age 25+)		HHI 75k to 99k	
O		4 yr College or more	HHI 50k to 74k	
P			HHI 75k to 99k	
Q	Participates in EE-funded Plan	Yes		
R		No		
S		0 (Q740 = 2no)		
T		1		
U	Contributed to Oustide Savings in Last 12 Months (Q752) (# Accounts)	2		
V		3		
W		4		
X		5+		
Y		Scenario 1 (Annual)	Likely	
Z	Auto Increase (Likelihood to Adapt)		Unlikely	
a		Scenario 2 (Raise)	Likely	
b			Unlikely	

6.3   Test for framing effects

This paper aims to investigate whether the framing of a matching contribution feature within a 401 (k) or similar plan can affect people's contribution rates to the plan and in turn induce higher savings. For this part of the analysis, mean and median contribution rates are compared between questions Q631 and Q632. These questions are, "If your employer offered to match 25% of your 401(k) or other company-sponsored retirement plan for up to 12% of your salary, what percent of your annual salary would you contribute?" and "If your employer offered to match 50% of your 401(k) or other company-sponsored retirement plan for up to 6% of your salary, what percent of your annual salary would you contribute?". Hence, it is examined whether framing the matching contribution as 'lower match rate-higher match threshold' versus

'higher match rate-lower match threshold', could induce higher contribution rates. The present analysis hypothesises that mean and median contribution rates will be significantly higher in the 'lower match rate-higher match threshold' scenario.

This comparison is made using figures from the 'education' banner and by requesting an ad-hoc significance table by Harris interactive. The education banner is used because it includes total responses to questions Q631 and Q632 under the filter 'total for profit'. The banner book designed specifically for the present analysis and described earlier, does not include such a filter. As there are also other banner books that include the 'total for profit' filter, the 'education banner' was just randomly selected between those.

The reason that the extra significance-test table was requested, is that the two match scenarios cannot lay themselves in a filter format within a banner. This means that the mean and the median responses of questions Q631 and Q632 are retrieved from different banners-sheets within the 'education' banner book and the significance test are run outside the banner format.

Due to the fact that the base for questions Q631 and Q632 is 'those with qualified plan currently offered to them', this is the primary base for the analysis for framing effects as well. However, mean and median responses are also tested using the 'participating in 401 (k) or similar plan', as well as the 'offered plan but not participating' bases.

Furthermore, mean and median contribution rates in question Q631 are compared between individuals that are offered matching contribution and those who are not. The goal of this sub-analysis is to examine whether contribution rates in the scenario of 'lower match rate-higher match threshold' vary with the fact that people are offered a match feature or not. In order to make such comparisons possible, the present analysis uses the 'household income' banner book; more specifically, the 'offered matching contribution' filter that is included in this banner book. The 'offered matching contribution' filter is divided in 'yes', 'no' and 'not sure'. Nevertheless, only the 'yes' and the 'no' sub-filters qualify for being in the scope of the present analysis. Lastly, this secondary analysis, is done also for all three bases used in the primary analysis for framing effects. Namely, 'those with qualified plan currently offered to them', 'participating in 401 (k) or similar plan' and 'offered plan but not participating'.

6.4   Test for self-control

As previously mentioned, this paper investigates whether commitment devices can mitigate self-control problems. Such commitment devices can be: having multiple retirement accounts. Consequently, the goal of the analysis is to examine whether having multiple accounts versus having only one, can lead to higher savings. This comparison is done within the banner for

question Q753. That is, "What percentage of your annual income have you contributed to your retirement investments outside of work in the past 12 months?"

Hence, mean and median savings rates are compared between people who use 1 account outside of work and those who use 2 or more. This comparison is facilitated by the 'Number of outside of work accounts' filter in the banner book designed specifically for the present paper. The base used in the Q753 survey question is people that are 'saving for retirement outside of work'. This is the reason that this base is primarily used by the present analysis as well. Nonetheless, contribution rates of those that are 'participating in a 401 (k) plan', as well as of those that are 'not offered a 401 (k) or similar plan or are offered one but are not participating', are also tested. This comparison between different bases reveals whether participating in a 401 (k) plan, changes the 'outside of work' saving behavior of employees.

What is more, using the 'Number of outside of work accounts' filter the present analysis examines whether savings increase as the number of accounts used also increases. Here, the analysis hypothesises that multiple savings accounts will yield significantly higher savings rates.

One could argue though, that there are also rational explanations to what drives people's saving outside of work. Such an explanation is the differences in income level. It is not unfair to claim that individuals with higher income will have higher 'outside of work' savings. Or, they will have lower 'outside of work' savings, because they do not really need to save more for retirement. To account for such arguments, this analysis examines whether higher income leads to higher or lower 'outside of work' savings. To do so, it uses the household income banner. This banner shows how responses to all questions vary with household income. Here, mean and median responses to question Q753 are tested against different levels of household income in all three bases.

6.5   Test for loss aversion

Using the questions Q702 and Q703 this thesis strives to examine whether addressing loss aversion can increase the use of an auto-escalation feature within a 401 (k) or similar employee funded plan. These two questions are as follows: Q702. "How likely would you be to use a feature in a 401(k) or similar plan where your employer would automatically increase your contribution rate (as a percentage of your salary) to the plan by 1% each year, until you choose to discontinue this increase" and Q703. "How likely would you be to use a feature in a 401(k) or similar plan where your employer would automatically increase your contribution rate (as a percentage of your salary) to the plan by 1% only after a salary raise, until you choose to discontinue this increase".

To test whether loss aversion can increase the use of an auto-escalation feature, this analysis compares likelihood between the two questions mentioned above. Hence, it compares

proportions between the two auto-increase scenarios. These are, '1% increase each year' and '1% only after a salary raise'. As in the 'framing effects' section, the percentages of 'likely' in these two questions are retrieved by the 'education' banner and tested separately in the ad-hoc significance testing table designed specifically for these two analyses and provided by Harris interactive. 'Likely' here, refers to percentages of 'very likely' and 'somewhat likely' combined. The hypothesis here is that likelihood in the question Q703 will be significantly higher compared to likelihood in question Q702. The present analysis hypothesises therefore, that the scenario where the auto-increase comes only after a salary raise will be more preferred by employees.

The base for questions Q702 and Q703 is 'all qualified respondents'. However, here comparisons are primarily made using the 'those with qualified plan offered to them' base, so as to have the same starting base for all analyses of the present paper. As auto-escalation features refer mainly to 401 (k) or similar plans, percentages of likelihood between questions Q702 and Q703 are also compared using the 'participating in 401 (k) or similar plan' and 'not offered 401 (k) or similar plan or offered one but not participating' bases.

By this point, it is already clear that question Q703 is the one that addresses loss aversion. Here, a secondary analysis is done to examine whether likelihood to use an auto-escalation feature only after a pay raise, varies with age. In fact, percentages of 'likely' in the question Q703 are compared between different age decades.

This sub-analysis is facilitated by the 'age' banner book. In the banner used in this book there are seven filters representing a different age decade each. Hence, proportions of 'likely' are compared between people in their twenties, thirties, forties, fifties, sixties, those who are 60 years old or more and those who are 65 years old or more. This extra analysis uses the same bases as the main analysis for loss aversion. It consequently uses the 'those with qualified plan offered to them' base, as well as the 'participating in 401 (k) or similar plan' and 'not offered 401 (k) or similar plan or offered one but not participating' bases.

6.6   Test whether financial literacy can mitigate framing effects

To examine the influence of financial literacy on behavioural biases this paper uses the level of education. The present analysis therefore assumes that people with higher education are more financially literate compared to those with low education.

It seems however, that there is a positive relationship between educational level and income level. This may imply for example that people with higher education and in turn higher income would contribute more to a 401 (k) plan, compared to individuals with lower education. To control for confounds due to differences in the income level, comparisons are made between lower educated and higher educated individuals that lay within the same income range. To

achieve this, the present analysis uses the two education filters included in the banner book designed specifically for this paper.

Firstly, comparisons are made under the education 1 filter and the '$ 50,000 to $ 99,000' filter for question Q631. That is "If your employer offered to match 25% of your 401(k) or other company-sponsored retirement plan for up to 12% of your salary, what percent of your annual salary would you contribute?". Hence, mean and median contribution rates are compared between people with high school education or less, with some college or trade school education, college graduates and postgraduates.

Secondly, this analysis makes use of the education 2 filter and the '$ 50,000 to $ 74,000' and the '$ 75,000 to $ 99,000' per year household income filters. In other words, it compares responses of people that have high school to some college diploma, to responses of people that have attended 4 years of college or more. What is more, this comparison is done within these income ranges for both types of education.

In order to investigate whether financial literacy mitigates framing effects, this paper examines what is the influence of education level on the mean and median contribution rate in the '0.25 match up to 12 percent' match scenario. Hence, it seeks to investigate whether individuals of higher education and in turn more financially literate, would have different contribution rates compared to those of lower education level.

The hypothesis used for this analysis is the following:

H4: Mean and median contribution rates to question Q631 will not significantly differ between higher and lower educated people. Hence, the hypothesis is that financial literacy cannot mitigate framing effects.

7. Results

In this chapter the results of the analysis are described and interpreted in detail. The following sections present the results per specific analysis as described earlier, as well as answers to this paper's research questions.

To make this chapter "reader-friendly", results are presented in simple tables versus in the original banner book format in this chapter. References to the banners, which can be found in the appendix of this thesis, are also included.

7.1 Test for framing effects

This section discusses the findings of the analysis concerning framing effects. Hence, it discusses whether the framing of a matching contribution can induce higher contribution rates within a 401 (k) or similar plan. Secondly, this section discusses results on whether contribution rates stated in the Q631 question differ between those offered a matching contribution and those who are not.

7.1.1 Does the 'lower match rate-higher match threshold' structure increase contribution rates?

As previously described, to answer the above question mean and median responses to questions Q631 and Q632 are compared. The hypothesis used for this analysis is as follows:

H1: In the case where the match threshold is higher (a match of 25% on contributions up to 12%), stated contribution will be significantly higher.

The results are overwhelming. This analysis finds significantly higher mean contribution rates in the '25% up to 12%' scenario than in the '50% up to 6%' scenario, suggesting strong framing effects. What is more, this difference is significant in the 'those with qualified plan currently offered to them' base, but also in the 'participating in 401 (k) or similar plan' base. In particular, using the 'those with qualified plan currently offered to them' base, the mean contribution rate in question Q631 is 13.1 and significantly higher than the mean contribution rate in question Q632 which is 12.1. Using the 'participating in 401 (k) or similar plan' base, the mean contribution rate in Q631 is 13.4 and significantly higher than the mean contribution rate in Q632 which is 12.2. It is worth mentioning here, that these differences are significant at both 5% and 10% risk levels.

As already mentioned though, the median rates seem to be a more robust method for the present analysis as they reflect the stated contributions rates more accurately. This happens because median contribution rates are not affected by skewness in the distribution of the responses.

The results of the median responses are even more striking. Median responses stand exactly at the same point where the match threshold does. In fact, for question Q631 (25% up to 12%) the median contribution rate is exactly 12 while for question Q632 (50% up to 6%) the median contribution rate is exactly 6. In addition to that, these results are the same in all bases examined, with the only exception of the 'offered plan but not participating' base where the

median contribution rate in question Q631 is 10. This further shows how strong are the framing effects; responses between different samples of the population are the same.

The results of the medians analysis not only show that the framing of the matching contribution feature can increase contribution rates, but also clearly suggest "anchoring effects". Hence, respondents appear to anchor to the starting or the default value of the feature. It seems therefore, that in line with what Choi et al. (2011) and Madrian (2012) have predicted, the match threshold serves as a *"focal point"* in people's cognitive procedure when deciding about contributions to their 401 (k) or similar plan. This means that by making little changes to the matching contribution structure, plan providers can powerfully nudge people save more for retirement. This is particularly important given the fact that the findings of this analysis are examined between prospects where the cost to the employer remains the same.

All in all, the results of the framing effects analysis support the hypothesis H1 and show that the framing of the matching contribution feature strongly affects contribution rates. Table 2 shows the results of this analysis, as well as part 1 of the appendix provides all the banners used for creating this table.

Table 2. Test for framing effects

Base: Those With Qualified Plan Currently Offered To Them	Q631 (25% up to 12%)		Q632 (50% up to 6%)	
	A		B	
	MEAN	13.1 Bb	MEAN	12.1
	STD. ERR.	0.21	STD. ERR.	0.24
	MEDIAN	12	MEDIAN	6
	Q631 (25% up to 12%)		Q632 (50% up to 6%)	
Base: Participating In 401K Or Similar Plan	A		B	
	MEAN	13.4 Bb	MEAN	12.2
	STD. ERR.	0.24	STD. ERR.	0.27
	MEDIAN	12	MEDIAN	6
Base: Offered Plan But Not Participating	Q631 (25% up to 12%)		Q632 (50% up to 6%)	
	A		B	
	MEAN	11.8	MEAN	11.8
	STD. ERR.	0.43	STD. ERR.	0.52
	MEDIAN	10	MEDIAN	6

Q631. If your employer offered to match 25% of your 401(k) or other company-sponsored retirement plan for up to 12% of your salary, what percent of your annual salary would you contribute?
Q632. If your employer offered to match 50% of your 401(k) or other company-sponsored retirement plan for up to 6% of your salary, what percent of your annual salary would you contribute?

Means: Columns tested (5%, 10% risk level) - A/B
Upper case denotes signifcance at the 5% risk level; lower case at 10%

7.1.2 Does familiarity with matching contributions affect stated contributions in Q631?

This sub-analysis of framing effects aims to investigate whether individuals that are offered a matching contribution feature would respond differently compared to those that are not

offered such a feature and are therefore somewhat unfamiliar with it. Hence, mean and median responses to the question Q631 are compared between individuals that are offered a matching contribution and those who are not.

The results of this sub-analysis further support the findings of the previous section. Differences in mean contribution rates between those who are offered matching contribution and those who are not, are not significant. These results suggest that the framing of the matching feature is so influential to people's decisions, that any familiarity with the feature does not outweigh it.

Again the median results show anchoring to the match threshold, irrespective of whether individuals are offered a matching contribution feature or not. In fact, median contribution rates are exactly 12 and the same for both individuals that are offered a matching contribution and those who are not. This holds, with only the exception of the 'Offered Plan But Not Participating' base, in which the contribution rate is 10 for both types of individuals. This '10' median contribution rate appears to be the consistent across the 2 analyses.

Consequently, familiarity with the matching contribution feature does not seem to affect contribution rates in question Q631 and surely it does not seem to crowd out the strong framing and anchoring effects detected in the previous section. The results for this sub-analysis are presented in table 3 and the banners used for table 3 are included also in part 1 of the appendix.

Table 3. Framing effects and offered matching contribution

Base: Those With Qualified Plan Currently Offered To Them	Offered Matching Contribution	
	Yes	No
	P	Q
MEAN	13.2	12.5
STD. ERR.	0.24	0.51
MEDIAN	12	12

Base: Participating In 401K Or Similar Plan	Offered Matching Contribution	
	Yes	No
	P	Q
MEAN	13.4	13.6
STD. ERR.	0.27	0.62
MEDIAN	12	12

Base: Offered Plan But Not Participating	Offered Matching Contribution	
	Yes	No
	P	Q
MEAN	12.1	9.6
STD. ERR.	0.56	0.85
MEDIAN	10	10

Q631. If your employer offered to match 25% of your 401(k) or other company-sponsored retirement plan for up to 12% of your salary, what percent of your annual salary would you contribute?

Means: Columns tested (5%, 10% risk level) - P/Q
Upper case denotes signifcance at the 5% risk level; lower case at 10%

7.2   Test for self-control

This section discusses the results from the analysis about self-control. The purpose of this analysis is to examine whether 'having multiple accounts' can serve as a commitment device for individuals and therefore induce higher retirement savings. For this reason it examines how mean and median contribution rates to 'outside of work' accounts vary with the number of accounts. Hence, mean and median responses to question Q753 are compared between the different number of accounts. The hypothesis used for this analysis is as follows:

H2: Individuals who use more than one outside of work savings accounts, will have significantly higher savings rates than those who have only one.

The results here clearly support the above stated hypothesis. Mean contribution rates to outside of work investments, are significantly higher for people who use two accounts compared to those who use only one. In specific, within the 'saving for retirement outside of work filter' base, the mean contribution rate for individuals who use only one account stands at 11.1 while for those who use 2 accounts at 15.1, which is significantly higher at both 5% and 10% risk levels. When testing responses in the 'participating in 401 (k) or similar plan' base, the results are similar; the mean contribution rate for one account is 9.3, while for two accounts 13.8, a mean significantly higher compared to the mean contribution rate of people using only one account. Lastly, this analysis yields the same result when using the 'not offered 401 (k) or similar plan or offered one but not participating' sub-sample. In fact, the mean contribution rate for people who use only one outside of work account is 13.1, while for those using two the mean rate is a significantly higher 17.5. It is evident therefore that the results here do not only support the hypothesis, but also are identical in all three bases used in the analysis.

Furthermore, the comparison of the median contribution rates in question Q753 are in line with the analysis of the means and in turn also support the hypothesis H2. Hence, in the first two bases the median contribution rate stands at 5 when people use one account and at 10 when people use two accounts. In the 'the 'not offered 401 (k) or similar plan or offered one but not participating' base, the median contribution to outside of work rate is 10 for individuals saving through only one account, while the median rate for those saving in two 2 is 15.

Moreover, the present analysis reveals a positive relationship between the mean contribution rates and the number of accounts used to save outside of work. Hence, as the number of accounts used increases, the mean contribution rates stated in question Q753 also increase. The mean contribution rate, as the number of accounts increases to 3, 4 or 5 plus accounts, is significantly higher than the rate of people using one account.

Summing up, these findings are in support of the suggestions by Soman and Cheema (2011), and show that having multiple accounts versus having only one may serve as a commitment

device and mitigate self-control problems. Such a commitment mechanism can induce higher contribution rates to outside of work saving vehicles and lead to better savings outcomes. The results of this analysis are presented in table 4 and the actual banners used for this table are included in the appendix part 2.

Table 4. Test for self-control

Base:	Saving For Retirement Outside Of Work	Contributed to Oustide Savings in Last 12 Months (# Accounts)				
		1	2	3	4	5+
		T	U	V	W	X
	MEAN	11.1	15.1 Tt	15.2 Tt	17.9 Tt	22.5 TUV tuv
	STD. ERR.	0.44	0.66	0.75	1.46	1.59
	MEDIAN	5	10	10	12	16
Base:	Participating In 401K Or Similar Plan	Contributed to Oustide Savings in Last 12 Months (# Accounts)				
		1	2	3	4	5+
		T	U	V	W	X
	MEAN	9.3	13.8 Tt	14.0 Tt	15.6 Tt	23.6 TUVW tuvw
	STD. ERR.	0.56	0.86	0.83	1.18	2.22
	MEDIAN	5	10	10	10	15
Base:	Not Offered 401 K Or Similar Plan Or Offered One But Not Participating	Contributed to Oustide Savings in Last 12 Months (# Accounts)				
		1	2	3	4	5+
		T	U	V	W	X
	MEAN	13.1	17.5 Tt*	18.8 Tt*	23.3 Tt*	20.3 Tt*
	STD. ERR.	0.70	0.99	1.61	3.79	1.46
	MEDIAN	10	15	15	12	20

Q753. What percentage of your annual income have you contributed to your retirement investments outside of work in the past 12 months?

Proportions: Columns tested (5%, 10% risk level) - T/U/V/W/X
* small base
Upper case denotes signifcance at the 5% risk level; lower case at 10%

It is however unclear whether the number of accounts is the only driver of outside of work savings. Income can be an important determinant of outside of work savings as well. The present analysis trying to sort out causes, examines how responses to question Q753 vary with income. Hence, total contribution rates to retirement accounts 'outside of work' are compared between different household income ranges.

The results of this secondary analysis are quite interesting. Mean contribution rates between people of higher and lower income, are not significantly different. Note that this holds for all three bases under examination; 'those with qualified plan offered to them', 'participating in 401 (k) or similar plan' and 'not offered 401 (k) or similar plan or offered one but not participating'. In addition to that, the median contribution rate stated in question Q753, is 10 and exactly the same in all income ranges and all bases used.

These results show that income does not affect savings 'outside of work'. This further strengthens the findings of the primary analysis in this section. That is, having multiple accounts can induce higher savings. The results of this secondary analysis are shown in table 5. The original banners used to design this table are provided in part 2 of the appendix.

Table 5. Saving outside of work and income level

Base:	Those With Qualified Plan Currently Offered To Them		Income		
			HHI< 50k	HHH 50 to 99k	HHI 100+
			D	G	J
		MEAN	14.3	14.4	13.2
		STD. ERR.	0.75	0.52	0.54
		MEDIAN	10	10	10
Base:	Participating In 401K Or Similar Plan		Income		
			HHI< 50k	HHH 50 to 99k	HHI 100+
			D	G	J
		MEAN	12.5	13.1	12.8
		STD. ERR.	1.13	0.70	0.64
		MEDIAN	10	10	10
Base:	Not Offered 401 K Or Similar Plan Or Offered One But Not Participating		Income		
			HHI< 50k	HHH 50 to 99k	HHI 100+
			D	G	J
		MEAN	15.6	16.0	14.1
		STD. ERR.	1.00	0.77	0.99
		MEDIAN	10	10	10

Q753. What percentage of your annual income have you contributed to your retirement investments outside of work in the past 12 months?

Proportions: Columns tested (5%, 10% risk level) - D/G/J
Upper case denotes signifcance at the 5% risk level; lower case at 10%

7.3 Test for loss aversion

This part presents the results of the analysis on loss aversion. It discusses therefore, whether addressing loss aversion through an auto-increase feature within a 401 (k) or similar plan, can increase the use of this feature. What is more, results of the secondary analysis done for loss aversion, are also discussed. This is, how does 'likelihood' in the scenario that addresses loss aversion vary with age.

7.3.1 Loss aversion and the use of auto-escalation features

To examine whether loss aversion could increase the use of an auto-increase feature within a 401 (k) or similar plan, the present analysis compares the percentages of 'very likely' and

'somewhat likely' combined under the label 'likely' between questions Q702 and Q703. Hence, percentages of 'likely' are compared between the 'annual scenario' described in question Q702 and the 'only after a pay raise' described in question Q703. The hypothesis used for this question is as follows:

H3: The plan where the automatic increase comes only after a salary raise will be preferred. This translates to: "the scenario where the automatic increase comes only after a salary raise will yield significantly higher 'likely' percentages".

The results of this analysis do not support hypothesis H3. Although 'likely' proportions in question Q703 are slightly higher compared to the proportions in Q702, the differences are not statistically significant. Hence, despite the fact that there is a slight preference for the 'only after a pay raise' scenario, which is the one addressing loss aversion, the above hypothesis is rejected. It is worth mentioning, that this holds for all bases under examination. Namely, 'those with qualified plan currently offered to them', those 'participating in a 401 (k) or similar plan' and those 'not offered a 401 (k) or similar plan or offered one but not participating'. Hence, 'likely' proportions are not significantly higher in question Q703 than in question Q702 in any of the different bases used.

The results suggest that addressing loss aversion could not significantly increase the use of an auto-escalation feature. However, as loss aversion is a very well documented bias that occurs in people's retirement decisions, the results of the present analysis may be largely driven by the specific set-up used in this paper. In fact, the survey research as well as the specific set of questions used in the present paper to test for loss aversion seem not to be the most effective way to elicit loss averse behavior. This is possibly attributed to the fact that loss aversion by definition is a bias occurring when people experience a realized loss. In a hypothetical framework such as the TCRS survey therefore, it is much more difficult to elicit loss averse behavior, as people can only imagine and not really feel 'painful losses'.

Another possible explanation to these findings could be the low escalation rate used in the scenarios under examination. Hence, the 1% increase in the two scenarios could possibly be perceived as a very low 'sacrifice', especially in the case where it comes only after a salary raise. The latter becomes therefore, an even more fair assumption when an employee is towards the end of her career and does not expect many further pay raises. This remark raises the question whether, even this low auto-increase 'only after a raise', could be more appealing to younger employees that expect to get several raises in their salary and is subject to the secondary forthcoming analysis on loss aversion.

The results for the primary analysis about whether loss aversion could increase the use of an automatic escalation feature are presented in table 6 below. The banners used for this table are included in part 3 of the appendix of the present paper.

Table 6. Loss aversion and the use of auto-increase features

Base:	Those With Qualified Plan Currently Offered To Them	Q702 Scenario 1 (Annual)	Q703 Scenario 2 (Raise)
		LIKELY	LIKELY
		A	B
		69%	72%
Base:	Participating In 401K Or Similar Plan	Q702 Scenario 1 (Annual)	Q703 Scenario 2 (Raise)
		LIKELY	LIKELY
		A	B
		70%	72%
Base:	Not Offered 401 K Or Similar Plan Or Offered One But Not Participating	Q702 Scenario 1 (Annual)	Q703 Scenario 2 (Raise)
		LIKELY	LIKELY
		A	B
		67%	70%

Q702. How likely would you be to use a feature in a 401(k) or similar plan where your employer would automatically increase your contribution rate (as a percentage of your salary) to the plan by 1% each year, until you choose to discontinue this increase?
Q703. How likely would you be to use a feature in a 401(k) or similar plan where your employer would automatically increase your contribution rate (as a percentage of your salary) to the plan by 1% only after a salary raise, until you choose to discontinue this increase?

Proportions: Columns tested (5%, 10% risk level) - A/B
Upper case denotes signifcance at the 5% risk level; lower case at 10%

7.3.2   Is loss aversion more prevalent in specific age groups?

This sub-analysis aims to investigate whether responses to question Q703 that addresses loss aversion, vary with age. For this reason, 'likely' percentages in question Q703 are compared between the following age groups: 20, 30, 40, 50, 60 or older and 65 and older years old.

The results here suggest that younger employees would be more likely to use an auto-increase feature after only a pay raise. This in turn may mean that younger employees are more driven by loss averse behavior compared to older employees. In fact, employees at their twenties and thirties have significantly higher 'likely' percentages compared to employees aged 50, 60, 60 and older and 65 and older years old. In addition, this is the case in all bases under examination. The only exception is the 'participation in 401 (k) or similar plan' base, where likelihood of people at age 20 and 30 is only significantly higher compared to the likelihood of people at their fifties.

Consequently, it seems that younger employees are more likely to use an auto-increase feature only after a pay raise, even with this very low increase rate. This may partly explain why the 'likely' aggregate percentages of the previous analysis do not support the hypothesis H3.

The results of this secondary analysis are shown in table 7, while the detailed banners are provided in part 3 of the appendix.

Table 7. Loss aversion and age

Base: Those With Qualified Plan Currently Offered To Them		Age Decades						
		Twenties	Thirties	Forties	Fifties	Sixties	60 and older	65 and older
		LIKELY	LIKELY	LIKELY	LIKELY	LIKELY	LIKELY	LIKELY
		D	G	J	M	P	S	V
		78% MPSv	76% MPS	71%	67%	67%	67%	68%
				Age Decades				
Base: Participating In 401K Or Similar Plan		Twenties	Thirties	Forties	Fifties	Sixties	60 and older	65 and older
		LIKELY	LIKELY	LIKELY	LIKELY	LIKELY	LIKELY	LIKELY
		D	G	J	M	P	S	V
		79% M	74% m	72%	67%	71%	71%	69%
Base: Not Offered 401 K Or Similar Plan Or Offered One But Not Participating				Age Decades				
		Twenties	Thirties	Forties	Fifties	Sixties	60 and older	65 and older
		LIKELY	LIKELY	LIKELY	LIKELY	LIKELY	LIKELY	LIKELY
		D	G	J	M	P	S	V
		71% Psv	77% jmPSV	67% S	68% Sv	62% S	56%	57%

Q703. How likely would you be to use a feature in a 401(k) or similar plan where your employer would automatically increase your contribution rate (as a percentage of your salary) to the plan by 1% only after a salary raise, until you choose to discontinue this increase?

Proportions: Columns tested (5%, 10% risk level) - D/G/J/M/P/S/V
Upper case denotes signifcance at the 5% risk level; lower case at 10%

7.4   Test whether financial literacy can mitigate framing effects

This section presents the findings of the analysis concerning the relationship between financial literacy and framing effects. This analysis aims to examine whether financial literacy mitigates framing effects, using education level as a proxy for financial literacy. Hence, it compares mean and median responses to question Q631 between higher and lower educated people. To control for confounds due to differences in income level, these mean and median responses are also compared within the same specific income ranges for both lower and higher educated people. The hypothesis for this test is the following:

H4: Mean and median contribution rates to question Q631 will not significantly differ between higher and lower educated people.

The results are to a large extend supporting the above stated hypothesis. Using the education 1 filter, the results perfectly support the H4 hypothesis. Hence, differences in mean contribution

responses to question Q631 are not significantly different between lower and higher educated individuals of the same income. What is more, this occurs for all 4 levels of education under examination and all 3 bases used to test the responses. These three bases are, 'those with qualified plan currently offered to them', those 'participating in a 401 (k) or similar plan' and those 'offered a plan but not participating'.

Using the same education 1 filter of the banner designed for this paper's purposes, the median comparisons findings are even stronger. Median contribution rates are exactly the same between the different levels of education. Moreover, these medians, with only the exception of the 'offered plan but not participating' base, are exactly 12; confirming the anchoring effects described in an earlier analysis. It is therefore evident, that the influence of the framing of matching contribution feature in people's contribution rates, is a lot stronger than the influence of financial education. This in turn, and in line with Thaler's (2013) argumentation, suggests that in some cases behavioral economics can be a more effective tool-compared to financial education- to help people save more for retirement.

The second part of this analysis uses the education 2 filter which includes only two levels of education and refers to people aged more than 25 years old. Mean and median responses here are compared between two educational levels and two household income levels.

The results of this second part are heterogeneous. The analysis of the mean responses to Q631 confirm hypothesis H4, as in no one of the comparisons, differences in mean contribution rates are significant. This also holds for all three bases used for this analysis. Consequently, the mean tests run here, also suggest that financial literacy cannot mitigate framing effects.

However, the findings from the median responses comparisons show differences between the two educational levels. Therefore, the analysis of the median contribution rates under the filter education 2 cannot conclude that financial literacy cannot mitigate framing effects. Nonetheless, the differences in these median contribution rates can be attributed to the very small base of the respondents. The fact that the base in these answers is very small, makes difficult any attempt to draw concrete conclusions.

Overall, this section of the analysis suggests that financial literacy cannot significantly mitigate framing effects. So, for the specific TCRS survey sample and using this specific set of questions to address framing effects, as well as education to proxy for financial literacy, this paper finds that framing effects are quite stronger compared to the effect of financial literacy in individuals' contribution decisions.

The results of the 2 analyses discussed in this section, are presented in tables 8 and 9. The banners used to create these tables are included in part 4 of the appendix.

Table 8. Financial literacy and framing effects-education 1

Base: Those With Qualified Plan Currently Offered To Them		Education 1			
		HS or Less	Some Col/Trade	Col Grad	Post Grad
		HHI 50 to 99k	HHI 50 to 99k	HHI 50 to 99k	HHI 50 to 99k
		B	E	H	K
	MEAN	13.4*	12.1	12.5	11.8*
	STD. ERR.	1.04	0.54	0.48	0.45
	MEDIAN	12	12	12	12

Base: Participating In 401K Or Similar Plan		Education 1			
		HS or Less	Some Col/Trade	Col Grad	Post Grad
		HHI 50 to 99k	HHI 50 to 99k	HHI 50 to 99k	HHI 50 to 99k
		B	E	H	K
	MEAN	14.0	12.5	12.7	12.0
	STD. ERR.	1.29	0.63	0.54	0.46
	MEDIAN	12	12	12	12

Base: Offered Plan But Not Participating		Education 1			
		HS or Less	Some Col/Trade	Col Grad	Post Grad
		HHI 50 to 99k	HHI 50 to 99k	HHI 50 to 99k	HHI 50 to 99k
		B	E	H	K
	MEAN	12.1*	10.4*	11.4*	99.9*
	STD. ERR.	1.69	0.92	1.01	1.84
	MEDIAN	10	10	10	10

Q631. If your employer offered to match 25% of your 401(k) or other company-sp
up to 12% of your salary, what percent of your annual salary would you contribute?
Means: Columns tested (5%, 10% risk level) - M/O - N/P
* small base
Upper case denotes signifcance at the 5% risk level; lower case at 10%

Table 9. Financial literacy and framing effects-education 2

Base: Those With Qualified Plan Currently Offered To Them		Education 2 (Age 25+)			
		HS Diploma to some college		4 yr College or more	
		HHH 50 to 74k	HHI 75 to 99k	HHH 50 to 74k	HHI 75 to 99k
		M	N	O	P
	MEAN	11.4*	13.4*	10.9	13.1
	STD. ERR.	0.92	1.41	0.27	0.58
	MEDIAN	12	12	10	12

Base: Participating In 401K Or Similar Plan		Education 2 (Age 25+)			
		HS Diploma to some college		4 yr College or more	
		HHH 50 to 74k	HHI 75 to 99k	HHH 50 to 74k	HHI 75 to 99k
		M	N	O	P
	MEAN	10.5*	15.0*	11.2	13.3
	STD. ERR.	0.79	1.68	0.30	0.64
	MEDIAN	12	12	12	12

Base: Offered Plan But Not Participating		Education 2 (Age 25+)			
		HS Diploma to some college		4 yr College or more	
		HHH 50 to 74k	HHI 75 to 99k	HHH 50 to 74k	HHI 75 to 99k
		M	N	O	P
	MEAN	12.4*	8.9*	9.6*	12.4*
	STD. ERR.	2.36	1.37	0.62	1.27
	MEDIAN	12	8	10	12

Q631. If your employer offered to match 25% of your 401(k) or other company-sponsored retirement plan for
up to 12% of your salary, what percent of your annual salary would you contribute?
Means: Columns tested (5%, 10% risk level) - M/O - N/P
* small base
Upper case denotes signifcance at the 5% risk level; lower case at 10%

7.5   Answers to research questions

This section in meant to provide answers to this paper's research questions, according to the findings of the analysis.

i.   The framing of a matching contribution feature within 401 (k), 403 (b) or similar employee-funded plans affects peoples contribution rates. In fact, it can significantly increase contribution rates.

ii.   The number of retirement accounts used, can influence retirement savings. In fact, having multiple outside of work retirement accounts can significantly increase retirement savings.

iii. This paper finds that addressing loss aversion through the framing of an automatic escalation feature within 401 (k), 403 (b) or similar employee-funded plans, cannot significantly increase the use of this feature. However, this may be strongly dependent on this specific methodology design.

iv.   Financial literacy does not significantly mitigate the influence of framing effects.

8. Discussion

Limitations and further research:

The main limitation of a survey research is that the data is self-reported. Hence, such a research is able to examine "intentions" and not actual choices as an empirical research would do. The present paper uses self-reported data to proxy for actual choices.

Research in "desire versus action" filed validates the above concerns. Choi et al. (2001) compare worker's intentions with actual behavioral changes. In their experiment, all employees not participating in their firm's 401 (k) plan, after attending a workshop, indicated that they will join the plan. Disappointingly though, over the next 6 months only 14 percent did so. The authors also find that among 10,000 employees in a single firm said that they should be saving about 14 percent of their salary; in reality they were only saving 6 percent. In line are the findings of the TCRS and Aegon surveys. However, these findings also support the lack of willpower phenomenon discussed earlier in this paper. Therefore, it is clear that is not only the survey research would yield such findings but also common practice.

To the survey research's defence and more specifically the online panel one that this paper uses, the following can be noted. The TCRS survey is a US national representative survey. This means that the sample is weighted for all possible differences in demographic and individual

characteristics. Furthermore, online panel surveys are structured as such to avoid interviewers effects. Moreover, and most importantly, participants of an online panel survey, voluntarily sign up to participate. Hence, it is a fair assumption that their intrinsic motivation is not crowded out by any external factor. What is more this motivation can lead to willingness to provide as much as possible accurate answers.

What is more, given the fact that actual plan records are scarce and most of the times difficult to be available for research purposes, such a survey seem to be one of the most effective ways to elicit behavioral norms about retirement decisions. This becomes evident in the case of framing effects where using this specific set-up, the results seem convincing and in line with what prior research suggests. Despite the fact that one could argue that this holds for the sample surveyed and for the specific methodology used here, this analysis seem to yield concrete results on how framing effects influence individual's decisions.

While for framing effects the survey research appears to be quite effective in eliciting behavioral biases, the present paper speculates that for loss aversion, actual plan records would yield more valid findings. In fact, actual choices, as in the Save More Tomorrow plan (Thaler, Benartzi, 2004), show that addressing loss aversion can significantly increase contribution rates and in turn savings within a 401 (k) or similar plan. Furthermore, the fact that loss aversion refers to realized losses further suggests that actual decisions would yield more valid results. Hence, people have probably a higher propensity to make optimistic statements in a 'safe' hypothetical environment compared what they would do if they really experience the loss. Consequently, future research should test whether addressing loss aversion through an auto-escalation feature could increase the use of this feature, by using actual choices. In addition, for the loss aversion analysis, a higher escalation rate could be used by future analysis to yield a more accurate indication of the influence of loss aversion on retirement decisions.

As far as financial literacy is concerned, this paper finds that it cannot significantly mitigate framing effects. However, the following considerations can be noted. As discussed earlier, prior research shows that financial literacy can help people make more informed and optimal retirement decisions. It is therefore clear, that the opposite findings of the present paper only partly examine the role of financial literacy, and can only conclude on the relationship between financial literacy and framing effects. This point becomes even more valid when taking under consideration that here financial literacy is addressed through the level of education, as well as that it is examined in a hypothetical framework such as the TCRS survey. However, the results of the present paper validate some concerns raised in previous behavioral research about the effectiveness of financial literacy as a tool to help people save more for retirement. Further research can use experiment or actual data to test the effects of financial literacy on people's decisions. What is more, research on financial literacy could be expanded and correlated with

other behavioral biases. The role of financial literacy could also be tested in other types of retirement decisions such as investment decisions within 401 (k) or similar plans.

Lastly, a limitation of the methodology used in the present paper, is the use of text boxes versus choice lists for responses. Hence, the fact that there is no upper bound to the stated contribution rates might have led to skewed distributions in many cases, making the mean responses comparisons difficult. The fact that this analysis did not have access to the raw data and therefore to any possibility to correct for this skewness, underscores the importance of this limitation. However, median comparisons proved very effective. The reason for not using choice lists is that they are associated with higher costs for the survey. What is more, the reason for not setting an upper limit to the responses is that theoretically employees can contribute up to 100% of their salary to their retirement plan.

9. Implications for retirement plan providers

This chapter discusses implications and suggestions to pension plan providers, according to the literature review as well as the findings of the present paper. Hence, general implications resulting from prior research are provided, backed by the findings of the present paper.

As previously mentioned, people seem to have self-control problems when deciding about long-term retirement savings. What appears to be quite effective in mitigating such problems is the use of 'commitment devices' and rules of thumb. Such successful commitment devices are the auto-enrollment and auto-escalation features. In fact, individuals do not have to make active decisions as they are automatically enrolled in their plan or to contribution increases. Plan providers and employers should expand the provision of such features to help people achieve better savings outcomes. Another commitment device that this study finds that it could be very effective, is 'saving through multiple accounts outside of work'. Hence, this paper finds that individuals who use 2 or more savings vehicles for their outside of work savings, have significantly higher savings rates compared to those that use only one. What is more, a "save in multiple accounts for your outside of work savings" could be a great rule of thumb to communicate to people.

Furthermore, plan designs seem to influence individuals' decisions the most. Both previous behavioral research and the analysis of this paper, show that people very often tend to use the 'default heuristic'. Hence, they stick to the default options and do not make any further changes or decisions. This appears to be most of the times sub-optimal for employees, since default options and features are often not well designed. It is clear therefore, that by carefully designed features and default options plan providers can greatly help people save more for retirement. Hence, by setting sensible and adequate default contribution rates-and usually at a very low cost-providers can induce considerably higher savings from employees.

This paper finds that simple changes in the default structure of a matching contribution feature and with no additional costs to the employers, can significantly increase people's contribution rates to their retirement plan. The present paper in particular suggests, that employers provide a '25% match up to 12% contributions' match structure, as it seems that it can lead to a lot higher savings outcomes for employees.

Moreover, another implication on default options that the literature review of the present paper suggests is to provide flexible plans. More specifically, providers could successfully help employees to continue saving adequately, by enabling them to maintain their contribution rates between different employers. For instance when changing jobs, people could be automatically enrolled in the new employer's workplace retirement plan using the previous contribution rate as default to this new plan. This way, they could continue saving at the same rate without 'resetting' their reference point.

Concerning the investment default options of 401 (k) or similar plans the same principles apply. Behavioral finance research suggests that offering people too many investment options, most of the times lead to 'choice overload' and in turn decisional paralysis. Hence, the single most important suggestion for plan providers here, is to provide a limited number of well diversified investment options. What indeed many providers do, is to offer simple and limited life-cycle or target funds. Target funds usually have a date for employees to choose according to their retirement age.

Lastly, financial education is one of the most suggested tools to help people improve their retirement planning and savings. It appears however, that financial literacy is not panacea for all difficulties people face when they decide about retirement savings. Prior research as well as this paper, shows that financial literacy can in some cases be less effective than suggestions from behavioral finance. Although the intention here is not to challenge the important role of financial literacy, this paper tends to align with what Thaler (2013) and Fernandes et al. (2014) suggest. Hence, in some cases providing well designed plans, simple rules of thumb and "just in time financial education" can be a more effective way to help people save more for retirement and achieve a decent retirement income.

10. Conclusion

The present paper reviews a large part of the behavioral finance research done in the last couple of decades concerning retirement savings. It also, using the TCRS Annual Retirement Survey, examines the impact of framing effects, financial literacy, self-control and loss aversion to people's retirement decisions. This study finds strong framing and anchoring effects to the match threshold of a matching contribution feature. This means that by simply changing the framing of a match contribution feature, pension plan providers can decidedly help people save

more. What is most important regarding this finding though, is that such incentive involves no further costs, whatsoever, to the employers. Moreover, this paper finds that this framing effect is quite stronger than the effect of financial literacy in individuals' decisions. This in turn may mean that in some cases addressing behavioral aspects of retirement saving should be preceding any provision of financial education. Lastly, the present paper finds that individuals who use multiple savings accounts save more compared to those that use only one. This paper therefore suggests, that by informing and incentivizing people to use multiple 'outside of work' savings vehicles versus using only one, pension providers can significantly help them save more for retirement.

In sum, saving for retirement is a difficult task for individuals. Carefully designed plans and features, adequate default options, ready-to-use rules of thumb, and simplified and targeted investment options can successfully help them save more.

11. Endnotes

Aegon

Aegon is an international life insurance, pensions and asset management company with businesses in over 20 markets in the Americas, Europe and Asia. Aegon companies employ around 24,000 people and serve millions of customers worldwide.

Transamerica Center for Retirement Studies®

The Transamerica Center for Retirement Studies® (TCRS) is a division of the Transamerica Institute, a nonprofit, private foundation. TCRS is dedicated to educating the public on emerging trends surrounding retirement security in the United States. TCRS' research emphasizes employer-sponsored retirement plans, issues faced by small to mid-sized companies and their employees, and the implications of legislative and regulatory changes. Transamerica Institute is funded by contributions from Transamerica Life Insurance Company and its affiliates and may receive funds from unaffiliated third parties.

Harris Interactive

Harris Interactive Inc. is a professional services firm that provides market research and polling services which include ad-hoc and customized qualitative and quantitative research, service bureau research (conducted for other market research firms), and long-term tracking studies.

Retirement plans & schemes definitions:

Annuity

A form of contract sold by life insurance companies that guarantees a fixed or variable payment to the annuitant at some future time, usually retirement. All capital in the annuity grows tax-deferred.

Asset allocation

An investment strategy that aims to balance risk and reward by apportioning a portfolio's assets (the three main assets classes are equities, fixed-income and cash) according to an individual's goals, risk tolerance and investment horizon.

Auto enrollment

An employer-sponsored retirement plan in which the employer is able to enroll an employee without that employee's express authorization. The employer determines what percentage of the employee's salary or wages is contributed to the plan. The employee is able to change this percentage, and can opt out of enrollment in the plan.

Auto escalation

A feature of a plan which automatically increases the percentage of (retirement) funds saved from salary. This feature generally uses a default or standard contribution escalation rate.

Defined Benefit (DB) plan

An employer-sponsored pension plan where the amount of future benefits an employee will receive from the plan is defined, typically by a formula based on salary history and years of service. The amount of contributions the employer is required to make will depend on the investment returns experienced by the plan and the benefits promised. Contrast defined contribution plan.

Defined Contribution (DC) plan

An employer-sponsored retirement plan, such as a 401 (k) plan or a 403 (b) plan, in which contributions are made to individual participants accounts. Depending on the type of DC plan, contributions may be made by the employee, the employer or both. The employee's benefits at retirement or termination of employment are based on the employee and employer contributions and earnings and losses on those contributions. Contrast defined benefit plan.

401 (k) plan

An employer-sponsored DC plan that enables employees to make tax-deferred contributions from their salaries to the plan.

403 (b) plan

An employer-sponsored DC plan that enables employees of universities, public schools, and non-profit organizations to make tax-deferred contributions from their salaries to the plan.

Health Reimbursement Account (HRA)

Employer-funded plans that reimburse employees for incurred medical expenses that are not covered by the company's standard insurance plan. Because the employer funds the plan, any distributions are considered tax deductible (to the employer). Reimbursement dollars received by the employee are generally tax free.

Individual retirement account (IRA)

A tax-deferred account set up by or for an individual to hold and invest funds for retirement

Money market fund

An investment whose objective is to earn interest for shareholders while maintaining a net asset value (NAV) of $1 per share. A money market fund's portfolio is comprised of short-term (less than one year) securities representing high-quality, liquid debt and monetary instruments. Investors can purchase shares of money market funds through mutual funds, brokerage firms and banks.

Mutual fund

An investment vehicle that is made up of a pool of funds collected from many investors for the purpose of investing in securities such as stocks, bonds, money market instruments and similar assets.

Saver's Credit

A non-refundable tax credit available to lower income individuals and households that contribute to qualified retirement savings plans. This includes employer-sponsored plans such as 401(k), SIMPLE and SEP plans, or the governmental 457 plan, along with contributions to Traditional and Roth IRAs.

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